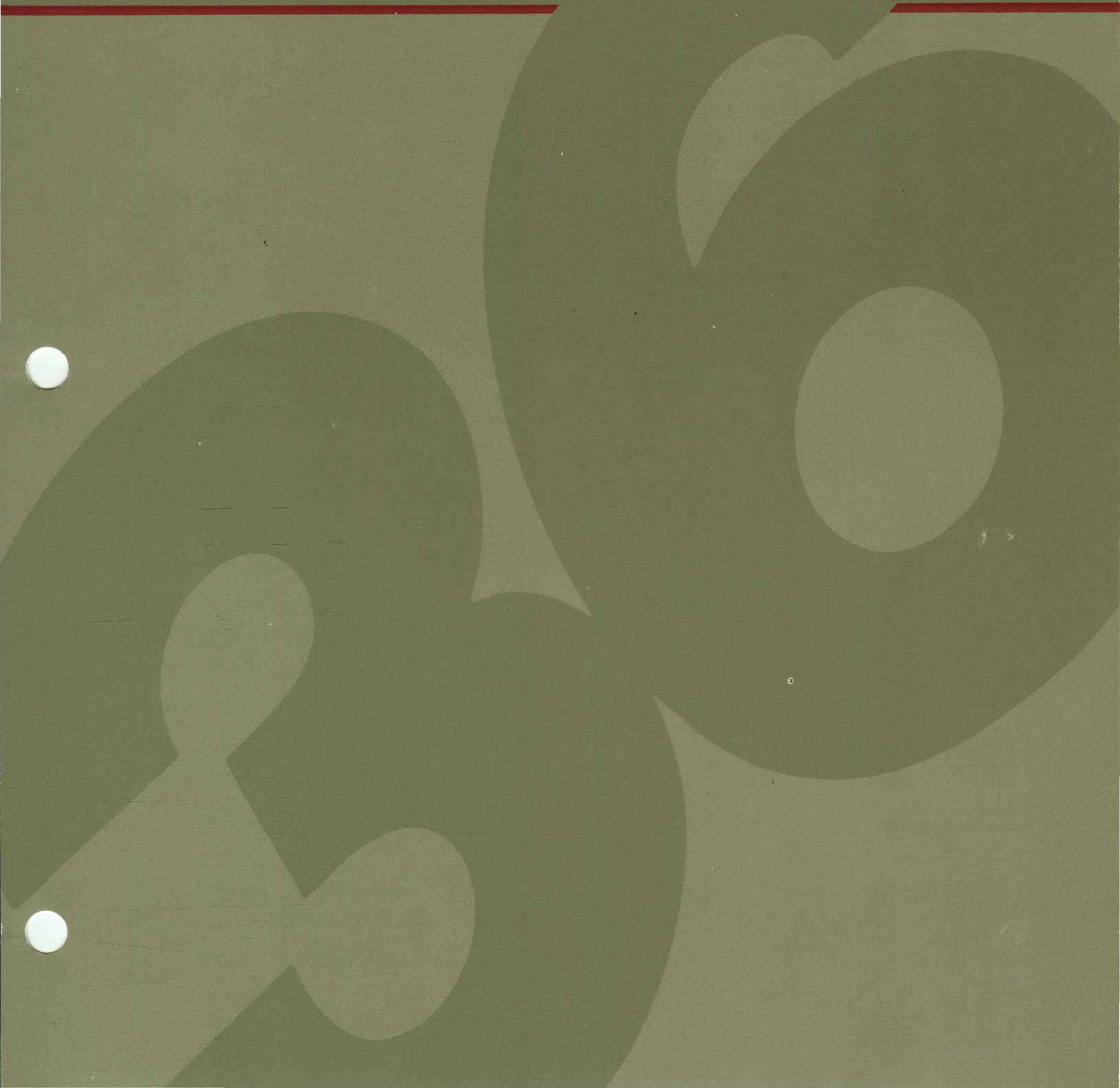IBM System/36

Data File
Utility Guide

When You Are:

You Can Find Information In:

Planning to Install Your Computer

What to Do Before Your Computer Arrives
                or
Converting from System/34 to System/36

Getting Your Computer Ready to Use

Setting Up Your Computer
Performing the First System Configuration For Your System
System Security Guide

Operating Your Computer

Learning About Your Computer
Operating Your Computer

Operating and Using the Utilities

Source Entry Utility Guide
Data File Utility Guide
Creating Displays
Work Station Utility Guide
Utilities Messages

Programming Your Computer

Concepts and Programmer's Guide
System Reference
Sort Guide
Work Station Utility Guide
(language manuals)
(language message manuals)

Communicating with Another Computer or Remote Device

(communication manuals)
(communication message manuals)

Determining the Cause of a Problem

System Messages
(message manuals)
System Problem Determination

IBM System/36:

Data File Utility Guide

Contents

About This Manual

Who should use this manual . . .

This manual should be read by the Data File Utility (DFU) display station operator and programmer. The early chapters of this manual should be read by the display station operator or inexperienced DFU user who wants an introduction to DFU and a step-by-step description of setting up a DFU program, and by the programmer or experienced DFU user who wants to review DFU. The later chapters of this manual can be read by any user as a reference for more details on the uses of DFU.

How this manual is arranged . . .

Chapter 1 gives you a general introduction to how DFU works. It explains setting up a new DFU program or using an existing program. It also introduces the relationship between DFU and the necessary file definition.

Chapter 2 provides an example of setting up a program and using an existing program. This chapter is for the new user or can be a review for the experienced user. Included in this chapter is a sample file definition (F- and I-specifications).

Chapter 3 lists and explains the required entries on the F- and I- specifications that make up the file definition you need for DFU.

Chapter 4, 5, and 6 provide details on Enter, Update, Inquiry, and List - including examples of each. All three chapters are divided into two sections. The first section is an example of setting up a program and the second section is a reference section containing all the details about the displays used to set up the program.

Chapter 7, *Attention Operators*, is for the operator who runs the DFU programs. It explains some general things like the status line on DFU displays, command and function keys, and record sequencing.

Chapter 8, *Attention Programmers*, includes a "run sheet" (a detailed list of instructions you need to provide to an operator who would use your program). This chapter also covers considerations for using DFU to do more complex programs.

Chapter 9, *DFU Attributes*, explains what DFU attributes are, how they are used and where they are displayed.

Chapter 10, *DFU Specifications*, explains how DFU creates specifications during program setup, what makes up the specifications, and how they can be used.

DFU terms in this manual . . .

There are several terms that are used throughout the *DFU Guide*. It will help if you are familiar with the following:

- DFU program: A DFU program for enter update and inquiry consists of both a load and subroutine member. A DFU program for list consists of only a subroutine member.

- Key field: A field in a record that is used to identify the record and define its order within an indexed file.

- Indexed file: A file in which the key and the position of each record are stored in a separate portion of the file called an index.

- Sequential file: A file in which records are stored in the order in which they were entered.

- Direct file: A file in which records are referred to by the relative record number.

- Remote file: A file that resides on a remote system.

- Record type: The classification of records in a file.

- Delete code: A character or code that identifies a record to be removed from a file.

- Numeric field: A field of data that contains only the digits 0 through 9.

- Alphameric field: A field of data that consists of both letters and numbers and other symbols, such as punctuation marks.

- Mode: A method of operation.

- Alternative index: An index that is built after a file is created, and that provides a different order of reading or writing records in the file.

- Record number: Identifying number assigned to a record within a file.

- Record key: A field in a record containing one or more characters used to identify the record and define the record's position in an indexed file.

- Non-contiguous key: A key that is made up of 2 or 3 non-consecutive record fields.

- Control field: A field that identifies a record's relationship to other records.

- Identifying code: Characters placed in a record to identify that record type.

What you should know . . .

You should be familiar with data processing concepts (such as disk, file, and library members) as described in *Learning About Your Computer*, SC21-9018 and with System/36 and its display stations as described in *Operating Your Computer*, SC21-9026. You should also be familiar with the operation of your display as described in the *Operator's Guide* for your particular display station.

If you need more information . . .

You might need some of the information in these manuals while using the *DFU Guide*.

- *Operating Your Computer*, SC21-9026, tells how to sign on or off the system, explains how to reply to messages, and answers general questions about operating the system.

- *Source Entry Utility Guide*, SC21-7901, tells you how to create a source member.

- *Concepts and Programmer's Guide*, SC21-9019, discusses the System/36 including file and library management.

- *Distributed Data Management Guide*, SC21-8011, tells you how to use the DDM feature for remote files.

The following publications offer information related to DFU:

- *Creating Displays: Screen Design Aid and System Support Program*, SC21-7902, guides you in designing and changing menus and displays for your programs.

- *System Reference*, SC21-9020, can be used for reference when using procedures, commands, and operation control language (OCL).

- *Utilities Messages*, SC21-7939, explains the messages you may see when using the utilities.

- *System Messages*, SC21-9028, explains messages you may see when using the system.

- *Ideographic Sort Guide*, SC09-1054, explains the procedures and concepts for sorting ideographic data.

If you would like more details about RPG II, see:

- *Programming with RPG II*, SC21-9006.

- *RPG Control and File Description Specifications*, GX21-9092.

- *RPG Input Specifications*, GX21-9094.

Naming conventions . . .

In this manual, the following conventions are used within the examples for program names.

Program names use the format aannnD, where:

- aa identifies the type of application:

  - AR means accounts receivable
  - IM means inventory management
  - OE means order entry
  - DE means data entry.

- nnn is a number that identifies the type of program:

  - 100-199 for data entry
  - 200-299 for inquiry
  - 300-399 for file maintenance
  - 400-499 for file update
  - 500-599 for sort
  - 900-999 for printing reports and program listings.

- D identifies the programming language as DFU.

Summary of changes

The following changes have been made for Release 3 Modification 0:

- DFU now supports limited non-contiguous keys.

- The maximum key length for indexed files has been increased to 99 bytes.

- The DDM feature to let DFU programs use remote files has been added.

- Alternative indexes can now be created over any file type.

- A new prompt to specify the VTOC file label if it is different from the specified file name has been added to the DFU procedure display screens.

- Various technical and editorial changes have been made to improve the quality and usability of this manual.

Chapter 1. What is DFU?

The Data File Utility (DFU) is a tool to help you meet some of your programming needs without your knowing a programming language. Through a series of displays, DFU asks you questions about the program you want to create and uses your answers to generate that program. Some DFU programmers may use the term *format* instead of *program*. A DFU format is the same as a DFU program.

DFU is designed so you can create programs to enter data into files, update files, inquire into files, and list files faster than coding similar programs with programming languages (RPG for example). In fact, with DFU you can often create one-time-only DFU programs that take a quick look at a data file or print a special report.

What Makes DFU Easy to Use?

What makes DFU programs easy to create is that you tell DFU what you want the program to do and DFU creates the program for you. By "tell", we mean that DFU shows you a series of displays with questions and blanks for you to fill in with information about your program. For example:

```
                   ENTER/UPDATE GENERAL INFORMATION
             Description of display and printout for index files

Job title . . . . . . . . . . . . . . . . . . . . . . .

How do you want the data displayed? . . . . . . . .   1,2,3  *
   1. Single column
   2. Multiple column
   3. Maximum data

Record delete code and position within the record . . . . . .

Print added records?. . . . . . . . . . . . . . . . . . N,Y

Print updated and deleted records? . . . . . . . . . . Y,N

Spaces between columns of printed data . . . . . . . . 0-9

Printer line width . . . . . . . . . . . . . . . . . 60-198

Stop printer on unprintable characters? . . . . . . . . N,Y

Should DFU generate keys? . . . . . . . . . . . . . . Y,N
```

As you tell DFU what you want the program to do, DFU translates your replies into something called DFU specifications. DFU understands these and needs them in order to create your DFU program. Here are some DFU specifications:

```
                    UPDATE DFU SPECIFICATIONS
                   Changes to DFU specifications

                Field1  Field2  Field3  Field4  Field5
                        *ENT/UPD*LIST   %,1     *COLUMNS
 ?=Remove line          *KEY    *GENKEY RECORD KEY IS:
 >=Add lines
                5    132*TITLE   ENTER CUSTMSTR
 Press ENTER to accept  01   *RECORD *LOWCASE
   changes                  *   CUSNM   CUSTOMER NAME
                            *   CUSA1   ADDRESS
                            *   CUSA2   CITY
                            *   STATE   STATE
                            *   ZIPCD   ZIP CODE






 Cmd7-End program setup
```

Because the specifications describe your program, DFU lets you save them and change them later if you want to.

You can already see that this is one way that DFU differs from a programming language. You don't code an entire DFU program on coding sheets the way you would code something like an RPG program. Instead you tell DFU what you want the program to do, and a source program (consisting of DFU specifications) is built for you.

Assume you've finished telling DFU what you want the program to do. Now, you press a command key to tell DFU to go ahead and create your DFU program. DFU takes your source and builds a program from it. In programming terms, what DFU does is similar to compiling your program.

DFU not only creates your program, it lets you run it right away. So if you described a list program to print a file, for example, as soon as you pressed the command key to tell DFU that you were done, DFU creates the program and then runs that program, and prints your file.

You Start With A File

We said that DFU helped you quickly create programs for data entry, file update, file inquiry, and file printouts. All of these programs process files. Before you create any DFU program, DFU needs to know what the file looks like. Is it indexed? Is it direct? Is it sequential? What fields are in the file? Which fields are numeric? Which fields are alphameric?

Describing the File

How does DFU know what the file looks like? The file definition describes the file. You provide the file definition on two RPG specifications: the F-specification and the I-specification. They look like this:

Using SEU to Enter the File Definition

In addition to filling out these forms (this is the only coding you have to do for DFU), you need to enter the information into a source member. You use the Source Entry Utility (SEU) to do this. The *Source Entry Utility Guide* will help you do this.

Sometimes, if the DFU program you're going to create will process an existing file, there are probably existing F- and I-specifications in the system that describe that file. For example, there might be an RPG program that enters data into a file named TRANS and you want to create a DFU program that will list this file.

DFU can use the F- and I-specifications from the RPG source program. You don't have to create a new source member for these specifications.

The same DFU program can be used to do several jobs. For example, you may create a program to enter records into a file. Each record has five fields. Then you can use the same program to update all five fields of the records when changes are necessary. Or you can use the same program to do file inquiry and look through the records for a review. Or you can use the same program to print a listing of all the records in a file.

If You Need Some Help

There is a Help key available when you're using DFU that will do just that - help you when you have a question about what you are doing. When you run into a problem, press the Help key, and DFU will display additional information about the display you are working on. If there is more help information than will fit on one display, use the Roll key to continue viewing the help information on another screen. You can roll back and forth through the help displays if necessary.

After you've had a chance to look over the help information, press the Enter key to return to the original display you were using so you can continue with your work.

For example, assume you are viewing the display you saw earlier - the General Information display. One of the parameters is *Record delete code and position within the record.*

```
            ENTER/UPDATE GENERAL INFORMATION
         Description of display and printout for index files

Job title . . . . . . . . . . . . . . . . . .

How do you want the data displayed? . . . . . . . . . . 1,2,3  2
   1. Single column
   2. Multiple column
   3. Maximum data

Record delete code and position within the record . . . . . .    ,1

Print added records?. . . . . . . . . . . . . . . . . . Y,N  Y

Print updated and deleted records?  . . . . . . . . . . . Y,N  Y

Spaces between columns of printed data  . . . . . . . . . 0-9  1

Printer line width  . . . . . . . . . . . . . . . . 60-198  132

Stop printer on unprintable characters? . . . . . . . . . N,Y  N

Should DFU generate keys? . . . . . . . . . . . . . . . . Y,N  Y
```

If you're not sure what the parameter means, press the Help key. Additional text similar to the following is displayed:

```
            HELP FOR ENTER/UPDATE GENERAL INFORMATION
                        INDEXED FILES

How do you want the data displayed? . . . . . . . . . . . 1,2,3

   Data will always be displayed to the right of its heading in one of the
   following formats:
      1. Single column
      2. Multiple column - DFU will determine the maximum number (1-4) of
         columns needed.  (Data will be displayed in a single column if
         there is not enough data to fill one column).
      3. Maximum data - DFU will first try to display data in single column,
         then multiple columns, and then, DFU will put the most data possible
         on the display.

Record delete code and position within the record . . . . . .

   The delete code character and its position within the record indicate
   which records are to be removed.  Records are not removed, but are
   marked with the delete code for later removal by the user.
   The position may not be part of the key field.

Enter-Exit help text                                             +
```

For more information on the Help displays, refer to the *Operator's Guide.*

To Sum Up DFU...

This chapter has given you a brief look at DFU and how it works. Before you go on to the details in the rest of the manual, you might want to review the steps you go through to set up and run a DFU program.

1. Describe Your File

Before setting up your DFU program, you need to describe your file to DFU. This description is called the *file definition* and is made up of RPG F- and I-specifications. If you have an existing RPG source program stored in your library that contains the F- and I-specifications describing your file, continue with step 2. If you do not have a file definition, you must enter the F- and I-specifications using SEU. Refer to the *SEU Guide* for more information on entering source members. Refer to Chapter 3 of this manual for a description of the entries that DFU needs on the F- and I-specifications.
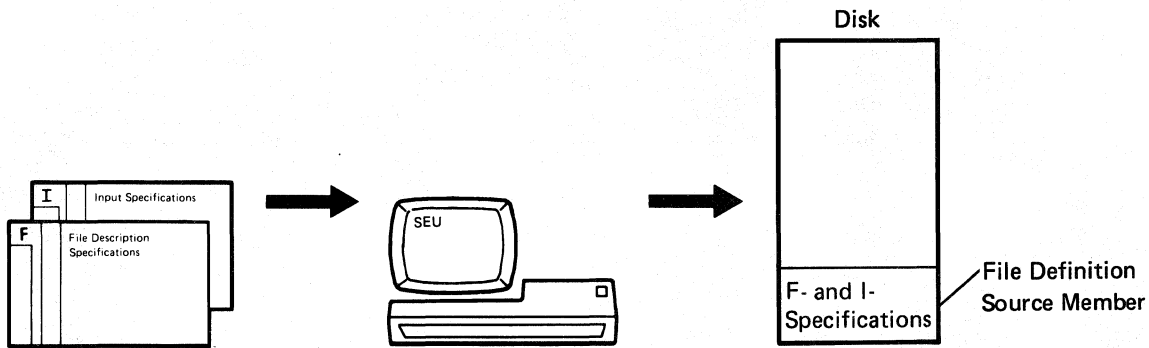
2. Identify Your File and Program

After you sign on to DFU (by entering 'DFU'), and select your option (create, update, display records in, or print a data file) from the DFU menu, DFU will ask for information such as the name of the file you are using, the name of the DFU program, and the name of the file definition.

When you identify the file definition, DFU automatically builds the DFU attributes from the file definition. Attributes are a simplified version of the F- and I-specifications. DFU puts the attributes in a work area and they remain there only until you finish setting up the program.
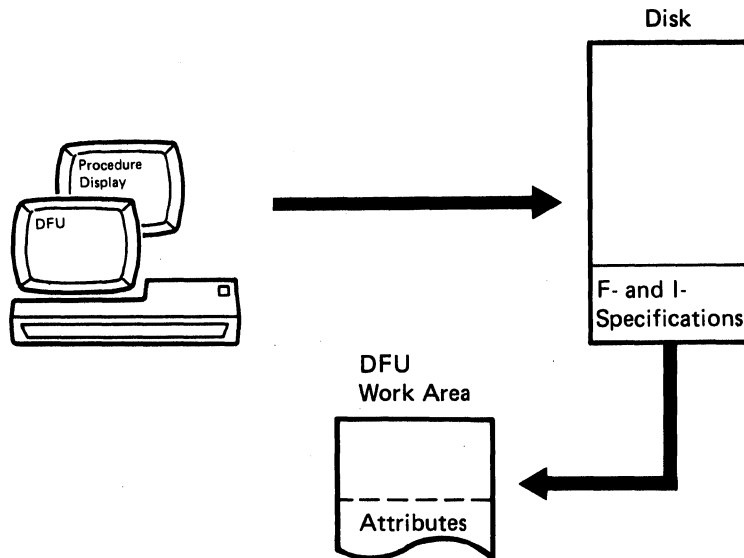
3. Tell DFU What You Want the Program To Do

Next DFU will show you several displays with questions for you to answer. DFU uses your answers to build the DFU specifications for your program.

DFU attributes, combined with the DFU specifications, now make up the DFU source for this program.
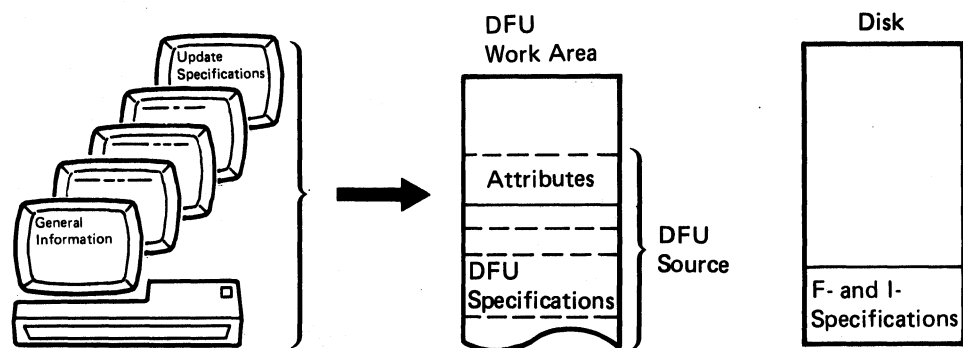
4. DFU Creates the Program

Now, press the Cmd 7 key. Once you reply to the Source Save Display prompts, DFU creates the program.

DFU
Work Area   Disk

Attributes

DFU
Specifications

DFU
Program

DFU
Source

F- and I-
Specifications

Cmd 7-
EOJ
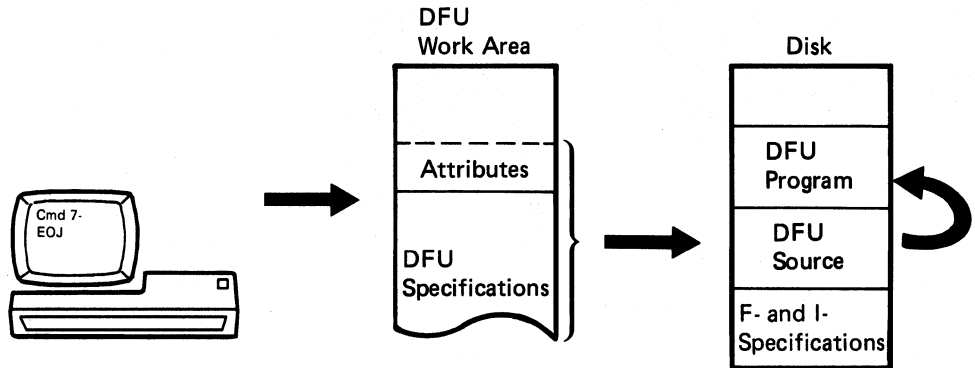
5. Using/Running Your Program

If you specified Y to the prompt to run the DFU program, the next display you see is the first display of your program. You can now begin to use your program.

Note: If you are running a DFU list program, there is no display.

Disk

DFU
Work Area

DFU
Program

DFU
Source

F- and I-
Specifications

First
Program
Display
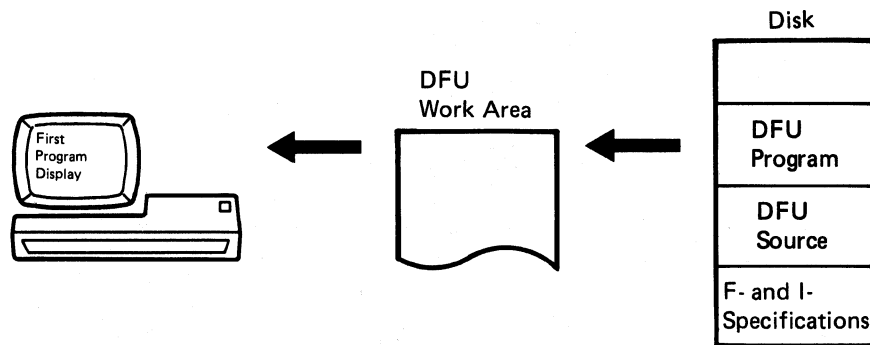
Chapter 2. Setting Up a New DFU Program

When you have a job to do, whether printing a report or listing a file, you must first set up the DFU program. This chapter shows you in Example 1 how to set up a program to enter data into a new file. Example 2 shows you how to use that same DFU program to update the file.

You can follow along at your display station and enter the examples as shown. Entries you should make are highlighted.

The examples show you what you enter to create the sample program. For more information on a particular use of DFU, see the related chapter later in this manual.

What Can You Do With DFU?

You can generate a quick report from information in your files. Or you can create a monthly report, an input file, a file of test data, a list of customers, or a way to review the data in your files. DFU will prompt an operator for information needed to create the job.

Before Using DFU You'll Need a File Definition

As you saw in Chapter 1, when you start setting up a DFU program, you must supply DFU with a description of the file you want to use. You can do this with F-specifications and I-specifications, either entering them yourself or using an existing RPG program. When a DFU prompt asks you for your file definition, you enter the name of the source member containing the F- and I-specifications.

For more information on the file definition, refer to Chapter 3.

What a File Definition Looks Like

The following illustration shows the first 16 statements of the file definition (the F- and I-specifications) that describes to DFU the file you are going to create.

```
 1    2            3              4         5  6 7  8            9

16  120   Z                  1    096   DFULIB     FILESRC         W1
0001.00        FCUSTMST U     256 5 I    2  DISK
0002.00        ICUSTMST    01
0003.00        I                              1   1 ARCOD
0004.00        I                              2   6 CUSNO
0005.00        I                              7   9 CUSCOD
0006.00        I                             10  34 CUSNM
0007.00        I                             35  59 CUSA1
0008.00        I                             60  84 CUSA2
0009.00        I                             85 109 CUSA3
0010.00        I                            110 111 STATE
0011.00        I                          P 112 1160ZIPCD
0012.00        I                          P 117 1180AREAC
0013.00        I                          P 119 1220PHONE
0014.00        I                            123 123 CUSTP
0015.00        I                          P 124 1270CRLIM
0016.00        I                          P 128 1300SLSNO




        Enter or update statement number . . . . . . . . . . . . . . .
```

1   The character I in lines 2 through 16 means that these lines are input specifications (or I-specifications) that describe the records in the file and the fields within each record.

2   The character F in line 1 means that this line is a file description specification (or F-specification). After the F is the file name, CUSTMST, followed by a U meaning that the file can be updated.

3   This numeric entry, 01, identifies the record type.

4   These two numbers specify the record key field. The 5 means the key field is five characters long, and the 2 means the field starts in the second position. In this example, the key field is CUSNO, which is in positions 2 through 6.

5   This indicates that the field is in packed data format.

6   These numbers indicate the beginning and ending position of each field, giving DFU the length of each field.

7   The number in this position indicates the number of decimal positions in that numeric field. (For example, a field containing dollars and cents would have a 2 in this position). Fields with no entry here are assumed to be alphameric.

8   This is the name of the file definition source member.

9   These are the field names within the file.

Creating a File Definition With SEU

The following example shows you how to create a file definition source member using the Source Entry Utility (SEU) to enter the specifications. For more information on SEU, see the *SEU Guide*.

Note: This example uses a key length of five bytes. The prompts will not appear as shown when the key length is other than five bytes.

Once you are signed onto the system, sign on to SEU by entering:

    SEU

When the following is displayed, enter the responses shown:

```
                      SEU PROCEDURE                    Optional-*

          Source entry utility (SEU) is a program that allows you to create,
          change, remove, and locate statements in source and procedure members


Name of member to be created or updated . . . . . . . . . . . .   FILESRC

Type of SEU member . . . . . . . . . . . . . . A,F,P,R,S,T,W  S

Name of member containing SEU formats . . . . . . . . . . . . .   #SE@XTRA

Length of statments . . . . . . . . . . . . . . . . . . . .                *

Name of library containing member . . . . . . . . . . . . . . .   DFULIB




Cmd3-Previous menu

                                                    (c) 1983 IBM Corp.
```

Note: You enter the name of your own library. You must have created the library DFULIB for this example.

Press the Enter key and the following Z display is selected by SEU:

```
16   120   Z          Enter         1   096   DFULIB    FILESRC      W1


         1         2         3         4         5         6         7
1234567890123456789012345678901234567890123456789012345678901234567890123456789


    8         9         0         1         2
012345678901234567890123456789012345678901234567890




   Enter or update statement number . . . . . . . . . . . . . . .0001.00
```
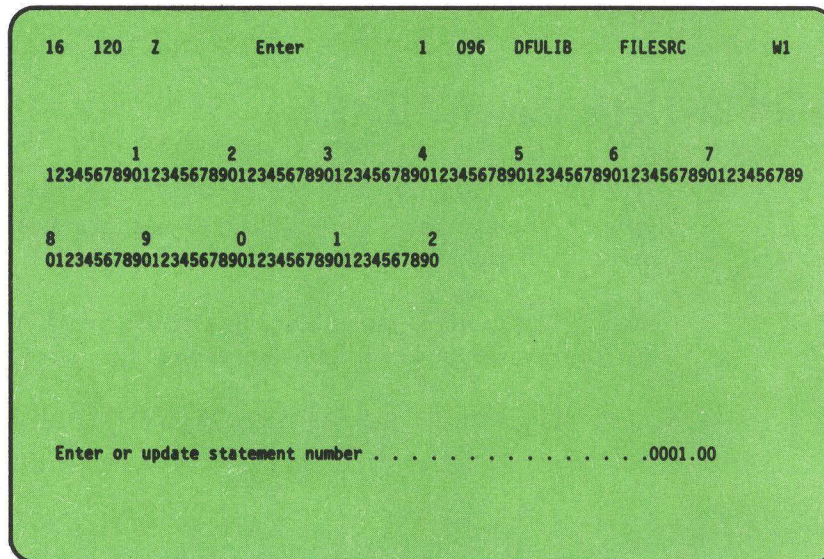
Although SEU always selects a Z display first, notice that the first statement you
are to enter is an F-specification. You will need to select the F display so that
you can enter the F-specification.

Do the following:

Press the Select Display command key (Cmd 3) to see the list of available displays
as shown in the following menu:

```
                           Select display

          1 Z          17 WSU-J     33 FORTRAN   49
          2 Z-LOWER    18 WSU-E     34 COBOL     50
          3 H          19 WSU-T     35 SDAS      51
          4 U          20 WSU-M     36 SDAH      52
          5 F          21 WSU-S     37 SDAD1     53
          6 G          22 WSU-D     38 SDAD2     54
          7 E          23 WSU-C     39 DOC-H     55
          8 L          24 SFGR-S    40 AUTOR     56
          9 T          25 SFGR-H    41 MESSAGE   57
         10 I          26 SFGR-D    42 SRT-HEAD  58
         11 J          27 D-CONT    43 SRT-RECD  59
         12 C          28 SORTH     44 SRT-CNST  60
         13 O          29 SORTRF    45 SRT-FLD   61
         14 P          30 SORTRC    46 MICRSYS   62
         15 K          31 SORTF     47 MICRSTCK  63
         16 A          32 ASSEM     48           64



      Enter the number of the specification display you want. . . . .
```

Enter the option to select the F display. When the F display appears, you can begin entering the F-specification as shown.

```
16    096    F          Enter           1   096   DFULIB    FILESRC        W1



            1      1 1 1 1 2    2     23 3 3 3  3    3 4        4  5    5 5
12345 6 78901234 5 6 7 8 9 0123 4567 8 90 1 2 34 5678 9 0123456 789012 3 456789
        CUSTMST                  256    5   I        2

6      6 6 6  7 7  7  7    8 8          9
012345 6 7 89 0 12 34 567890 1234567890123456





    Enter or update statement number . . . . . . . . . . . . . . . .0001.00
```

When you finish typing in the F-specification and press the Enter key, another F display is shown. Because there is only one F-specification to enter for this example, you now need to select an I-specification display.

Press the Cmd 3 key again to display the list of specification displays. Enter the option to select the I display. When the following I display appears, enter the first I-specification that defines the file.

```
16    096    I          Update           1   096   DFULIB    FILESRC        W1

      FCUSTMST           256  5 I     2


            1     1    12 2    2   2 3  3    3    34  4 4 4    4 5   5 5       56
12345 6 78901234 5678 90 1234 567 8901 234 5678 901 2 3 4567 8901 2 345678 90
        CUSTMST          01

6  6  6  6  67 7    7    8 8          9
12 34 56 78 90 1234 567890 1234567890123456





    Enter or update statement number . . . . . . . . . . . . . . . .0002.00
```

Because the rest of the I-specifications define fields within the file, press the Cmd 3 key and choose the J (I Cont) display. Enter the next I-specification as shown:

```
16   096  J              Update         1   096   DFULIB    FILESRC        W1

     ICUSTMST     01


            1          2          3        4  4 4 4     4 5  5 5      56 6 6  6
12345 6 789012345678901234567890123456789012 3 4567 8901 2 345678 90 12 34 56
      I                                        1    1   ARCOD

6 67 7   7   8 8         9
78 90 1234 567890 1234567890123456



 Enter or update statement number . . . . . . . . . . . . . . .0003.00
```

Now enter the rest of the I-specifications:

F Specification

Line	Form Type	Filename	...	Block Length	Record Length	L/R	Mode/Type	...	Key Field Starting Location
0 2	F	CUSTMST			256	5	I		2
0 3	F								

I Specification

Line	Form Type	Filename or Record Name	Number	Record Identifying Indicator	From	To	P/B/L/R	RPG Field Name
0 1	I	CUSTMST		01				
0 2	I				1	1		ARCOD
0 3	I				2	6		CUSNO
0 4	I				7	9		CUSCOD
0 5	I				10	34		CUSNM
0 6	I				35	59		CUSA1
0 7	I				60	84		CUSA2
0 8	I				85	109		CUSA3
0 9	I				110	111		STATE
1 0	I				112	1160	P	ZIPCD
1 1	I				117	1180	P	AREAC
1 2	I				119	1220	P	PHONE
1 3	I				123	123		CUSTP
1 4	I				124	1270	P	CRLIM
1 5	I				128	1300	P	SLSNO
1 6	I				131	1352	P	AMDUE
1 7	I				136	1390	P	DLTPM
1 8	I							

As you finish typing each specification (these are called statements by SEU), press the Enter key and another J display is selected for the next statement. When you have finished typing the last statement, press the Enter key; another J display is shown.

However, because we are through entering the F- and I-specifications, you will not use the display. Press the Cmd 7 key to end the job. The following options are displayed:

```
                        END OF JOB OPTION MENU

Select one of the following:

0. Return to processing
1. End of job with no additional options
2. End of job with a printout
3. End of job with serialization
4. End of job with serialization and a printout
5. End of job - member is not replaced




Specify the option you want. . . . . . . . . . . . .  2
```
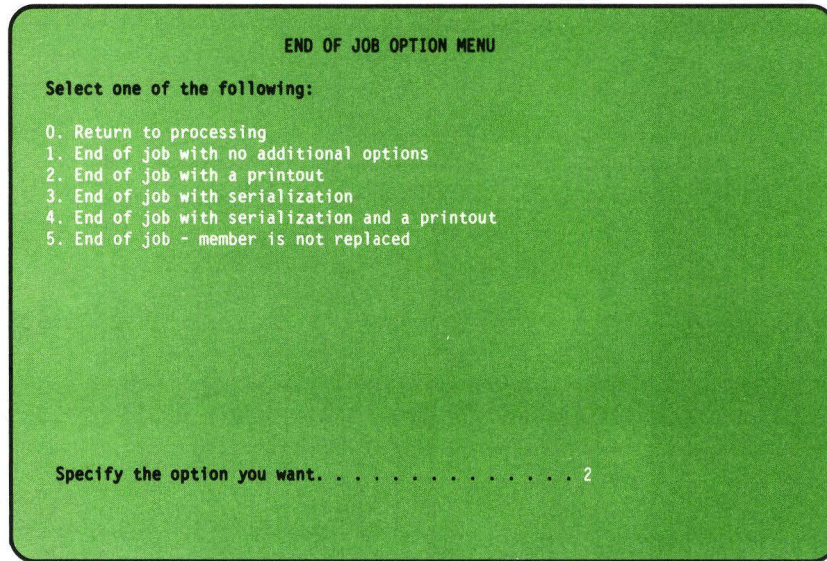
For this example, choose option 2. A printout of the specifications you entered will be printed on the printer assigned to your display at the end of your job.

The following is then displayed:

```
                              END OF JOB


Member name . . . . . . . . . . . . . . . . . . . . .  FILESRC

Library name . . . . . . . . . . . . . . . . . . . . .  DFULIB

Reference number .  . . . . . . . . . . . . . . . . .  000001

Library member subtype . . . . . . . . . . . . . . . .  40
     2 DTA     13 BAP     16 MNU     19 SRT     33 COB     36 WSU     43 BGF
    11 ARS     14 DFU     17 MSG     31 ASM     34 FOR     40 UNS
    12 ARP     15 FMT     18 PHL     32 BAS     35 RPG     42 BGD

Remove diagnostics from diagnosed source member? . . . . . Y,N  N
```
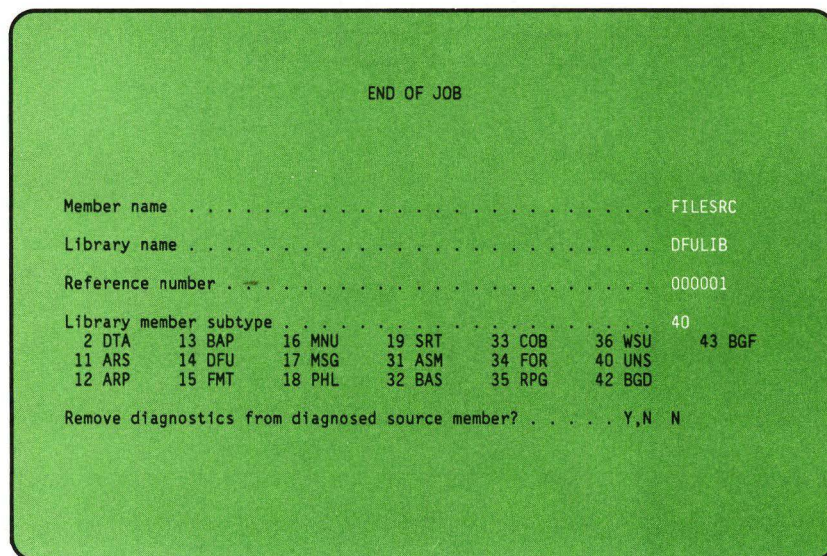
Enter the responses shown and press the Enter key. The source member will be stored in the library you specify. The following message is displayed while SEU stores the source member in your library:

```
Member now being placed in your library
```

Your printout will look similar to this:

```
MEMBER     FILESRC  LIBRARY    DFULIB        SEU EOJ PRINTOUT        DATE  12/03/82      TIME  09.11
                                             IBM SYSTEM/36 SOURCE ENTRY UTILITY

    FCUSTMST              256  5 I      2
    ICUSTMST     01
    I                                             1    1 ARCOD
    I                                             2    6 CUSNO
    I                                             7    9 CUSCOD
    I                                            10   34 CUSNM
    I                                            35   59 CUSA1
    I                                            60   84 CUSA2
    I                                            85  109 CUSA3
    I                                           110  111 STATE
    I                                        P  112 1160ZIPCD
    I                                        P  117 1180AREAC
    I                                        P  119 1220PHONE
    I                                           123  123 CUSTP
    I                                        P  124 1272CRLIM
    I                                        P  128 1300SLSNO
    I                                        P  131 1352AMDUE
    I                                        P  136 1390DLTPM
                            **** E N D  O F  S E U  P R I N T O U T ****
```

After the member is placed in the library, you are returned to the main options menu.

```
                                    MAIN                              W1
                         Main System/36 help menu

    Select one of the following:

        1. Display a user menu
        2. Perform general system activities
        3. Use and control printers, diskettes, or tape
        4. Work with libraries, files, or folders
        5. Use programming languages and utilities
        6. Communicate with another system or user
        7. Define the system and its users
        8. Use problem determination and service
        9. Use office products
       10. Sign off the system


    Cmd3-Previous menu   Cmd7-End   Cmd12-How to use help    Home-Sign on menu

    Ready for option number or command


                                                    (c) 1985 IBM Corp.
```

Getting Back to DFU

Once the file definition is created, you can set up the DFU program. The first thing you need to do is sign on to DFU. (You may have heard this referred to as calling or accessing DFU.) Sign on to DFU by entering:

DFU

Example 1. How to Set Up a DFU Program to Create a File

The following example will show you how to set up a DFU program to create a file. The program will prompt an operator to enter some records.

DFU Menu

Once you have signed on to DFU, the following display lets you select what you want to do:

```
                                    DFU                                W1
                               Data file utility

    Select one of the following:

        1. Run a DFU program
        2. Create or change a DFU program








    Cmd3-Previous menu     Cmd5-Main help menu     Cmd7-End   Home-Sign on menu

    Ready for option number or command
    2

                                               (c) 1983 IBM Corp.
```
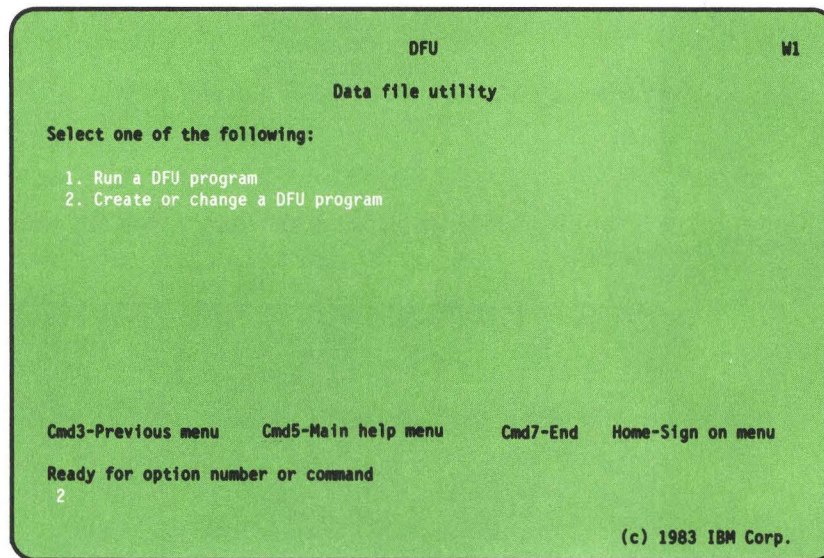
Because you are creating a new program, select option 2 and press the Enter key.

SETUPDFU Menu

The next display asks you what you want the program to do:

```
                              SETUPDFU                              WS2

                      Create or change a DFU program

Select one of the following:
    1. Create a data file
    2. Update a data file
    3. Display records in a data file
    4. Sort and print a data file






Cmd3-Previous menu      Cmd5-Main help menu  Cmd7-End      Home-Sign on menu

Ready for option number or command
1
                                                        (c) 1983 IBM Corp.
```

For this example, select option 1 and press the Enter key. The next display is the Procedure display.

Procedure Display

This display will differ slightly depending on how you are using DFU. It asks you to identify such things as what the file name is, what you want to name the program, where the program is to be stored, and the name of the file definition source member.

```
                          ENTER PROCEDURE                 Optional-*

                         Creates data files


Name of file to be created . . . . . . . . . . . . . . . . . CUSTMST
    Name of file on disk, if different . . . . . . . . . . .           *

Name of DFU program . . . . . . . . . . . . . . . . . . . . DE100D     *

Number of records to be in file . . . . . . . . 1-8000000  100

Name of library . . . . . . . . . . . . . . . . . . . . . . DFULIB

Name of file definition source member . . . . . . . . . . . FILESRC

Name of DFU specification source member . . . . . . . . . . DE100DS    *

Name of display source member, if to be saved . . . . . . .            *



Cmd3-Previous menu                              (c) 1985 IBM Corp.
```

Type the responses shown and press the Enter key.

Name of file to be created

This is the name of the file you are creating.

Name of file on disk, if different

This refers to the name of the file on disk if it is different from the name of the file to be created. This parameter is also referred to as file label.

The file label is an optional parameter. If it is left blank, the file label will be the name of file to be created. For this example, leave the parameter blank.

Name of DFU program

This is the name of the program you are setting up. The program will contain the information you supply about how you want the operator prompted to enter records.

Name of library

This is the name of the library in which the program is to be stored. You must have created the library DFULIB for this example. The file definition source member must be stored in the library you name for this prompt.

Name of file definition source member

This is the name of the source member that describes the file you are creating. (These are the F- and I-specifications you entered to describe the file to DFU.)

Name of DFU specification source member

This is the name of the source member that contains or will contain the saved DFU specifications. If you enter a name for this prompt, and the specification source member does not exist, DFU creates it. If the member does exist, DFU will use it to create the program.

If you save the program source, you can later modify the program.

Name of display source member, if to be saved

As you respond to DFU prompts during program setup, you supply information to DFU about how your program should prompt an operator entering records. DFU builds specifications describing the display the operator will see when running the program. You can later use these display specifications to change the display. Refer to Chapter 10, *Changing Stored Display Source*, for more information.

For this example, leave the parameter blank.

Enter the responses shown and press the Enter key. The next display is the General Information display.

General Information Display

This display asks you for some general information about your program.

```
              ENTER/UPDATE GENERAL INFORMATION
           Description of display and printout for index files

Job title . . . . . . . . . . . . . . . . .   ENTERING CUSTMST

How do you want the data displayed? . . . . . . . . . . . 1,2,3  2
   1. Single column
   2. Multiple column
   3. Maximum data

Record delete code and position within the record . . . . . . .  %,1

Print added records?. . . . . . . . . . . . . . . . . . . Y,N  Y

Print updated and deleted records? . . . . . . . . . . . . Y,N  Y

Spaces between columns of printed data . . . . . . . . . . 0-9  5

Printer line width . . . . . . . . . . . . . . . . . .60-198  132

Stop printer on unprintable characters? . . . . . . . . . . N,Y  N

Should DFU generate keys? . . . . . . . . . . . . . . . . . Y,N  Y
```

Type the responses shown and press the Enter key.

Job title

The job title is the name that will appear on the display or a printout of your records.

How do you want the data displayed?

DFU can display the data in a single column, more than one column, or it can fit as much data as possible on the display at one time before going to the next display.

Record delete code and position within the record

Indicate here the character you want DFU to use to mark a record for removal from the file. You must also indicate the position that character will occupy within the record. DFU places the character you specify, in the position you specify, to mark the record for removal. If you do not specify a code and position, DFU will use a blank in position 1 as the default record delete code.

Print added records?

You can choose to have DFU print, at the end of the job, all the records you added during the job.

Print updated and deleted records?

> You can also have DFU print, at the end of the job, all the records you changed or marked for removal during the job.

Spaces between columns of printed data

> You specify here how many spaces you want DFU to leave between columns of data on your printouts.

Printer line width

> This specifies the width of the printer line when you print records.

Stop printer on unprintable characters?

> You can indicate whether you want the printer to stop when it finds a character that is not printable. If you do not want the printer to stop, it will print blanks in place of these characters.

Should DFU generate keys?

> When you are using an indexed file, DFU can provide record keys for you.

> *Note:* This prompt will only appear if the key is 5 bytes long.

Record Key Description

Because you are using an indexed file, a key field is used to identify each record. In this case, the key field was identified in the file definition.

On the last display you chose to have DFU generate the record keys for you rather than assign each record a key yourself. This display asks you how you want to be prompted when DFU displays the record keys.

```
                         RECORD KEY DESCRIPTION

                    Description of the record key

                    *FILE    CUSTMST     256
                    *KEY                   5          6
        01          *RECORD
                      ARCOD                1          1
                      CUSNO                5          6
                      CUSCOD               3          9
                      CUSNM               25         34
                      CUSA1               25         59
                      CUSA2               25         84
                      CUSA3               25        109

  Record key heading . . . . . . . . . . . . . . . . .     RECORD KEY IS:
```

Enter the responses as shown and press the Enter key. The next display is the Record Type Selection display.

Record Type Selection

There can be more than one type of record (for example, header records and detail records) identified in the file definition. The attributes for each type of record will be shown at the top of the display along with the record identifier.

```
                           RECORD TYPE SELECTION              Record type: 01

                    Selection of record types to be processed


            01      *RECORD
                                    ARCOD       1       1
                                    CUSNO       5       6
                                    CUSCOD      3       9
                                    CUSNM      25      34
                                    CUSA1      25      59
                                    CUSA2      25      84
                                    CUSA3      25     109
                                    STATE       2     111
                                    ZIPCD  P    9.0   116



        Process this record type? . . . . . . . . . . . . . . . . . Y,N   Y

        Allow lowercase data? . . . . . . . . . . . . . . . . . . . N,Y   Y
```

Process this record type?

Because you can have more than one type of record, DFU asks you if you want to use the type of record identified at the top of the display. This example shows record type 01 attributes.

Allow lowercase data?

You indicate here whether you want lowercase data to be allowed when entering data.

Enter the responses as shown and press the Cmd 12 key.

Note: For the rest of the example, press the Cmd 12 key rather than the Enter key when you have finished responding to a display. If you press the Enter key, the display you were using will be repeated so that you can enter more information. You must then press the Enter key again to continue.

Data Field Selection

This display asks you to select which of the fields described in the file definition (FILESRC) you want to include in the program.

```
                    DATA FIELD SELECTION              Record type: 01
             Fields in which data is to be entered
                          STATE        2    111
                          ZIPCD   P    9.0  116
                          AREAC   P    3.0  118
                          PHONE   P    7.0  122
                          CUSTP        1    123
                          CRLIM   P    7.2  127
                          SLSNO   P    5.0  130
                          AMDUE   P    9.2  135
                          DLTPM   P    7.0  139

   Data field    Heading           Functions:   A=Accumulate
      CUSNM       CUSTOMER NAME                  B=Mod 10 check
      CUSA1       ADDRESS                        C=Mod 11 check
      CUSA2       CITY                           D=Auto-dup
      STATE       STATE
      ZIPCD       ZIP CODE
```

Data field

Type in the names of the fields you want used when the program is run. These will be the only fields in the record that will be displayed. You must type the field names exactly as they are shown at the top of the display.

Note: Hold down the shift key and press the Roll Up (Roll↑) key to view all the attributes.

Heading

Type in the heading you want used to prompt the operator as data is being entered. Because field names are limited to a certain number of characters, entering a heading allows you to expand the field name that will be displayed when the program is run.

If you do not enter a heading, DFU uses the field name from the file definition.

Functions

There are four operations that can be performed on data fields. Only two operations can be performed on numeric fields. 'Auto-dup' applies to all types of fields. Accumulation may be achieved on alphanumeric fields, but the results may not be meaningful. For this example, no functions are used.

Enter the responses as shown and press the Cmd 12 key.

Note: If you press the Enter key instead of the Cmd 12 key, another blank Data Field Selection display is shown. Press the Enter key again to go on to the next display.

Update DFU Specifications

DFU gives you a chance to check the DFU specifications before it builds the program for you.

```
                    UPDATE DFU SPECIFICATIONS
                   Changes to DFU specifications

              Field1 Field2 Field3 Field4 Field5
                     *ENT/UPD*LIST  %,1    *COLUMNS
 ?=Remove line       *KEY    *GENKEY RECORD KEY IS:
 >=Add lines     5   132*TITLE  ENTERING CUSTMST
                 01  *RECORD *LOWCASE
 Press the Enter key to   *    CUSNM    CUSTOMER NAME
   accept changes         *    CUSA1    ADDRESS
                          *    CUSA2    CITY
                          *    STATE    STATE
                          *    ZIPCD    ZIP CODE




 Cmd7-End program setup
```

Because you have no corrections to make, press the End-of-Job command key (Cmd 7) to tell DFU that you have finished reviewing the DFU specifications.

DFU Source Save

This display asks if you want to save the DFU specifications for this program. If you do want to save the specifications, enter a Y for the first prompt. The source member name and the library where the member will be stored are supplied. (You can change these if you want the member stored under a different name, or in a different library.) The next prompt asks if you are replacing an existing source member when you store the specifications. The last prompt will be shown if you pressed the Cmd 7 key on the Update DFU Specifications display.

```
                    DFU PROGRAM SOURCE SAVE DISPLAY

                    Save DFU source specification

Do you want to save the DFU source specifications? . . . Y,N   Y

Name of the member to contain the DFU source . . . . . . . .   DE100DS
   Name of the library to contain the source member  . . . .   DFULIB

Replace source member with the same name?  . . . . . . . Y,N   Y

Do you want to run the DFU program?  . . . . . . . . . . Y,N   Y




Cmd5-Page back
```

Enter the responses shown and press the Enter key.

The following message is displayed:

`DFU program is being created`

DFU is creating the program and will continue on to run the program.

Using the Program You Just Created

The next display is the first display you see when using your program.

```
     ENTERING CUSTMST               Filename: CUSTMST          Mode: ENTRY
  Record type: 01          Last record type:              Auto-dup: OFF
  RECORD KEY IS: 00010

  CUSTOMER NAME
  ADDRESS
  CITY
  STATE
  ZIP CODE
```

Notice that the fields that are displayed are the fields you specified on the Data
Field Selection display.

DFU displays the record key on line 3.

Enter the data as shown. Notice that you can now type in lowercase letters (as
you specified on the Record Type display). You can use the Field Exit key to
move from field to field.

```
     ENTERING CUSTMST               Filename: CUSTMST          Mode: ENTRY
  Record type: 01          Last record type:              Auto-dup: OFF
  RECORD KEY IS: 00010

  CUSTOMER NAME Currey's Upholstery
  ADDRESS       100 SW Carlton St
  CITY          Plainville
  STATE         KS
  ZIP CODE      000067663
```

When you press the Enter key, you are prompted to enter data for the next record.

```
          ENTERING CUSTMST              Filename: CUSTMST              Mode: ENTRY
          Record type: 01        Last record type: 01               Auto-dup: OFF
          RECORD KEY IS: 00020

          CUSTOMER NAME
          ADDRESS
          CITY
          STATE
          ZIP CODE
```
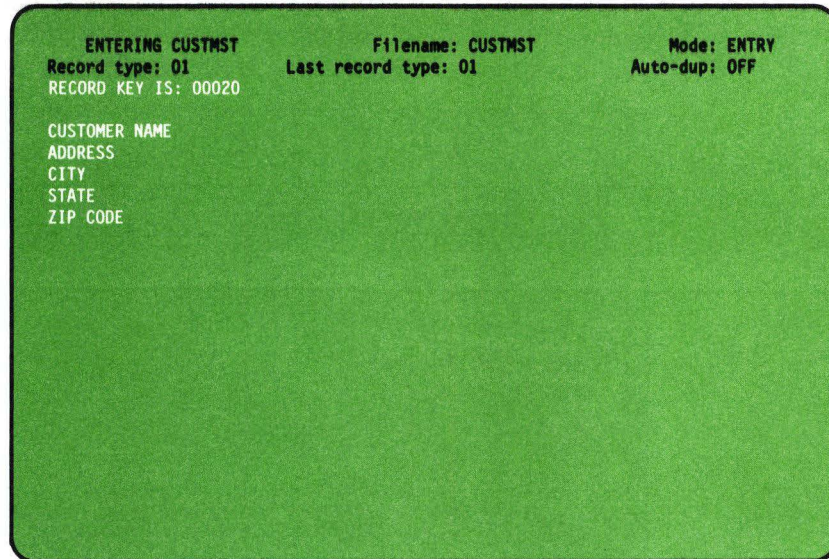
Continue entering the sample records:

CUSTOMER NAME	ADDRESS	CITY	STATE	ZIP CODE
Currey's Upholstery	100 SW Carlton St	Plainville	KS	67663
Connely's Motel	3741 SW Enterprise Drive	Camdenton	MO	65020
Gladwin & Sons Inc	1705 Folwell Drive	Eagle Butte	SD	57625
Republic Savings & Loan	1912 SW Oak Knoll Lane	Northfield	MN	55057
Schaefer Decorator's	607 Memorial Parkway	Okoboji	IA	51355
Garth Insurance	3731 College View Road	Maribel	WI	54227
John Day & Associates	56 Crossroads Center	Stewartville	MN	55976

When you are through entering records, and have pressed the Enter key to make the last change, press the End-of-Job command key (Cmd 7).

Now You're Finished

At the end of the job, DFU displays the following End-of-Job Request display. If you want to return to your job and enter more records, enter N and DFU returns you to your job. Because this is the end of the example, enter Y instead.

```
                        END OF JOB REQUEST


              Number of records processed

                 Created          7
                 Updated          0
                 Deleted          0


     Is this DFU job complete? . . . . . . . . . . . . . .   Y,N  Y
```
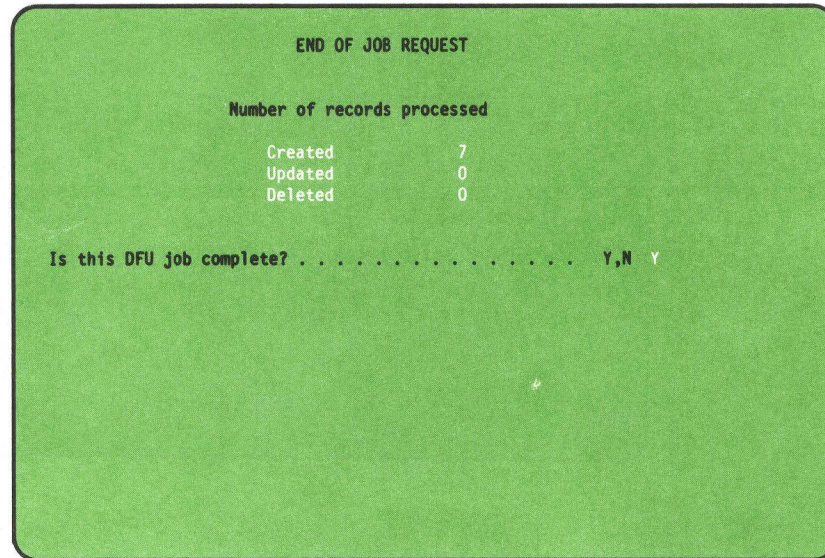
You are returned to the SETUPDFU menu.

Check the printer assigned to your display station for a printout of the records you entered. The printout should be similar to this:

12/03/82		ENTERING CUSTMST				PAGE
RECORD KEY IS:	CUSTOMER NAME	ADDRESS		CITY	STATE	ZIP COI
10	Currey's Upholstery	100 SW Carlton St		Plainville	KS	6766:
20	Connely's Motel	3741 SW Enterprise Drive		Camdenton	MO	6502(
30	Gladwin & Sons Inc	1705 Folwell Drive		Eagle Butte	SD	5762!
40	Republic Savings & Loan	1912 SW Oak Knoll Lane		Northfield	MN	5505
50	Schaefer Decorator's	607 Memorial Parkway		Okoboji	IA	5135!
60	Garth Insurance	3731 College View Road		Maribel	WI	5422
70	John Day & Associates	56 Crossroads Center		Stewartville	MN	5597(

7 RECORDS ENTERED
0 RECORDS UPDATED
0 RECORDS DELETED

Example 2. How to Use the Same DFU Program to Update Records

This example will show you how to update the records you just entered. You can update the records using the same program you just used to enter the records.

Note: If you are following this example from Example 1, the SETUPDFU display is shown now. Press command key 3 to back up to this display.

DFU Menu

The following is displayed so that you can select what you want to do:

```
                              DFU                            W1

                        Data file utility

Select one of the following:

  1. Run a DFU program
  2. Create or change a DFU program












Cmd3-Previous menu    Cmd5-Main help menu  Cmd7-End      Home-Sign on menu

Ready for option number or command
  1

                                              (c) 1983 IBM Corp.
```

Because you are using an existing program, select option 1 and press the Enter key.

RUNDFU Display

This display asks you what you want to do with the program:

```
                          RUNDFU                              W1

                     Run a DFU program


         1. Create a data file
         2. Change a data file
         3. Display a data file
         4. Sort and print a data file






  Cmd3-Previous menu      Cmd5-Main help menu  Cmd7-End      Home-Sign on menu

  Ready for option number or command
    2

                                              (c) 1983 IBM Corp.
```
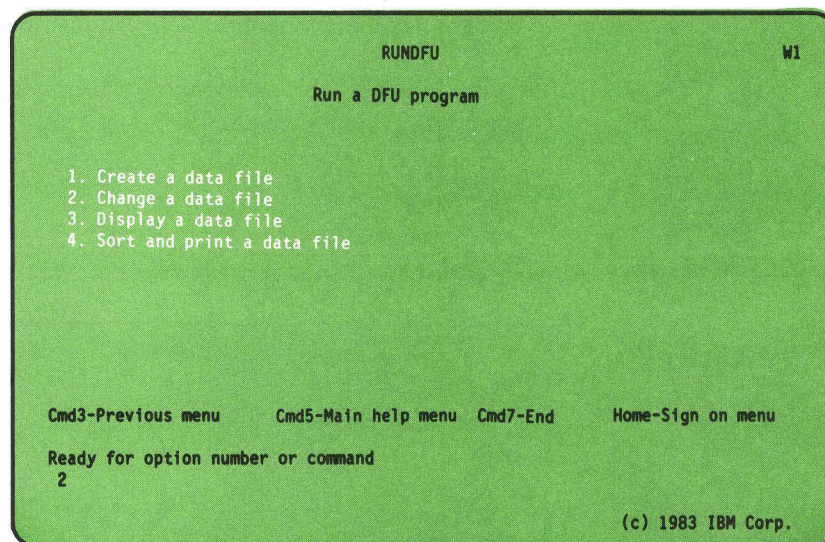
For this example, select option 2 and press the Enter key. The next display is the
Update Procedure display.

Update Procedure Display

This display asks you to identify such things as the file you are changing, the name of the program, and the name of the user library where the program is stored.

```
                       UPDATE PROCEDURE                Optional-*

                   Add to or change disk files


Name of file to be updated  . . . . . . . . . . . . . . . . .  CUSTMST
     Name of file on disk, if different  . . . . . . . . . . .            *

Name of DFU program . . . . . . . . . . . . . . . . . . . . .  DE100D

Number of records to extend file
   when it is full  . . . . . . . . . . . . . . . . . 0-8000000 0

Name of library . . . . . . . . . . . . . . . . . . . . . . .  DFULIB

                                                      *



Cmd3-Previous menu                                  (c) 1985 IBM Corp.
```

Enter the responses shown and press the Enter key.

DFU begins running the program. You are prompted to enter the record key of the record you want to change; for this example, enter 10 and press the Field Exit key:

```
ENTERING CUSTMST            Filename: CUSTMST          Mode: UPDATE
                            Last record type:          Auto-dup: OFF
RECORD KEY IS: 00010
```

The record you chose is displayed for you:

```
     ENTERING CUSTMST              Filename: CUSTMST              Mode: UPDATE
Record type: 01              Last record type: 01           Auto-dup: OFF
RECORD KEY IS: 00010

CUSTOMER NAME Currey's Upholstery
ADDRESS       100 SW Carlton St
CITY          Plainville
STATE         KS
ZIP CODE      0000067663
```

Assume you need to change the spelling of the city. Type in the change as shown and press the Enter key.

```
     ENTERING CUSTMST              Filename: CUSTMST              Mode: UPDATE
Record type: 01              Last record type: 01           Auto-dup: OFF
RECORD KEY IS: 00010

CUSTOMER NAME Currey's Upholstery
ADDRESS       100 SW Carlton St
CITY          Plainview
STATE         KS
ZIP CODE      0000067663
```

When you press the Enter key, DFU stores the change you made and prompts you to choose the next record you want to change. Enter the number as shown:

```
    ENTERING CUSTMST              Filename: CUSTMST           Mode: UPDATE
                               Last record type: 01        Auto-dup: OFF
RECORD KEY IS: 00020
```

The record is displayed for you.

```
    ENTERING CUSTMST              Filename: CUSTMST           Mode: UPDATE
Record type: 01                Last record type: 01        Auto-dup: OFF
RECORD KEY IS: 00020

CUSTOMER NAME Connely's Motel
ADDRESS       3741 SW Enterprise Drive
CITY          Camdenton
STATE         MO
ZIP CODE      000065020
```
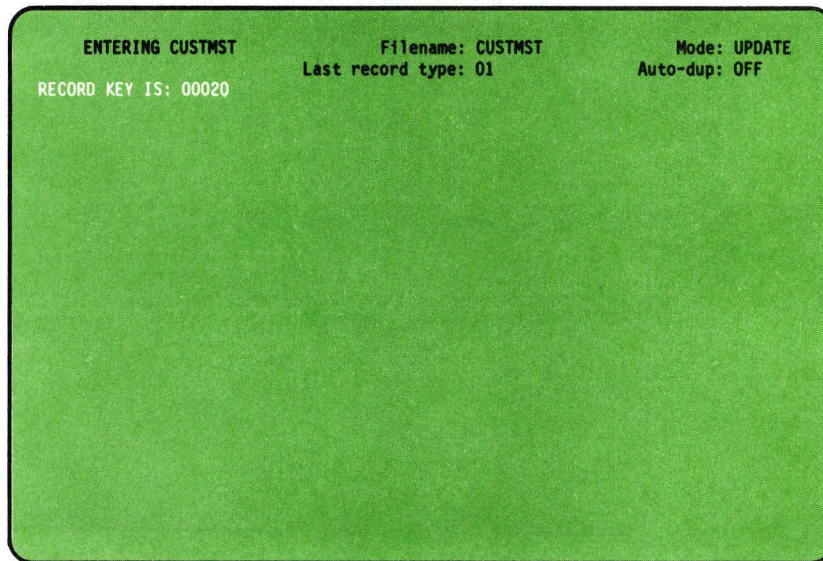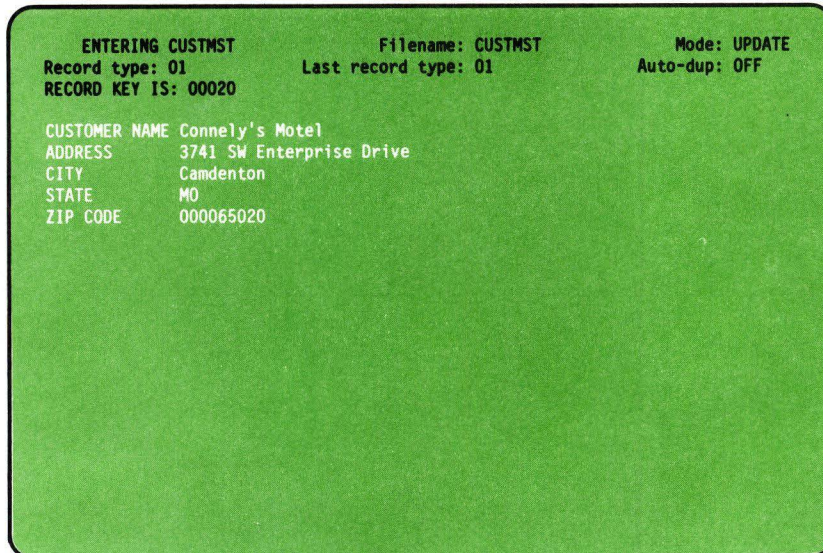
You need to change the customer name. Type the change as shown:

```
    ENTERING CUSTMST              Filename: CUSTMST           Mode: UPDATE
 Record type: 01          Last record type: 01            Auto-dup: OFF
 RECORD KEY IS: 00020


 CUSTOMER NAME Connely's Motel & Lounge
 ADDRESS       3741 SW Enterprise Drive
 CITY          Camdenton
 STATE         MO
 ZIP CODE      000065020
```

Press the Enter key. DFU continues to prompt you for another record key.
Assume you want to remove a record. Enter the number as shown:

```
    ENTERING CUSTMST              Filename: CUSTMST           Mode: UPDATE
                          Last record type: 01            Auto-dup: OFF
 RECORD KEY IS: 00070
```

The record is displayed for you:

```
   ENTERING CUSTMST              Filename: CUSTMST              Mode: UPDATE
  Record type: 01           Last record type: 01           Auto-dup: OFF
  RECORD KEY IS: 00070

  CUSTOMER NAME John Day & Associates
  ADDRESS       56 Crossroads Center
  CITY          Stewartville
  STATE         MN
  ZIP CODE      000055976
```

Now press the Delete command key (Cmd 4). The following is displayed:

```
   ENTERING CUSTMST              Filename: CUSTMST              Mode: UPDATE
                             Last record type: 01           Auto-dup: OFF
  RECORD KEY IS:




  DFU-0028 Displayed record marked for deletion
```

The message at the bottom of the display tells you that the record that was just displayed (00070) is now marked for deletion.

Note: Records are not actually removed from the file until the SAVE or COPYDATA procedure is run against the file. See "Record delete code and position within the record" under "General Information Display" in Chapter 4.

Press the Enter key. Because we have no more corrections to make, press the End-of-Job key (Cmd 7) to tell DFU that you have finished making changes.

End of Job Request Display

At the end of the job, DFU displays the following End of Job Request display. If you want to return to your job and enter more records, enter N and DFU returns you to your job. Because this is the end of the example, enter Y instead.

```
                        END OF JOB REQUEST

                   Number of records processed

                        Created         0
                        Updated         2
                        Deleted         1

        Is this DFU job complete? . . . . . . . . . . . . . . . Y,N  Y
```
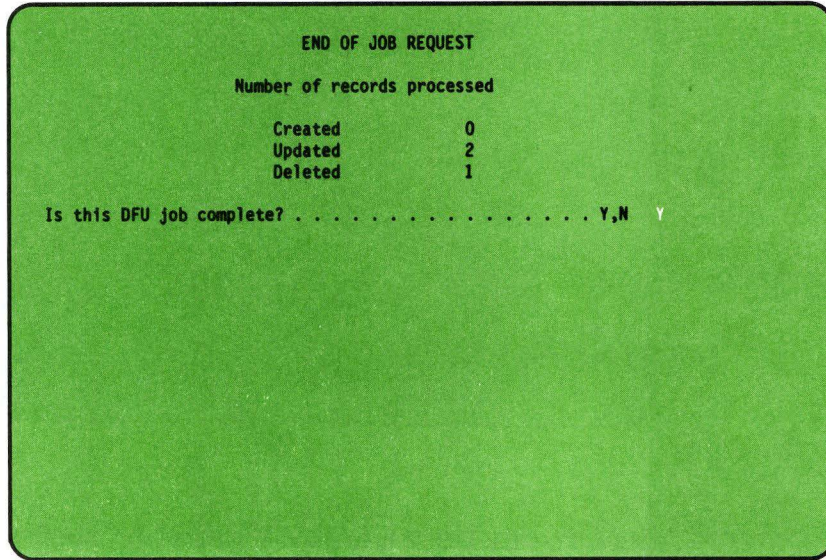
Check the printer now. Your printout should look similar to this:

12/03/82		ENTERING CUSTMST			PA
RECORD KEY IS:	CUSTOMER NAME	ADDRESS	CITY	STATE	Z
10	Currey's Upholstery	100 SW Carlton St	Plainville	KS	
20	Connely's Motel Connely's Motel & Lounge	3741 SW Enterprise Drive	Plainview Camdenton	MO	
70 RECORD DELETED	John Day & Associates	56 Crossroads Center	Stewartville	MN	

```
    0  RECORDS ENTERED
    2  RECORDS UPDATED
    1  RECORDS DELETED
```

In the Following Chapters

Now you've seen how to create a DFU program that can be used to enter records and later update the same records.

Chapter 3 gives you more details about what DFU requires in the file definition, and following chapters contain examples to explain other uses of DFU.

Chapter 3. What DFU Requires in the File Definition

When a DFU program is set up, you must provide a source member that describes the file you are using. This source member, called a file definition, can contain only file description and input specifications (F- and I-specifications), or it can contain an entire RPG source program. DFU uses the file definition, along with your responses to prompts, to create a program.

Entries On the File Description Specification

The F-specification describes the file the DFU program will use.

If the file definition contains more than one F-specification, DFU uses the one having the file name (columns 7 through 14) that matches the file being processed. DFU issues an error message if the file name being processed does not match any of the files described in the file definition source member. The following chart describes only the F-specification entries required by DFU. DFU ignores other entries, allowing you to use an existing RPG program.

F		Filename	File Type					Mode of Processing						Device	Symbolic Device	Labels S/N/E/M	Name of Label Exit	Extent Exit for DAM		File Addition/Unordered		
				File Designation				Length of Key Field or of Record Address Field												Number of Tracks for Cylinder Overflow		
					End of File				Record Address Type											Number of Extents		
						Sequence				Type of File Organization or Additional Area									Storage Index		Tape Rewind		
Line							File Format														File Condition U1-U8, UC		
							Block Length	Record Length		Overflow Indicator								Continuation Lines				
	Form Type		I/O/U/C/D	P/S/C/R/T/D/F	A/D	F/V/S/M/D/E			L/R	A/P/I/K	U/X/D/T/R or 2	Key Field Starting Location	Extension Code E/L									R/U/N	A/U
							External Record Name									K	Option	Entry			
3 4 5	6	7 8 9 · 10 11 12 13 14	15	16	17	18	19 20 21 22 23	24 25 26 27	28	29 30	31	32 33 34 35 36 37 38	39	40 41 42 43 44 45 46	47 48 49 50 51 52	53	54 55 56 57 58 59	60 61 62 63 64 65	66	67 68 69	70	71 72 73 74
0 2	F	CUSTMST						256		5	I		2									
0 3	F																					

Note: DFU does not require all the entries on the F- and I-specifications that RPG does. To avoid RPG syntax errors, specify S for source and not R for RPG at SEU sign on. The entries that DFU does require are checked and must be correct.

Column	Heading	Explanation
6	Form Type	Contains an F, indicating a file description specification.
7 through 14	Filename	If there is only one set of F- and I-specifications, DFU ignores this entry.
24 through 27	Record Length	Record length of the file being processed. Maximum record length is 1024. This entry must be right-adjusted.
29 and 30	Length of Key Field or of Record address Field	For an indexed file, the maximum length is 99 (unpacked keys) or 8 (packed keys). For a sequential/direct file, these columns must be blank. This entry must be right-adjusted.
31	Record Address Type	An entry is required only for an indexed file with a packed key (P).
32	Type of File Organization or Additional Area	Enter an I for an indexed file; any other entry indicates a sequential or direct file.
35 through 38	Key Field Starting Location	For an indexed file, enter the starting location of the record key in the record. For a non-contiguous keyed file, enter EXTK. For a sequential or direct file, leave these columns blank. This entry must be right-adjusted.

Entries On the Input Specifications

The I-specifications define the format of the file the program uses by specifying how the records are identified, what the field names are, and where the fields are located.

I	Line	Form Type	Filename or Record Name / Data Structure Name	O R A N D	Sequence	Number (1/N)	Option (O), U, S	Record Identifying Indicator, **, or DS	Record Identification Codes — 1 Position	Not (N)	C/Z/D	Character	2 Position	Not (N)	C/Z/D	Character	3 Position	Not (N)	C/Z/D	Character	Stacker Select	P/B/L/R	Field Location From / Occurs n Times	To / Length	Decimal Positions	RPG Field Name	Control Level (L1-L9)	Matching Fields or Chaining Fields	Field Record Relation	Plus	Minus	Zero or Blank
	0 1	I	CUSTMST					01																								
	0 2	I																					1	1		ARCOD						
	0 3	I																					2	6		CUSNO						
	0 4	I																					7	9		CUSCOD						
	0 5	I																					10	34		CUSNM						
	0 6	I																					35	59		CUSA1						
	0 7	I																					60	84		CUSA2						
	0 8	I																					85	109		CUSA3						
	0 9	I																					110	111		STATE						
	1 0	I																				P	112	116	0	ZIPCD						
	1 1	I																				P	117	118	0	AREAC						
	1 2	I																				P	119	122	0	PHONE						
	1 3	I																					123	123		CUSTP						
	1 4	I																				P	124	127	0	CRLIM						
	1 5	I																				P	128	130	0	SLSNO						
	1 6	I																				P	131	135	2	AMDUE						
	1 7	I																				P	136	139	0	DLTPM						
	1 8	I																														

DFU uses I-specifications to define record types, fields, and data structures.

Record Type Definitions

Each record type in a file must be described by one or more record-defining specifications (on the I-specification). A record-identifying indicator (01 through 99) must be assigned to each record type. A record code, a certain character, or characters in particular positions within the record can optionally be chosen.

To determine the record type, DFU scans the record codes, if they exist, in the order specified in the file definition. The record type selected is the first one that has the specified data in the position described by the record code. If no record codes exist, DFU takes the first record type defined in the DFU specification source member.

The following charts describe only the I-specification entries required by DFU for defining a record type.

Column	Heading	Explanation
6	Form Type	Contains an I, indicating an input specification.
7 through 14	Filename	This field needs to be entered only for the first I-specification for a file. The name must match the file name you specified on the preceding display. If there is only one set of F- and I-specifications, DFU ignores this entry.
14 through 16	OR/AND	This field can be used only when two or more record-defining specifications are required to identify a record type, or when another record type is to be specified: AND The record identification codes on this specification must be used with those on the preceding specification to identify the record type. OR The record identification codes on this specification can be used instead of the codes for previously specified record types. Or, another record type can be defined by coding its ID in columns 19 and 20.

Column	Heading	Explanation
15 and 16	Sequence	A numeric entry (01 through 99) indicates this record type is numerically sequenced. If so, DFU checks column 17 for 1 or N records of this type in sequence. **Note:** Record sequencing is used only for an enter/update program.
17	Number (1/N)	DFU checks this column if there is an entry in columns 15 and 16. A 1 indicates only one of this record type in a sequence; an N indicates more than one record of this type in a sequence. If there is not a 1 or an N, DFU does not expect the record types to be sequenced. **Note:** Once DFU has encountered a valid sequenced record type, all succeeding record types are assumed sequenced. If columns 15 through 17 have invalid sequence entries, DFU assumes more than one record in the sequenced record type.
19 and 20	Record Identifying Indicator	A numeric entry (01 through 99) identifying the record type.
21 through 41	Record Identification Codes	Up to three codes in an AND relationship can be specified on each record identifying line to describe a record type. A maximum of 60 codes can be specified to identify a record type when it is necessary to use AND/OR lines to describe the record type. Two or more record types can be described with OR lines.

Field Definitions

The field-defining specifications for a record type directly follow the record type-defining specifications. These specifications identify the locations, lengths, and data types for each field in the record type.

Note: If you use a subdivided key field, the subfields may be defined in the I-specifications by a data structure definition.

The following chart describes only the I-specification entries required by DFU for defining a field.

Column	Heading	Explanation
6	Form Type	Contains an I, indicating an input specification.
7 through 42		Must be blank.
43	P/B/L/R	Code a P for a packed field; otherwise leave blank.
44 through 47	Field Location (From)	Position in the record at which the field starts. This entry must be right-adjusted.
48 through 51	Field Location (To)	Position in the record at which the field ends. This entry must be right-adjusted.
52	Decimal Position	Code 0 through 9 for a numeric field. Leave blank for an alphameric field.
53 through 58	Field Name	The first character must be A through Z, #, @, or $; the remaining characters can be any combination of alphameric characters.
63 and 64	Field Record Relation	If a record-identifying indicator (01 through 99) is in these columns, the field is a part of only that record type. A blank indicates the field goes with all record types defined in the previous record-defining input specifications.

Data Structure Definitions

The third type of I-specification, data structure definitions, is optional. These specifications allow a previously specified data field to be divided into named subfields. If present, data structure definitions must follow all record- and field-defining I-specifications for the file.

Note: DFU will not scan for data structure subfields of data fields previously defined as packed or binary. For a further explanation of data structures, see *Programming With RPG II.*

The following charts describe only the I-specification entries required by DFU for defining a data structure.

Note: A data structure definition requires two or more specifications. The first specification names the data structure; succeeding specifications identify the subfields in the data structure.

First Specification

Column	Heading	Explanation
6	Form Type	Contains an I, indicating an input specification.
7 through 12	Filename	Name of the data structure. It must correspond to the field name of a previous field specification.
19 and 20	Record Identifying Indicator	Must contain the characters DS for data structure.

Column	Heading	Explanation
6	Form Type	Contains an I, indicating an input specification.
44 through 47	Field Location (from)	Relative start position of subfield in data field. This entry must be right-adjusted
48 through 51	Field Location (to)	Relative end position of subfield in data field. This entry must be right-adjusted.
52	Decimal Position	Code 0 through 9 for a numeric field.
53 through 58	Field Name	Name of the subfield.

Entering a File Definition Source Member

You create the source member that contains the F- and I-specifications by using the source entry utility (SEU). Enter SEU, then respond to the prompts on the first display. Refer to Chapter 2 in the *SEU Guide* for more information about the entry prompting sequence.

Using an Existing RPG Source Program

You can also use an existing RPG source program as your file definition. If the RPG source program contains F- and I-specifications that describe the file you are using with the DFU program, you do not need to create a separate file definition. After you sign on to DFU and are prompted by the DFU Procedure display for a file definition source member name, enter the name of the existing RPG source program.

DFU will use the information it needs from the RPG source and ignore the rest of the source program.

File Definition Considerations

DFU requires that:

- For indexed files, record keys can be no more than 99 characters for an unpacked key or 8 characters for a packed key.

- When printing a transaction file (whether non-contiguous keyed or not) together with a related non-contiguous keyed master file, you must specify one field in the I-specifications for the transaction file to hold the composite key of the non-contiguous keyed master file.

- Records in a file can be no more than 1024 characters.

- Alphameric fields to be processed can be no more than 60 characters.

- No more than 60 record identification codes can be used for each record type.

- Numeric fields can be no more than 15 positions if unpacked and no more than 8 positions if packed. (Array fields that have been defined as packed and greater than 15 positions are not allowed.)

- Binary fields are ignored by DFU.

- If processing a sequential or direct file, and the record number is to be placed in a field in the record, the maximum length is 8 positions.

- The maximum number of fields is 60 including the key fields.

Using Remote Files

If your system has DDM (Distributed Data Management), DFU allows you to update, inquire, and print files that reside on a remote system. Refer to Chapter 8, "Remote Files."

Note: Non-contiguous keyed files cannot be remote. If you specify a remote non-contiguous keyed file, DFU will issue an error message.

Error Detection and Correction

DFU checks the F- and I-specifications for errors before converting them to DFU attributes. If an error is found, DFU prints the incorrect specification, displays an error message, and ends the job.

For more information, refer to *Programming With RPG II.*

Chapter 4. Setting Up DFU Programs to Enter or Update Files

This chapter will explain setting up and using programs that enter or update files. Enter is used to create files. Update is used to make changes to existing files.

As a matter of fact, the program that is set up to create a file can also be used to update the same file, as you saw in Chapter 2.

A DFU program was set up in Example 1 to create a file and then used in Example 2 to update the same file. The only limitation to using a DFU program in this way is you must always use the same fields in the file.

Example Section

This chapter includes another example: one that shows you how to set up a DFU program that can be used to update different fields of the file or a different file. Because you already created the file CUSTMST in Chapter 2, the example will show you how to update different fields in that file.

The example is in the first section of this chapter. You can follow along at your display station and enter the example as shown. The entries you should make are highlighted.

More detail on each of the displays is included in the second section of the chapter. This reference section will discuss the possible entries for each prompt and any limitations.

Example 3. How to Set Up a DFU Program to Update a File

Update can be used to maintain your existing files. For example, if you have records that contain confidential information, you can limit the update to only certain fields of the record. Or if you have records with many fields and only a few need regular updating, you can limit the update to only those few fields.

The following example will show you how to set up an Update program to make changes to the file CUSTMST, using the file definition FILESRC this member was created in Example 1. The file definition for CUSTMST looks like this:

```
MEMBER      FILESRC  LIBRARY    DFULIB        SEU EOJ PRINTOUT          DATE  12/16/82     TIME  08.58

                                              IBM SYSTEM/36 SOURCE ENTRY UTILITY


        FCUSTMST            256  5 I      2
        ICUSTMST     01
        I                                        1    1 ARCOD
        I                                        2    6 CUSNO
        I                                        7    9 CUSCOD
        I                                       10   34 CUSNM
        I                                       35   59 CUSA1
        I                                       60   84 CUSA2
        I                                       85  109 CUSA3
        I                                      110  111 STATE
        I                                    P 112 1160ZIPCD
        I                                    P 117 1180AREAC
        I                                    P 119 1220PHONE
        I                                      123  123 CUSTP
        I                                    P 124 1272CRLIM
        I                                    P 128 1300SLSNO
        I                                    P 131 1352AMDUE
        I                                    P 136 1390DLTPM
                            **** E N D   O F   S E U   P R I N T O U T ****
```

Once you have signed on to the system, begin by entering:

DFU

The following DFU menu is displayed.

DFU Menu

This display asks you whether you are using an existing program or setting up a new program.

```
                              DFU                              W1
                        Data file utility

Select one of the following:

    1. Run a DFU program
    2. Create or change a DFU program






Cmd3-Previous menu      Cmd5-Main help menu Cmd7-End      Home-Sign on menu

Ready for option number or command
2
                                              (c) 1983 IBM Corp.
```

Because you are setting up a new program, select option 2 and press the Enter key. The next display is the SETUPDFU menu.

SETUPDFU Menu

This display asks you which type of program you are creating.

```
                            SETUPDFU                                    W1

                   Create or change a DFU program

Select one of the following:

     1. Create a data file
     2. Update a data file
     3. Display records in a data file
     4. Sort and print a data file




Cmd3-Previous menu     Cmd5-Main help menu   Cmd7-End        Home-Sign on menu

Ready for option number or command
  2

                                                           (c) 1983 IBM Corp.
```

For this example, select option 2 and press the Enter key. The next display is the procedure display.

Procedure Display

This display asks you to identify such things as the file you are updating, what you want to name the program, where the program is to be stored, and the name of the file definition source member.

```
                       UPDATE PROCEDURE                      Optional-*

                   Add to or change disk files


Name of file to be updated . . . . . . . . . . . . . . . . .  CUSTMST
     Name of file on disk, if different . . . . . . . . . . .           *

Name of DFU program . . . . . . . . . . . . . . . . . . . . .  DE100D    *

Number of records to extend file
     when it is full . . . . . . . . . . . . . . . . 0-8000000 0

Name of library . . . . . . . . . . . . . . . . . . . . . . .  DFULIB

Name of file definition source member . . . . . . . . . . . .  FILESRC

Name of DFU specification source member . . . . . . . . . . .  DE400DS   *

Name of display source member, if to be saved . . . . . . .            *



Cmd3-Previous menu                              (c) 1985 IBM Corp.
```

Enter the responses shown and press the Enter key. The next display is the Enter/Update General Information display.

General Information Display

This display asks you for some general information about the program.

```
                    ENTER/UPDATE GENERAL INFORMATION
              Description of display and printout for index files
Job title . . . . . . . . . . . . . . . . . . .   UPDATING CUSTMST

How do you want the data displayed? . . . . . . . . . . 1,2,3   2
   1. Single column
   2. Multiple column
   3. Maximum data

Record delete code and position within the record . . . . . .   %,1

Print added records?. . . . . . . . . . . . . . . . . . Y,N   Y

Print updated and deleted records? . . . . . . . . . . . Y,N   Y

Spaces between columns of printed data . . . . . . . . . 0-9   3

Printer line width . . . . . . . . . . . . . . . .   60-198   132

Stop printer on unprintable characters? . . . . . . . . . Y,N   N

Should DFU generate keys? . . . . . . . . . . . . . . . . Y,N   Y
```

Enter the responses shown and press the Enter key. The next display is the Record Key Description display.

Record Key Description

This display asks you for the heading to be displayed when the program is prompting the operator for the record key field.

```
                     RECORD KEY DESCRIPTION

                 Description of the record key

             *FILE    CUSTMST     256
             *KEY                  5         6
      01     *RECORD
                      ARCOD        1         1
                      CUSNO        5         6
                      CUSCOD       3         9
                      CUSNM       25        34
                      CUSA1       25        59
                      CUSA2       25        84
                      CUSA3       25       109




Record key heading . . . . . . . . . . . . . . . . . .   RECORD KEY IS:
```

Enter the heading shown and press the Enter key. The next display is the Record Type Selection display.

Record Type Selection

This display is shown for each record type in the file. At the top, DFU displays the attributes for the program, which include the record-identifying indicator of the record type and as many fields as possible from the record type. (If all the attributes don't fit on the display, use the Roll keys to roll through the attributes.)

When a program uses more than one record type, this display is repeated for each type.

```
                      RECORD TYPE SELECTION                Record type: 01

          Selection of record types to be processed


      01        *RECORD
                          ARCOD         1       1
                          CUSNO         5       6
                          CUSCOD        3       9
                          CUSNM        25      34
                          CUSA1        25      59
                          CUSA2        25      84
                          CUSA3        25     109
                          STATE         2     111
                          ZIPCD    P    9.0   116



  Process this record type? . . . . . . . . . . . . . . . . . .Y,N  Y

  Allow lowercase data? . . . . . . . . . . . . . . . . . . N,Y  Y
```

Enter the responses shown and press the Record Advance command key (Cmd 12). The next display is the Data Field Selection display.

Note: For the rest of the example, press the Cmd 12 key rather than the Enter key when you have finished responding to the display. If you press the Enter key, the display you were using will be repeated so that you can enter more information. You must then press the Enter key again to continue.

Data Field Selection

This display asks you which fields you want to enter, what the headings will be for those fields, and any function you want for those fields. The example shows that any values entered in the Amount Due field will be added together so that you will have a total for that field at the end of the job. This is indicated by the character A in the functions column.

Any values entered for Salesman Number will be checked for accuracy as indicated by the C (for Modulus 11 check) in the functions column. More information on Modulus 11 can be found in Chapter 8.

When a program uses more than one record type, this display is repeated for each type.

```
                    DATA FIELD SELECTION                    Record type: 01
              Fields in which data is to be entered
              01      *RECORD
                                ARCOD        1        1
                                CUSNO        5        6
                                CUSCOD       3        9
                                CUSNM       25       34
                                CUSA1       25       59
                                CUSA2       25       84
                                CUSA3       25      109
                                STATE        2      111
                                ZIPCD    P   9.0    116
     Data field       Heading              Functions:    A=Accumulate
       CUSNM          CUSTOMER NAME                       B=Mod 10 check
       AMDUE          AMOUNT DUE                A         C=Mod 11 check
       DLTPM          DATE LAST PAYMNT                    D=Auto-dup
       SLSNO          SALESMAN NUMBER
```

Enter the responses shown and press the Cmd 12 key.

Updating the DFU Specifications

The program setup is now complete and DFU displays the specifications that make up the DFU program source. You can review the specifications to make sure they are correct. More information on what the specifications mean can be found later in Chapter 10.

```
                    UPDATE DFU SPECIFICATIONS
                   Changes to DFU specifications

                Field1  Field2  Field3  Field4  Field5
                        *ENT/UPD*LIST   %,1     *COLUMNS
?=Remove line           *KEY    *GENKEY RECORD KEY IS:
>=Add lines
                3   132*TITLE  UPDATING CUSTMST
Press the Enter key to  01      *RECORD *LOWCASE
  accept changes                *       CUSNM   CUSTOMER NAME
                                *ADD    AMDUE   AMOUNT DUE
                                *       DLTPM   DATE LAST PAYMNT
                                *K      SLSNO   SALESMAN NUMBER




Cmd7-End program setup
```

You can also make any additions to the specifications at this time. For example, assume you have completed program setup and decide you need to add one more field before DFU creates the program.

Notice that the directions in the upper left corner of the display tell you to use the > sign to show DFU where you want to add the information. Place the > sign on the line you want the added information to follow and press the Enter key:

```
                    UPDATE DFU SPECIFICATIONS
                   Changes to DFU specifications

                Field1  Field2  Field3  Field4  Field5
                        *ENT/UPD*LIST   %,1     *COLUMNS
?=Remove line           *KEY    *GENKEY RECORD KEY IS:
>=Add lines
                3   132*TITLE  UPDATING CUSTMST
Press the Enter key to  01      *RECORD *LOWCASE
  accept changes        >       *       CUSNM   CUSTOMER NAME
                                *ADD    AMDUE   AMOUNT DUE
                                *       DLTPM   DATE LAST PAYMNT
                                *K      SLSNO   SALESMAN NUMBER




Cmd7-End program setup
```

Add DFU Specifications

The Add DFU Specifications display is shown next so that you can enter the additional information. Type in the data as shown and press the Enter key.

```
                        ADD DFU SPECIFICATIONS
                      Additions to DFU specfications

                    Field1  Field2  Field3  Field4  Field5
                              *      CUSNM   CUSTOMER NAME
    Press the Enter key to           CRLIM   CREDIT LIMIT
       accept additions






















    Cmd7-End program setup
```

DFU again displays the program specifications for your review. Because the program setup is now complete, press the End-of-Job Command key (Cmd 7).

Correct DFU Specifications

DFU will not complete the program because there is an error in the specifications.

```
              CORRECT DFU SPECIFICATIONS
              Corrections to DFU Specifications

              Field1  Field2  Field3  Field4  Field5
?=Remove line                 CRLIM   CREDIT LIMIT
>=Add lines           *ADD    AMDUE   AMOUNT DUE
                      *       DLTPM   DATE LAST PAYMNT
Press the Enter key to *K     SLSNO   SALESMAN NUMBER
  accept changes






Cmd7 -End program setup
Cmd12-Accept with error
Cmd19-Cancel setup

DFU-0115 Invalid operation code in field 2
```

Notice that the message at the bottom of the display says there is an error in Field 2. The example included an error so that you could see what happens when DFU finds an error in the specifications.

Assume that you do not know how to correct the error, or do not have time to correct it. The command keys that are available are listed in the lower left corner of the display.

When you are updating specifications, Cmd 12 allows you to accept the program with the error. In other words, DFU will store the program source for you even though there is an error in the specifications. DFU cannot, however, create a program that runs, because DFU needs error-free source to do that.

Press the Cmd 12 key. The next display is the Source Save display.

Source Save Display

This display allows you to name and store the program specifications even though they contain an error. If you wanted to store the specifications now and later correct the error, you could type in the responses as shown and press the Enter key.

Assume, however, you decided instead to correct the error now rather than later. Notice at the bottom of the display, DFU lists the Cmd 5 key being available so that you can return to the last display (page back).

```
                    DFU PROGRAM SOURCE SAVE DISPLAY

                      Save DFU source specification

Do you want to save the DFU source specifications? . . . Y,N   Y

Name of the member to contain the DFU source . . . . . . . .   DE400DS
    Name of the library to contain the source member  . . . .   DFULIB

Replace source member with the same name?  . . . . . . . Y,N   Y




Cmd5-Page back
```
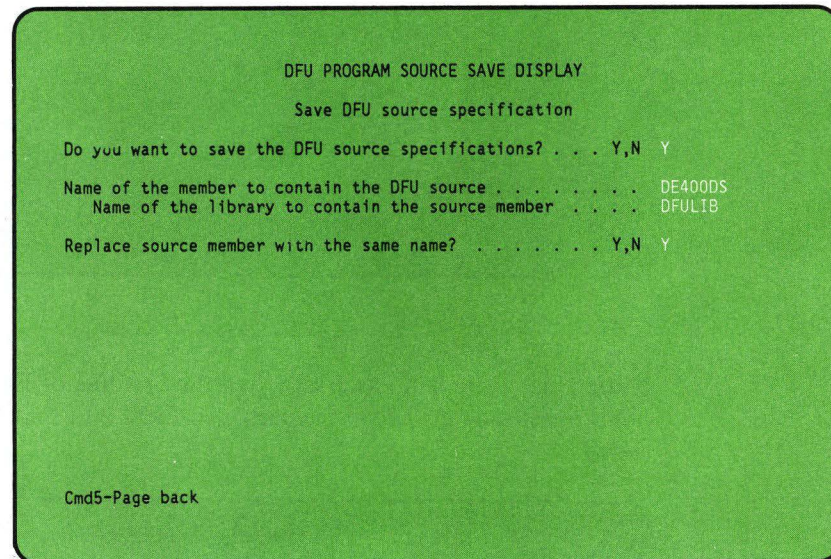
Press the Cmd 5 key and you are returned to the Update DFU Specifications display.

```
                         UPDATE DFU SPECIFICATIONS
                         Changes to DFU specifications

                    Field1  Field2  Field3  Field4  Field5
?=Remove line               *ENT/UPD*LIST   %,1    *COLUMNS
>=Add lines                 *KEY    *GENKEY RECORD KEY IS:
                     3   132*TITLE  UPDATING CUSTMST
Press the Enter key to  01  *RECORD *LOWCASE
  accept changes            *       CUSNM   CUSTOMER NAME
                                    CRLIM   CREDIT LIMIT
                            *ADD    AMDUE   AMOUNT DUE
                            *       DLTPM   DATE LAST PAYMNT
                            *K      SLSNO   SALESMAN NUMBER




Cmd7-End program setup
```
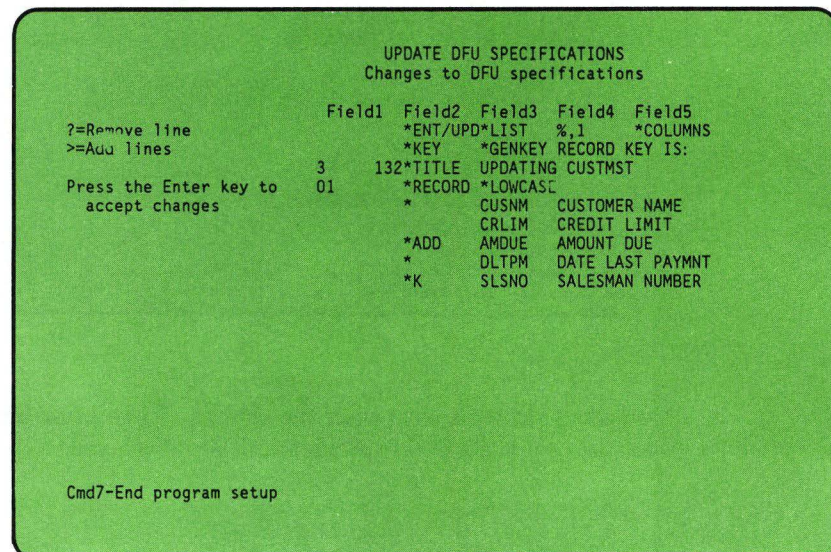
When the specifications are displayed for your review, press Cmd 7 and DFU will again display the message telling you where the error is.

```
                          CORRECT DFU SPECIFICATIONS
                         Corrections to DFU Specifications

                     Field1  Field2  Field3  Field4  Field5
   ?=Remove line                      CRLIM   CREDIT LIMIT
   >=Add lines                 *ADD   AMDUE   AMOUNT DUE
                                *      DLTPM   DATE LAST PAYMNT
   Press the Enter key to      *K     SLSNO   SALESMAN NUMBER
     accept changes




   Cmd7 -End program setup
   Cmd12-Accept with error
   Cmd19-Cancel setup

   DFU-0115 Invalid operation code in field 2
```

Notice that there is no asterisk (*) in the first line of Field 2 as there is for the other lines of data. Move the cursor to Field 2 of that line, type in the asterisk as shown:

```
                          CORRECT DFU SPECIFICATIONS
                         Corrections to DFU Specifications

                     Field1  Field2  Field3  Field4  Field5
   ?=Remove line               *      CRLIM   CREDIT LIMIT
   >=Add lines                 *ADD   AMDUE   AMOUNT DUE
                                *      DLTPM   DATE LAST PAYMNT
   Press the Enter key to      *K     SLSNO   SALESMAN NUMBER
     accept changes




   Cmd7 -End program setup
   Cmd12-Accept with error
   Cmd19-Cancel setup

   DFU-0115 Invalid operation code in field 2
```

Press the Enter key to enter the change. Then press the Enter key again and all of the corrected DFU specifications are displayed.

```
                              CORRECT DFU SPECIFICATIONS
                             Corrections to DFU Specifications

                          Field1  Field2  Field3  Field4   Field5
                                          *ENT/UPD*LIST   %,1     *COLUMNS
     ?=Remove line                        *KEY    *GENKEY  RECORD KEY IS:
     >=Add lines                  3   132*TITLE   UPDATING CUSTMST
                                  01      *RECORD *LOWCASE
     Press the Enter key to               *       CUSNM   CUSTOMER NAME
       accept changes                     *       CRLIM   CREDIT LIMIT
                                          *ADD    AMDUE   AMOUNT DUE
                                          *       DLTPM   DATE LAST PAYMNT
                                          *K      SLSNO   SALESMAN NUMBER




     Cmd7 -End program setup
     Cmd12-Accept with error
     Cmd19-Cancel setup
```

Now that you have corrected the specifications, press the Print Record Command key (Cmd 6). DFU will print both the program specifications and the program attributes. At the end of the job, check the printer attached to your display station for a copy of the program specifications and attributes. The specifications printout will look like this:

```
**  DFU SPECIFICATIONS  **        DATE        TIME       FILE DESC   DFU PROGRAM   DFU SPECS   DSPLY SRCE    MASTER I
                                  12/03/82    10.19.27   FILESRC     DE400D        DE400DS     #DFW11


        *ENT/UPD*LIST   %,1     *COLUMNS
        *KEY    *GENKEY  RECORD KEY IS:
   3   132*TITLE   UPDATING CUSTMST
   01      *RECORD *LOWCASE
        *       CUSNM   CUSTOMER NAME
        *       CRLIM   CREDIT LIMIT
        *ADD    AMDUE   AMOUNT DUE
        *       DLTPM   DATE LAST PAYMNT
        *K      SLSNO   SALESMAN NUMBER
```

The attributes printout will look like this:

```
**  DFU ATTRIBUTES  **            DATE        TIME       FILE DESC   DFU PROGRAM   DFU SPECS   DSPLY SRCE    MASTER FILI
                                  12/03/82    10.19.27   FILESRC     DE400D        DE400DS     #DFW11


        *FILE   CUSTMST   256
        *KEY              5       6
   01   *RECORD
                ARCOD     1       1
                CUSNO     5       6
                CUSCOD    3       9
                CUSNM     25      34
                CUSA1     25      59
                CUSA2     25      84
                CUSA3     25      109
                STATE     2       111
                ZIPCD   P 9.0     116
                AREAC   P 3.0     118
                PHONE   P 7.0     122
                CUSTP     1       123
                CRLIM   P 7.2     127
                SLSNO   P 5.0     130
                AMDUE   P 9.2     135
                DLTPM   P 7.0     139
```

Because there are no more corrections to make and you have a copy of the program specifications and attributes, press Cmd 7 to end the job. DFU now checks the program and allows you to save the source.

The Source Save display is shown again:

```
              DFU PROGRAM SOURCE SAVE DISPLAY

               Save DFU source specification

Do you want to save the DFU source specifications? . . . Y,N Y

Name of the member to contain the DFU source. . . . . . . . DE400DS
   Name of the library to contain the source member . . . . DFULIB

Replace source member with the same name?  . . . . . . . Y,N

Do you want to run the DFU program?  . . . . . . . . . . Y,N Y







Cmd5-Page back
```

DFU will store the program as load and subroutine members under the name DE400D. You must now decide whether you want the program source saved.

If you save the source by entering a Y to the first prompt, you can change the source later to create a similar program and avoid the setup steps.

Respond to the prompts and press the Enter key to continue. The following message is displayed:

```
DFU program is being created
```

The next display asks you which record you want to update.

Enter record key 10 as shown:

```
       UPDATING CUSTMST                Filename: CUSTMST              Mode: UPDATE
                                       Last record type:             Auto-dup: OFF
   RECORD KEY IS: 00010
```

Record 10 is displayed:

```
       UPDATING CUSTMST                Filename: CUSTMST              Mode: UPDATE
   Record type: 01                     Last record type: 01          Auto-dup: OFF
   RECORD KEY IS: 00010

   CUSTOMER NAME    Currey's Upholstery
   CREDIT LIMIT     0000000
   AMOUNT DUE       000000000
   DATE LAST PAYMNT 0000000
   SALESMAN NUMBER  00000
```

The program used to create the file CUSTMST did not specify the credit limit, amount due, date last payment, or salesman number fields, even though they were a part of the file definition.

Because the program you created to update this file does specify these fields, they now appear as empty fields.

Type in the information as shown and press the Enter key.

```
     UPDATING CUSTMST              Filename: CUSTMST              Mode: UPDATE
  Record type: 01           Last record type: 01              Auto-dup: OFF
  RECORD KEY IS: 00010

  CUSTOMER NAME     Currey's Upholstery
  CREDIT LIMIT      0075000
  AMOUNT DUE        000025000
  DATE LAST PAYMNT  0060882
  SALESMAN NUMBER   48208
```

When you press the Enter key, the next display asks you which record you want
to update. Type 00020 and press the Enter key. Record (00020) is displayed.

Type in the information as shown and press the Enter key.

```
    UPDATING CUSTMST              Filename: CUSTMST              Mode: UPDATE
  Record type: 01         Last record type: 01              Auto-dup: OFF
  RECORD KEY IS: 00020

  CUSTOMER NAME       Connely's Motel & Lounge
  CREDIT LIMIT        0085000
  AMOUNT DUE          000017525
  DATE LAST PAYMNT 0061082
  SALESMAN NUMBER     48216
```

When you press the Enter key, you are again prompted for another record key. You can make changes to any of the fields or add new data. When you are finished correcting records, and have pressed the Enter key to enter the last correction, press the End-of-Job key (Cmd 7) to end the job. The following is displayed for you.

End of Job Request

```
                         END OF JOB REQUEST


                 Number of records processed

                     Created          0
                     Updated          2
                     Deleted          0

   Is this DFU job complete? . . . . . . . . . . . . . . . .  Y,N   Y
```
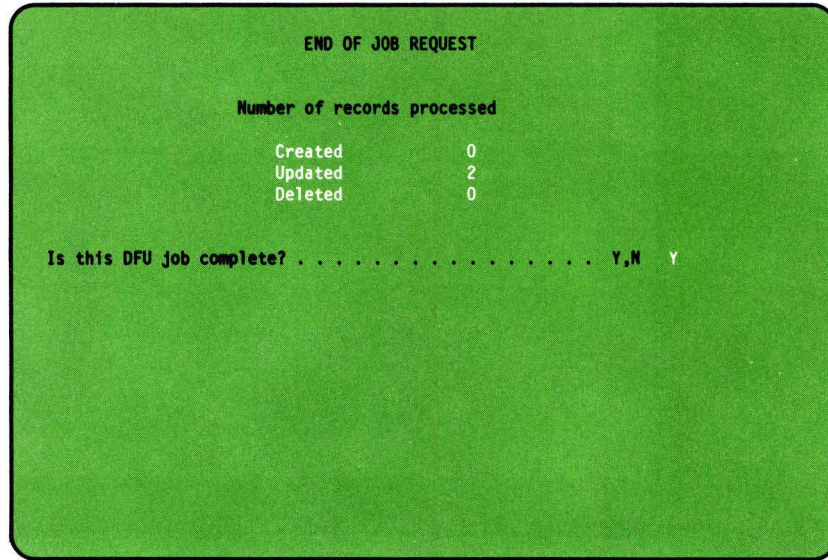
If you select N, DFU returns to the start of the mode you were last using.

If the default (Y) is selected, DFU ends the job.

For this example, enter a Y.

Notice that when you are using DFU to create or update a file, the number of records entered, updated, and deleted is displayed.

Accumulators Display

When you enter Y and end the job, any batch accumulators are displayed (the example specified on the Data Field Selection display that the amount due fields be added together).

```
                        ACCUMULATORS DISPLAY

  Batch accumulators are displayed


                AMOUNT DUE                    425.25












  Enter-Continue processing
```
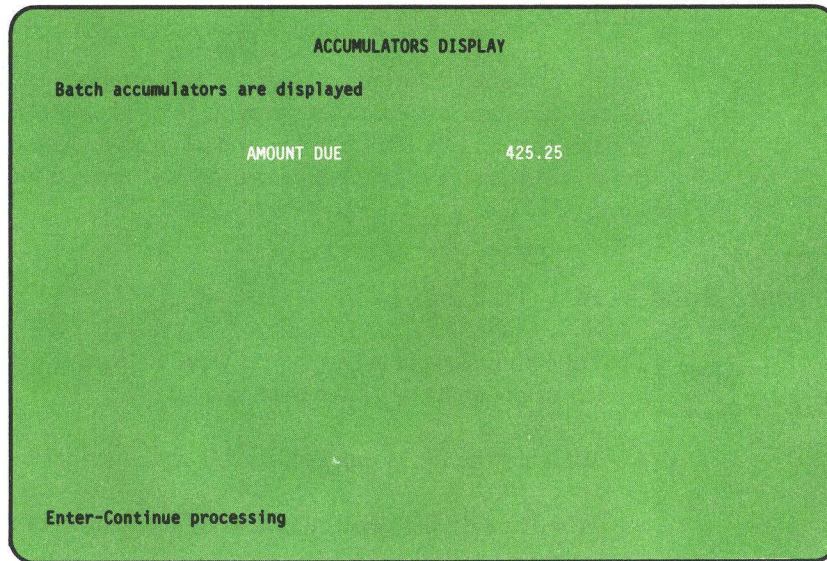
In addition, the record count is printed as the last line of the printout. (On the General Information display you chose to have the total of updated records printed at end of job.)

```
12/03/82                              UPDATING CUSTMST                              PAGE    1

RECORD KEY IS:   CUSTOMER NAME         CREDIT LIMIT   AMOUNT DUE   DATE LAST PAYMNT   SALESMAN NUMBER
      10         Currey's Upholstery        0.00         0.00              0                 0
                                          750.00       250.00          60882             48208
      20         Connely's Motel & Lounge   0.00         0.00              0                 0
                                          850.00       175.25          61082             48216

Batch accumulators are displayed
        AMOUNT DUE

        425.25

Total accumulators are displayed
        AMOUNT DUE

        425.25

     0  RECORDS ENTERED
     2  RECORDS UPDATED
     0  RECORDS DELETED
```

Pressing the Enter key twice returns you to the SETUPDFU display.

Reference Section

This section of the chapter will give you the details about the displays you saw as you went through the example. Each DFU display that you might see as you run an enter or update program is discussed here. Use this section to answer your questions.

Note: The enter and update displays and prompts are similar. Where there is a difference in the wording of a prompt, the wording for the enter display is added in parenthesis. For example, the update prompt *Name of file to be updated* will be shown as *Name of file to be updated (or entered)* to include the enter display wording.

An Enter/Update Road Map

The following flowchart shows you what to expect for enter and update. The branch of the chart you take depends on:

- Whether the file is indexed, direct, or sequential

- Whether DFU is generating record keys/numbers for you

- The number of positions in the key field (for indexed files)

- Your description of the record key/number field

Notice that whichever branch of the chart the program follows, the displays you see are similar.

```
                    ┌──────────────┐
                    │ DFU          │
                    │ Menu         │
                    │ (option 2)   │
                    └──────┬───────┘
                           │
                           ▼
                    ┌──────────────┐
                    │ DFU          │
                    │ Setup        │
                    │ Menu         │
                    └──────┬───────┘
                           │
    Sequential/            ▼              Indexed File
    Direct File     ┌──────────────┐
┌────────────────  │ Procedure    │  ───────────────┐
│                  │ Display      │                 │
│                  └──────────────┘                 │
▼                                                   ▼
┌──────────────┐                            ┌──────────────┐
│ General      │                    Yes     │ General      │
│ Information  │                ◄───────────│ Information  │      (If key position
│              │                            │ DFU Generate │      is 5 long)
│ Process      │                            │ Key?         │
│ Sequentially?│                            └──────┬───────┘
└──────┬───────┘                                   │ No
       │                  No                        ▼
       ▼              Response      ┌──────────────┐
┌──────────────┐      Entered       │ Record       │      ┌──────────────┐
│ Record Number│  ◄─────────────────│ Key          │ ◄────│ Key          │
│ Description  │                    │ Description  │      │ Field        │
│              │                    └──────┬───────┘      │ Selection    │
│ *DFU Generate│                           │              └──────┬───────┘
│ Numbers?     │                           │                     │
└──────┬───────┘                           ▼                Response
       │                            ┌──────────────┐        Entered
       │                            │ Record       │            │
       └───────────────────────────►│ Type         │◄───────────┘
                                    │ Selection    │
                                    └──────┬───────┘
                                           │
                                           ▼
                                    ┌──────────────┐
                                    │ Data         │
                                    │ Field        │
                                    │ Selection    │
                                    └──────┬───────┘
┌──────────────────────────────────────────┼──────────────────────────────────┐
│                                           ▼                                   │
┌──────────────┐      Errors       ┌──────────────┐    Additions    ┌──────────────┐
│ Correct      │  ◄────────────────│ Update       │  ──────────────►│ Add          │
│ DFU          │                   │ DFU          │                 │ DFU          │
│ Specifications│                  │ Specifications│                │ Specifications│
└──────────────┘                   └──────┬───────┘                 └──────────────┘
                                           │ No
                                           ▼
                                    ┌──────────────┐
                                    │ Save         │
                                    │ Source?      │
                                    └──────┬───────┘
                                           │
                                           ▼
                                    Program Runs or
                                    Return to Menu
```
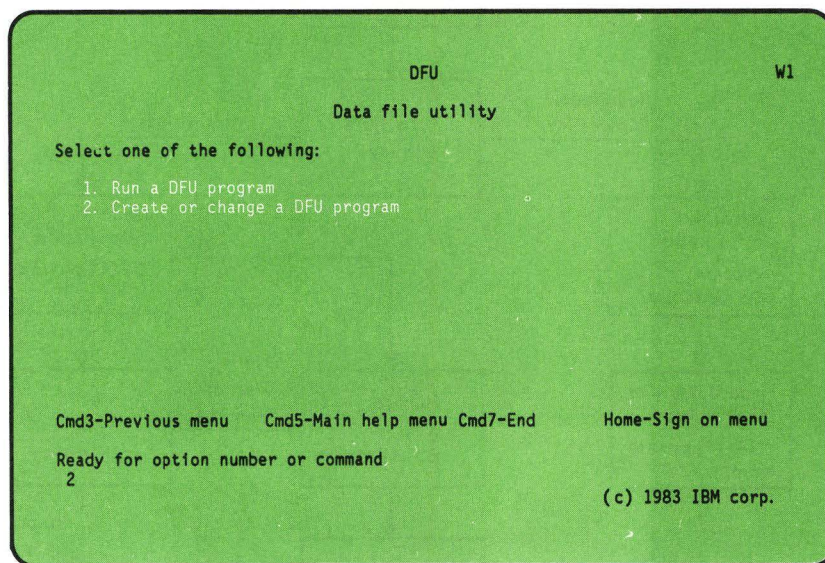
DFU Menu

The display asks you whether you are using an existing program or creating a new program. Option 1 (Run a DFU program) indicates you will be supplying the name of an existing program. When you supply the program name on the procedure display, DFU will search the library specified for load and subroutine members by that name and run the program.

```
                              DFU                              W1
                        Data file utility

Select one of the following:

    1.  Run a DFU program
    2.  Create or change a DFU program




Cmd3-Previous menu    Cmd5-Main help menu Cmd7-End      Home-Sign on menu

Ready for option number or command
    2
                                              (c) 1983 IBM corp.
```

Option 2 (Create or change a DFU program) indicates you will be supplying the name of a program you want to create. When you supply the program name on the procedure display, DFU will search the specified library for the program and run it if it exists. If the program does not exist and you specified a DFU source specification member, DFU will search the library specified for that member. DFU will then display the source member if it is found. (See *How to Change DFU Specifications* in Chapter 7 for more information.) Otherwise DFU will begin creating a new source member and a new program.

Enter the number of the option you choose.

SETUPDFU (or RUNDFU) Menu

This menu asks you to indicate what the DFU program will do: create, update, display records from, or sort and print a data file.

Enter the number of the option you choose.

```
                           SETUPDFU                              W1
                     Create or change a DFU program

  Select one of the following:

       1. Create a data file
       2. Update a data file
       3. Display records in a data file
       4. Sort and print a data file








  Cmd3-Previous menu    Cmd5-Main help menu   Cmd7-End        Home-Sign on menu

  Ready for option number or command
     2
                                                       (c) 1983 IBM Corp.
```

Procedure Display

This display will differ slightly depending on how you are using DFU. It asks you to identify such things as what the file name is, what you want to name the program, where the program is to be stored, and the name of the file definition.

```
                        UPDATE PROCEDURE                   Optional-*

                     Add to or change disk files


Name of file to be updated . . . . . . . . . . . . . . . . . . CUSTMST
     Name of file on disk, if different . . . . . . . . . .              *

Name of DFU program . . . . . . . . . . . . . . . . . . . . . . DE100D   *

Number of records to extend file
   when it is full . . . . . . . . . . . . . . . .  0-8000000 0

Name of library . . . . . . . . . . . . . . . . . . . . . . . . DFULIB

Name of file definition source member . . . . . . . . . . . . FILESRC

Name of DFU specification source member . . . . . . . . . . . DE400DS   *

Name of display source member, if to be saved . . . . . . . .             *



Cmd3-Previous menu                                   (c) 1985 IBM Corp.
```

Name of file to be updated (or entered)

This is the name of the file you want to change or create. You can enter a name up to 8 characters long.

Name of file on disk, if different

This is the name of the file on the disk (the file label). You must enter this name if it is different from the name of file to be updated (or entered).

Name of DFU program

This is the name of the program you are using or creating. The program contains information about the file, how the file is to be processed, and the display formats used to enter, update, insert, and view the data. Enter the name of the program you are either using or setting up. An entry in this field is optional.

Number of records to extend file when it is full (or to be in file)

This is the number of records you want to add to the file when it is full. Or it is the number of records you want to save space for in the file if you are creating a new file.

Name of library

This is the name of the library in which the program is stored or will be stored. If no library is specified, DFU stores the program in the library you are currently using.

If you specify a user library on this display, the file definition must be stored in that library. If you did not identify a user library, DFU uses the library that you are currently using.

Any load, subroutine, or source members created by DFU are stored in this library.

Name of file definition source member

This is the name of the source member containing the RPG specifications that describe the file you want to change or create. It can contain one or more sets of F- and I-specifications or an entire RPG program. (The F- and I-specifications that describe your file will be used by DFU.)

If you specify a user library on this display, the file definition source member must be stored in that same library. If you did not identify a user library, DFU searches the library that you are currently using.

Name of DFU specification source member

This is the name of the source member that contains or will contain the DFU specifications for this program.

If you identified a user library, DFU searches for or stores the program specifications in this library. If you do not specify a user library, DFU stores the specifications in the library you are currently using.

Note: You can also change the DFU specification source member name and library name on the source save display when program setup is complete.

Name of display source member, if to be saved

Information you supply during program setup, such as how many columns of data you have, the names of the fields, and whether you want fields accumulated, all affect what the program display looks like to the operator. An entry in this field is optional.

DFU generates specifications describing the program displays that are similar to those you can create using the Screen Design Aid (SDA). Although you can alter these specifications if changes to the display are necessary, changing display specifications requires a great deal of care, and only the most experienced users should attempt to change the specifications. Chapter 10 in this manual describes DFU limitations on altering display specifications. Before attempting to change the specifications, refer to the *Creating Displays: Screen Design Aid and System Support Programming* manual.

General Information Display

This display asks you for information on how you want the file to be displayed and printed when you run the program.

```
                    ENTER/UPDATE GENERAL INFORMATION
               Description of display and printout for index files

Job title . . . . . . . . . . . . . . . . . .

How do you want the data displayed? . . . . . . . . . . .  1,2,3
   1. Single column
   2. Multiple column
   3. Maximum data

Record delete code and position within the record . . . . . . .

Print added records?. . . . . . . . . . . . . . . . . . . Y,N

Print updated and deleted records? . . . . . . . . . . . . Y,N

Spaces between columns of printed data . . . . . . . . . . 0-9

Printer line width . . . . . . . . . . . . . . . . . . 60-198

Stop printer on unprintable characters? . . . . . . . . . N,Y

Should DFU generate keys?. . . . . . . . . . . . . . . . . Y,N
```

Job Title

This is the name that appears on the printout and the display for this job. The name can be a maximum of 24 characters long. If you leave this blank, there will be no name on your printout to identify the job.

How do you want the data displayed?

Enter 1, 2, or 3 to indicate how you want the data displayed. Data is displayed to the right of its heading.

1: Single column means DFU will put as much data on the display as it can in one column, then continue on a second display.

2: Multiple columns means DFU will put as much data on the display as it can fit in one column, then continue in another column (up to 4 columns), before going to a second display.

3: Maximum data means DFU will fit as much data on the display as possible without being restricted to a column format.

Note: Even though you can choose a multiple columns display format, data will be displayed in a single column if there is not enough data to fill a column.

Record delete code and position within the record

A delete code is a character you specify to identify a record that is to be marked for removal from the file. You indicate here the character you want to use as the delete code and its position within the record. The default is a blank in position 1 of the records. When you are using a multiple-indexed file and accessing that file through an alternative index, make sure that the delete code position you specify is not a position within the primary key field.

Note: Records marked for deletion are not actually removed until the SAVE or COPYDATA procedure is run against the file. See the *System Reference* manual for more information on this procedure.

Print added records?

Y indicates that all records added to the file while running the program will be printed at the end of job. N indicates that the new records are not to be printed.

Print updated and deleted records?

Y indicates that all records updated or marked for deletion during this job will be printed. N indicates that updated records or records marked for deletion are not to be printed.

Spaces between columns of printed data

You may specify 0 through 9 spaces between fields on the printer output. If you do not enter a response, DFU will put one space between fields. Use as much space as possible between printed columns to make the printout more readable at the end of the job.

Printer line width

This specifies how long you want the lines on a printout. If you do not enter a response, DFU will print lines that are 132 characters wide. Widths greater than 132 positions require special consideration. See "Printer Line Width" in Chapter 7 for more details.

Stop printer on unprintable characters?

Y indicates that the printer stops and the system issues a system message when characters that can not be printed are in the data to be printed.

N, the default, indicates that the printer will not stop when these characters are in the data to be printed. Instead, the printer will print blanks in place of these characters.

Should DFU generate keys?

Note: This prompt appears for indexed files if the record key is five positions long (unpacked data) or three positions long (packed data).

Y indicates that DFU is to create keys for the file. In update, the first key generated will be the current high key value rounded up to the next multiple of 10.

N indicates that you will provide the record keys when you enter the records.

When DFU generates the record keys, the first display of the program contains the first record key and prompts for the first set of fields for the record type indicated. DFU starts with a key value of 00010 when a file is created. The record key value is then increased by 00010 for each following record.

When an existing file is being updated, DFU locates the highest key and starts generating record keys at the next multiple of 10. For example, if the highest key is 16, the first key DFU generates will be 00020.

You can interrupt automatic key generation and manually specify a new record key that is less than the next key to be generated by DFU. Pressing the Insert command key (Cmd 9) switches processing to *insert mode*. You can update existing records by pressing the Update command key (Cmd 11). To return to DFU-generated record keys after using insert or update, you must press the Entry command key (Cmd 10).

Processing with DFU-generated keys is the same as processing with operator-specified keys. Our example shows a DFU-generated record key.

Note: DFU suspends the automatic generation of keys if one of the following occurs:

- The record key to be generated is greater than 99990.

- A duplicate record key error is encountered when DFU attempts to write a record for which it had just generated the key.

- Another operator is using the file and it is shared.

Considerations for Automatic Record Key Generation

Only one display station operator can use the automatic record key generation if other DFU operators are currently entering data into the same file.

The operator using automatic generation will lose it if another operator (working with the same file) creates a record key or number first that matches a number that DFU would have generated.

For example, assume that DFU is generating record keys of 0370, 0380, 0390, and so on for operator A, and that operator B (working with the same file) creates a record key value of 0400. When DFU attempts to generate a record key of 0400 for operator A, it recognizes 0400 as a duplicate value and stops automatic record key generation for operator A.

In such a case, the operator can still enter, insert or update data; however DFU will no longer supply record keys in *entry mode*.

Process the file sequentially

Note: The prompt appears only for direct or sequential files.

Y indicates you want to enter a sequential file, or update a direct file sequentially.

N indicates you are working with a direct file and want to be able to specify a record number to retrieve a record.

Note: This next display you will see is the Record Number Description display. Refer to that section next.

Key Field Selection Display

You must supply the names of the fields that make up the record key and the headings you want for those fields.

```
                    KEY FIELD SELECTION

            Fields that compose the record key

                *FILE   CUSTMST   256
                *KEY               5         6
        01      *RECORD
                        ARCOD     1         1
                        CUSNO     5         6
                        CUSCOD    3         9
                        CUSNM     25        34
                        CUSA1     25        59
                        CUSA2     25        84
                        CUSA3     25        109

            Key field          Heading

             CUSNO             CUSTOMER NUMBER
```

Key Field

This is the name of the field(s) that makes up the record key. The name you enter for key field must be typed exactly as shown in the attributes at the top of the display.

A maximum of ten fields can be used to make up the key field. Alphameric fields cannot have a length of more than 30 bytes. Numeric fields can be a maximum of 15 bytes long. The maximum size of the combined key fields is 99 bytes.

You can specify two or three non-contiguous keys, with the same restrictions as above. If you want to use non-contiguous keys you must have specified them in the file specification source member.

Note: The field(s) you name on this display must make up the entire key area defined in the file definition.

Heading

This is the key field heading you want to appear on the display for the operator. A heading can be a maximum of 16 characters long. If you do not enter a heading for the field, DFU uses the field name specified in the file definition.
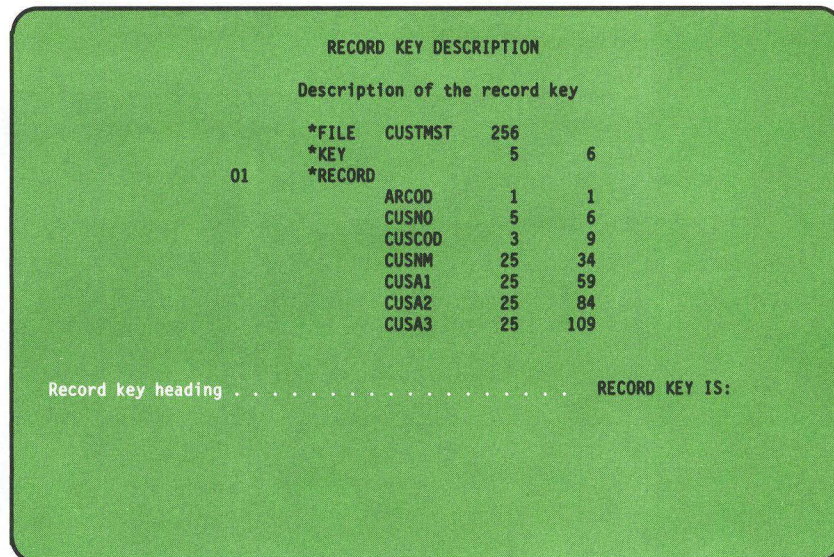
Note: If you type in fields and press the Enter key, DFU will redisplay the Key Field display for more fields making up the record key, unless ten fields have already been specified.

If you press the Enter key or the Rec Adv command key (Cmd 12) without entering data, DFU takes the record key definition from the I-specifications. The record key will then consist of one field. (You must then continue with a Record Key Description display.)

For a non-contiguous keyed file, the record key will consist only of the primary key, which will be displayed as one field.

Record Key Description Display

This display is shown only when you are using an indexed file and DFU is generating record keys for you or you did not specify any fields for the record key on the last display. You must describe how you want the record key to be processed.

```
                    RECORD KEY DESCRIPTION

                 Description of the record key

             *FILE    CUSTMST    256
             *KEY                  5         6
        01   *RECORD
                      ARCOD        1         1
                      CUSNO        5         6
                      CUSCOD       3         9
                      CUSNM       25        34
                      CUSA1       25        59
                      CUSA2       25        84
                      CUSA3       25       109



    Record key heading . . . . . . . . . . . . . . . . .    RECORD KEY IS:
```

Record key heading

You can enter a heading up to 16 characters long that you want used to identify the record key when it is displayed or printed.

If you do not enter a heading, DFU will display *KEY.

Is the record key numeric?

Note: This prompt is only shown when DFU is not generating record keys and when you have not specified a field or fields to be used as keys on the Key Field Selection Display. If the file has packed keys, you will not see this prompt, and the key will be numeric.

Enter a Y to indicate that all keys are numeric fields.

Enter an N to indicate that all keys are not numeric fields.

Note: The next display you will see is the Record Type Selection display. Refer to that section next.

Considerations for record key fields and headings

When you are using an indexed file, the record key contains one to ten fields. The headings and data for each field that make up the record key (one key field per line) are displayed beginning on line three of the display.

Record Number Description

This display occurs instead of the Record Key Description display, when you are using a sequential or direct file. The display asks how you want to be prompted for the record number field. The record number displayed when the program is run is the actual record number in the file, not the value that is in the record number field. This prompt allows you to name the field in the record that holds the record number.

```
                    RECORD NUMBER DESCRIPTION              Optional-*

                 Description of the record number

                 *FILE   FILE      256
         01      *RECORD
                 *CODE    C      H              1
                  CODE           1.             1
                  CUSTNO         5.0            6
                  ORDNO          6.3           12
                  CUSORD         5             17
                  DATE           6             23
                  SHPTO          2             27
                  SHPVIA        48             75
 Should DFU generate record numbers . . . . . . . . . . . . N,Y  N

 Record number heading . .\. . . . . . . . . . . . . . . . . . *RECNUM

 Name of the field to contain record number . . . . . . . . . .
```

Should DFU generate record numbers?

Note: This prompt appears only for direct files not being processed sequentially.

Y indicates that DFU should generate record numbers for the file.

N indicates that you will provide the record numbers when you enter the records.

When DFU generates the record numbers, the first display contains the first record number and prompts for the first set of fields for the record type indicated. When a file is being created, DFU starts with a record number of 1. Each succeeding record number is 1 greater than the record just created.

When an existing file is being updated, DFU locates the first blank record in a file that is not delete-capable, or the first deleted record in a delete-capable file and starts with the corresponding record number.

Note: Because DFU reads the file consecutively until such a record is found, the time needed to begin the job increases with the number of records that must be read before a blank or deleted record is found.

You can interrupt automatic record number generation and manually specify record numbers by pressing the Insert command key (Cmd 9) to switch processing to *insert mode* (for a direct file only). You can update existing records by pressing the Update command key (Cmd 11). To return to DFU-generated record numbers after using insert or update, you must press the Entry command key (Cmd 10).

Operator-Specified Record Numbers: When you specify record numbers, you must enter on the first display: (1) the record number of the record to be processed, along with (2) all of the fields for that record type that fit on the first display for that record.

The record number appears on any succeeding displays along with remaining field prompts. As with DFU automatic generation, the record number cannot be modified after the first display is entered without completing the current record or restarting the job.

Record number heading

This specifies the heading you want displayed when the operator is prompted for the record number. You can enter a maximum of 16 characters for this name. If you do not enter a heading, DFU uses *RECNUM as the heading.

Considerations for Record Number Fields and Headings: When you are using a sequential or direct file, the record number prompt appears on line 3.

When using update mode you type the record key or record number field(s) to select a record. Using enter mode, once you've specified the record key or record number and entered the record type for the first display, you cannot modify the record key or record number without completing the current record or restarting the job. Pressing the Record Backspace (Rec Bksp), command key (Cmd 5), or one of the mode selection command keys will restart record processing.

Name of the field to contain record number

When you are using a direct file, you can select a field within the record in which to store the physical record number. Because the stored record number matches the physical record number, it can be used to reference the record when you are using a printout of your records or updating the file.

The length of the field you select to contain the record number determines how many characters you are prompted for by the *record number heading.* (The default heading is *RECNUM.)

For example, if you select a 2-character field in which to store the record number, you are only prompted for a 2-character record number. You can then only get records 1 through 99.

The maximum field length is eight positions for unpacked data and four positions for packed data. If you do not select a field to contain the record number, the record number field is 8 character positions long.

Record Type Selection

This display allows you to indicate whether you want this record type to be processed. The record type is shown in the upper right corner of the display. As many fields as possible are displayed from this record type at the top of the display.

This display will be repeated for each record type described in the file definition.

```
                    RECORD TYPE SELECTION        Record type: 01
              Selection of record types to be processed

        01      *RECORD
                        ARCOD           1           1
                        CUSNO           5           6
                        CUSCOD          3           9
                        CUSNM          25          34
                        CUSA1          25          59
                        CUSA2          25          84
                        CUSA3          25         109
                        STATE           2         111
                        ZIPCO    P      9.0        116




     Process this record type? . . . . . . . . . . . . . . . Y,N  Y

     Allow lower case data?. . . . . . . . . . . . . . . . . Y,N  Y
```

Process this record type?

Y indicates that the record type displayed is to be processed.

N indicates that the record type displayed is not to be processed.

If there are more record types in the file, this prompt will be repeated for the next defined record type.

For any record type, only 60 fields (including the record key or record number) can be processed at a time. If printing is requested for a record, DFU will print only the first 16 lines of edited data. Data that will not fit on the first 16 print lines will be placed in the record, but will not be printed.

Note: If you respond Y, you must enter at least one data field on the Data Field Selection display or you will not have any fields to enter data into for that record type when the program is run. When running the program, DFU will bypass the displays that have no input to be entered and proceed to the next display. DFU will also bypass the display if all of the data fields on a display are defined as automatic duplication fields and the automatic duplication indicator is on.

In either case, no data is displayed when the program is run, and:

• DFU is generating record keys for that record type. DFU creates and writes records in the file until the file is full or until the record type is changed (using sequenced record types).

• You request a record of that type for update. DFU gets the record, determines no data can be entered, and prompts for another record.

Allow lowercase data?

N indicates that you can type only uppercase data for this record type.

Y indicates that you can type uppercase and lowercase data for this record type. You must shift to uppercase as needed.

Note: Consider the record key along with the data when deciding how to answer this prompt. Determine whether lowercase characters will be needed.

Data Field Selection Display

This display allows you to select which fields for each record type you want displayed when the program is run. Only the fields you select will be displayed to the operator entering data. The record type is displayed in the upper right corner of the display.

If you enter data fields and press the Enter key, DFU will redisplay the Data Field Selection display for more fields *unless* the maximum of 60 fields (including the record key or record number) have already been specified.

Note: For any record type, only as many fields as will fit on 16 print lines can be processed at one time, up to a maximum of 60 fields (including any record key or record number fields).

When creating a record, any packed fields not specified to be processed for this record type and not part of a record key are initialized to packed zero values by DFU. A maximum of 100 fields are initialized per record type.

```
                        DATA FIELD SELECTION              Record type: 01
                  Fields in which data is to be entered
                  01      *RECORD
                                     ARCOD        1        1
                                     CUSNO        5        6
                                     CUSCOD       3        9
                                     CUSNM       25       34
                                     CUSA1       25       59
                                     CUSA2       25       84
                                     CUSA3       25      109
                                     STATE        2      111
                                     ZIPCD   P   9.0      116
         Data field      Heading              Functions:  A=Accumulate
           CUSNM         CUSTOMER NAME                     B=Mod 10 check
           AMDUE         AMOUNT DUE             A          C=Mod 11 check
           DLTPM         DATE LAST PAYMENT                 D=Auto-dup
           SLSNO         SALESMAN NUMBER        C
```

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Data Field

This is the name of the field to be used in this program; they must match the names used in the file definition. Data fields cannot overlap the record key when you are using an indexed field.

Note: If you press either the Enter key or the Rec Adv command key (Cmd 12) without typing in any data, the Data Field prompting ends for this record type.

Heading

This is the heading for the field that you want displayed or printed on a report when the program is run. The maximum length is 16 characters. If you do not enter a heading name, DFU uses the field name from the file definition.

Functions

Enter the letters of the functions you want used in the field. More than one function can be specified for a field, however B and C cannot be used together.

    A = Accumulation field
    B = Modulus 10 check field
    C = Modulus 11 check field
    D = Auto-duplication field

Accumulation field means the contents of the fields will be added together as they are entered. These accumulated fields will be displayed and printed at the end of the job for control purposes. More information on accumulated fields can be found later in the chapter.

Modulus 10 and 11 check fields allow mathematical checking as data is entered. For example, if you specified modulus checking on a Salesman Number field, DFU would check the number as it was entered to make sure the number was a valid number. See *Modulus Checking* in Chapter 8 for more details.

Automatic duplication means the field is automatically copied in the next record.

Update DFU Specifications

The program setup is now complete and this display lets you review the DFU program specifications before the program is created.

To change any of the data, move the cursor to the field you want to change and type the correct data.

To delete a line of data, move the cursor to the line you want to remove and type a question mark (?) in the first position of Field 1. Press the Enter key and DFU removes the line.

To add a line of data to the specifications, move the cursor to the line you want the new data to follow and type a greater than sign (>) in the first position of Field 1. The following display allows you to enter the new DFU specifications.

```
                         UPDATE DFU SPECIFICATIONS
                         Changes to DFU specifications

                    Field1  Field2  Field3  Field4  Field5
?=Remove line               *ENT/UPD*LIST   %,1     *COLUMNS
>=Add lines                 *KEY    *GENKEY RECORD KEY IS:
                    3    132*TITLE   UPDATING CUSTMST
Press the Enter key to  01  *RECORD *LOWCASE
   accept changes           *       CUSNM   CUSTOMER NAME
                            *ADD     AMDUE   AMOUNT DUE
                            *       DLTPM   DATE LAST PAYMNT
                            *K      SLSNO   SALESMAN NUMBER




Cmd7-End program setup
```

For more information on updating specifications, refer to Chapter 10.

Add DFU Specifications

This display allows you to add DFU specifications. It will only be displayed when you type a > in the first position of a DFU specification line.

Enter one specification per line. If you press the Enter key, DFU adds the new specification and returns you to the Update DFU Specifications display. If you fill every line of the Add DFU Specifications display, the display is repeated for more additions.

```
                         ADD DFU SPECIFICATIONS
                       Additions to DFU specfications

                      Field1  Field2  Field3  Field4   Field5
   Press the Enter key to       *     CUSNM   CUSTOMER NAME
     accept additions                 CRLIM   CREDIT LIMIT

















   Cmd7-End program setup
```

Correct DFU Specifications

This display is shown only when DFU finds an error in the DFU specifications. If an error is found in the specifications, DFU highlights the error and moves the cursor to the error. An error message is displayed on the last line of the display to identify the error.

If the error is a syntax error, the highlighted specifications containing the error must be corrected or removed in order to continue.

When a required specification is missing, the specification in its place is highlighted. For some errors, several specifications may together be causing the error. Only one of the specifications is highlighted at a time. Refer to the *Utilities Messages* for more information.

You can press the Accept With Error command key (Cmd 12) and DFU will save the DFU specifications as a source member, but will not create the program. DFU will continue with the next display (the Source Save display).

```
                        CORRECT DFU SPECIFICATIONS
                        Corrections to DFU Specifications

                 Field1  Field2  Field3  Field4   Field5
  ?=Remove line                   CRLIM   CREDIT LIMIT
  >=Add lines              *ADD   AMDUE   AMOUNT DUE
                           *       DLTPM   DATE LAST PAYMNT
  Press the Enter key to   *K      SLSNO   SALESMAN NUMBER
    accept changes




  Cmd7 -End program setup
  Cmd12-Accept with error
  Cmd19-Cancel setup

  DFU-0115 Invalid operation code in field 2
```

DFU Program Source Save Display

This display allows you to name the source member that will contain the DFU program specifications. If you pressed Cmd 12 on the earlier display, DFU allows you to save the specifications for later update and use. If you pressed Cmd 7 on the earlier display, DFU will create the program and ask you if you want the program run.

```
                    DFU PROGRAM SOURCE SAVE DISPLAY

                    Save DFU source specification

Do you want to save the DFU source specifications? . . . Y,N  Y

Name of the member to contain the DFU source. . . . . . .   DE400DS
    Name of the library to contain the source member . . . .   DFULIB

Replace source member with the same name?  . . . . . . . Y,N  Y












Cmd5-Page back
```

Do you want to save the DFU source specifications?

Enter Y or N to tell DFU if you want to save the source for this program.

If you want to save the source, enter Y. You can use the source for a similar program and avoid the setup procedure by updating the source.

If you do not want DFU to save the source for this program, enter N.

Name of source member to contain DFU source

You can enter up to eight characters for a member name. The name you specified on the DFU procedure display when setting up this program is displayed for you. You can change the name displayed and DFU will store the source member under the new name.

Enter a new name if you have used an existing source member to create a second program. The original source member is still saved under the original name and the new, updated source member is saved under the new name.

Name of library to contain source member

Enter the name of the library where DFU is to store the source member. The name of the library you are currently using is displayed for you. You can change the library name if you want to store the member in another library.

Replace source member with the same name?

Enter a Y if you want this source member to replace an existing source member (by the same name) in the library.

Enter an N if you do not want the new source member to replace an existing member in the library.

You should enter an N if you are not sure whether there is another source member in the library with this name. If DFU finds another member by the same name, an error message is displayed and the source member name is highlighted. You should then change the member name or change your response to this prompt to Y.

Do you want to run the DFU program?

This prompt is only shown if you pressed Cmd 7 on the Update DFU Specifications display.

If you enter a Y, DFU will create the program and then run the program.

If you enter an N, DFU will create the program and end the job. The program is stored as a subroutine and load member in the library you specified.

End of Job Request Display

When you are using DFU to enter or update a file, the number of records entered, updated, and deleted is displayed when end of job is requested. End-of-job information includes:

- Number of records processed.

- Batch and Final Accumulators: displays the value of accumulators for each of the fields you designated with an A under FUNCTIONS.

- If you requested a printout using the Print Record command key (Cmd 6) while running the program, the number of records you entered and updated is printed on the last line of the printout.

```
                    END OF JOB REQUEST


           Number of records processed

                    Created         0
                    Updated         2
                    Deleted         0


Is this DFU job complete? . . . . . . . . . . . . . . . .   Y,N   Y
```
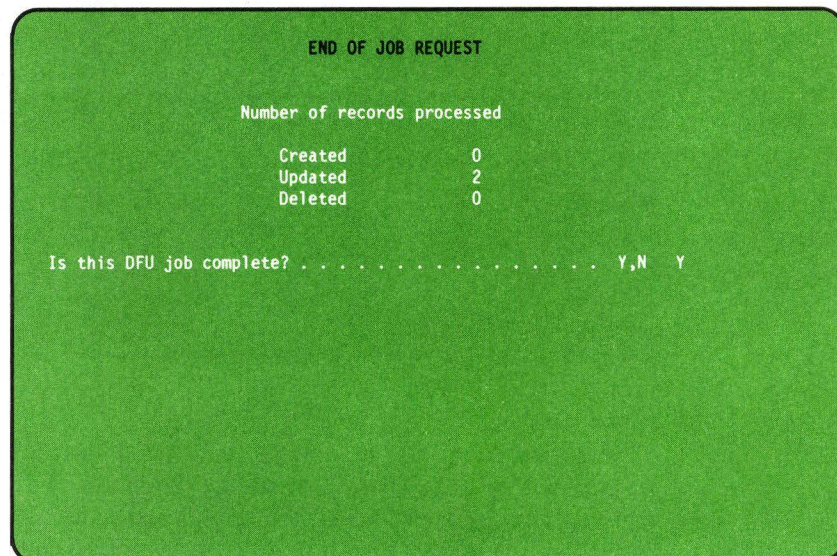
Batch and Total Accumulators (Subtotals and Totals)

At program setup you can specify 10 fields (alphameric or numeric) to be accumulated (or totaled). If the same field name occurs in two or more different record types, the record subtotals are added together in the same total field. When using an enter program, you can press the Display Accum command key (Cmd 2) to display the current subtotals. These subtotals are printed only if printing has already occurred during this job.

```
                     ACCUMULATORS DISPLAY

Batch accumulators are displayed


            AMOUNT DUE              425.25










Enter-Continue processing
```
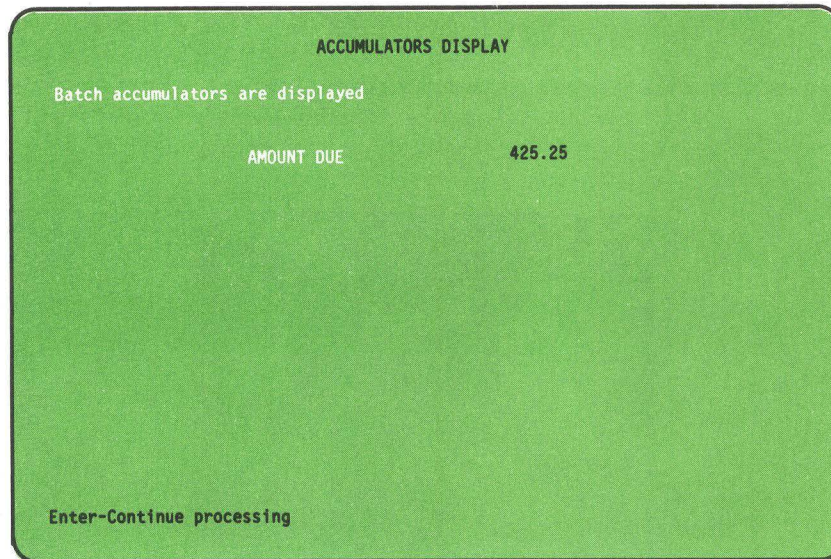
If you select Y to end the job and no accumulators have been used, the job is ended. If totals have been used during the job, they are displayed. When you are finished viewing the subtotals that are displayed at end of job, press the Enter key to display the totals. Press the Enter key again to end the job.

Whenever the subtotals are displayed, they are added to the corresponding final totals and reset to zero. Any fields with 15 or less positions of unpacked data or 8 or less positions of packed data can be accumulated. Subtotal fields not used in the enter or update program are printed and displayed as blanks. DFU calculates the accumulator length to be the length of the accumulator field plus 2 positions to a maximum of 15 positions. For packed fields, the length used is the length of the accumulator field when it is unpacked. Accumulated values larger than the calculated target cause the fields to overflow. In this case, the accumulators overflowed display will be displayed, and the field is reset.

Note: If data that is not numeric is in a field to be accumulated, the results will be totals that are not numeric.

After a record is complete, DFU adds the subtotals for any accumulator fields the record may contain as follows:

Entry mode or insert mode: Field values are added together for a subtotal.

Update mode: If a record is marked for deletion, its field values are subtracted from the subtotal.

If a deleted record is changed to nondeleted status (by changing the delete code), the field value is added to the subtotal.

If a record is changed, changes to the accumulator fields are reflected in the subtotals.

Accumulator Overflow

As values are added in an accumulator field, it is possible that the value will reach the size limit of the accumulator field. In this case a subtotal is printed and displayed and the accumulator field is reset to zero. Subtotals will be combined and a final total printed at the end of the program.

This information is also printed if a printer has been used in this job. If any accumulators overflowed during the job, DFU issues an ACCUMULATORS OVERFLOWED warning message.

Using the Three Modes of Enter and Update

DFU programs you use to enter or update files can be used in one of three modes: *entry, update*, or *insert*. For example, you may have created a program to update a file. But while using that program to make changes to existing records, you may want to add new records at the end of the file or between existing records, so you can use the entry or insert mode.

Or, you can set up a program to create a file. But while using that program you may need to go back to a record you just entered and make changes; you can use the update mode for this. In either case, you can select the mode you need by pressing the appropriate command key (Cmd 9, 10, or 11).

Entry Mode (Cmd 10)

When you are updating a file, press the Entry command key (Cmd 10) to be prompted to enter a new record.

Any record key specified during entry mode when using an indexed file must not exist in the data file or an error message is displayed and the duplicate record key is rejected.

Any record number specified during entry mode when using a direct file must exist within the file and correspond to a record that is currently *blank* (for a file that is not delete-capable) or *deleted* (for a delete-capable file); if not, an error message is displayed and the record number is rejected.

When you use entry mode, DFU displays the first display for the first record type specified in the DFU source specification unless record sequencing is specified. If record sequencing is specified, the display for the first sequenced record type in the program is displayed. You can select a different record type by pressing the Select Record Type command key (Cmd 3). If record sequencing is not automatic, you can move the cursor to the Record Type field and type in a new record type.

Whenever you return to entry mode from another mode, the record type is reset to the last record type processed in entry mode. When you return to entry mode and the next entry record type is different from the last record type processed, be sure to turn off the automatic duplication indicator.

Update Mode (Cmd 11)

When you are working with an indexed file, press the Update command key (Cmd 11) and you are prompted for a record key currently in the data file. When a key is specified, the data fields and associated headings are displayed for that record, and all but the record key can be changed.

Note: When using a multiple indexed file and accessing that file through an alternative index, make sure you don't specify the primary key field as any of your data fields. Making a change to the primary key field during an update will cause an error.

See *Multiple Indexed Files* in Chapter 8 for more information.

When you are working with a sequential or direct file, press the Update command key to be prompted for the record number of a record that exists in the file. The record must not be blank (for a file that is not delete-capable) or deleted (for a delete-capable file). When a record number is specified, the data fields and associated headings in that record are displayed, and all but the record number can be changed.

If a record is displayed with the wrong record type format, or if DFU is unable to associate a record with one of the defined record types (by record codes within the file definition), you can specify the correct format. Position the cursor at the record type field and enter the format in which the record is to be displayed.

You can request records for update by pressing the Roll Up function key to get the next nonblank record in the file (for files that are not delete-capable) or nondeleted record (for a delete-capable file). Pressing the Roll Down function key will get the previous record in the file that is not blank or deleted.

Note: If the automatic duplication indicator is on, fields defined to be automatically duplicated cannot be updated.

Insert Mode (Cmd 9)

Insert mode allows you to enter new records without automatic record type sequencing or automatic record key or record number generation. Select insert mode by pressing the Insert command key (Cmd 9), which sets the record type to that of the last record type processed.

When processing indexed files, you are prompted for a record key and the associated data. Insert mode then functions like entry mode, with operator-specified record keys. If DFU-generated record keys have been specified in the DFU program, however, you must specify a new record key less than the next record key to be generated by DFU or DFU will not continue to generate record keys for you.

When processing direct files, you are prompted for a record number and the associated data. Insert mode then functions like entry mode with operator-specified record numbers. The record corresponding to the specified record number must exist in the file and must currently be blank.

Note: You cannot insert records into a sequential file.

Chapter 5. Using DFU to Look at Data In Files

There are times when you might need to review data in a file, when you don't need a printed report, or, when you don't want to wait until one is printed. After you call DFU, a series of prompts asks you to specify the information you want to view. In this way, you can limit the inquiry to only certain fields of data you want displayed.

Example Section

This chapter includes an example of creating a program to inquire into a file. The file used is CUSTMST, the file created by the example in Chapter 1.

The example is in the first section of this chapter. You can follow along at your display station and enter the example as shown. The entries you should make are highlighted.

More detail on each of the displays is included in the second section of the chapter. This reference section will discuss the possible entries for each prompt and any limitations.

Example 4. How to Set Up a DFU Program to View a File

This example will assume that a file definition source member called FILESRC exists.

This source member was created in Example 1:

```
MEMBER     FILESRC  LIBRARY     DFULIB        SEU EOJ PRINTOUT          DATE  12/16/82     TIME  09.00
                                              IBM SYSTEM/36 SOURCE ENTRY UTILITY

       FCUSTMST              256  5 I     2
       ICUSTMST     01
       I                                              1    1 ARCOD
       I                                              2    6 CUSNO
       I                                              7    9 CUSCOD
       I                                             10   34 CUSNM
       I                                             35   59 CUSA1
       I                                             60   84 CUSA2
       I                                             85  109 CUSA3
       I                                            110  111 STATE
       I                                          P 112  116OZIPCD
       I                                          P 117  118OAREAC
       I                                          P 119  1220PHONE
       I                                            123  123 CUSTP
       I                                          P 124  1272CRLIM
       I                                          P 128  1300SLSNO
       I                                          P 131  1352AMDUE
       I                                          P 136  1390DLTPM
       I                    **** E N D   O F   S E U   P R I N T O U T ****
```

This example will show you how to set up a DFU Inquiry program to view four fields in the file called CUSTMST.
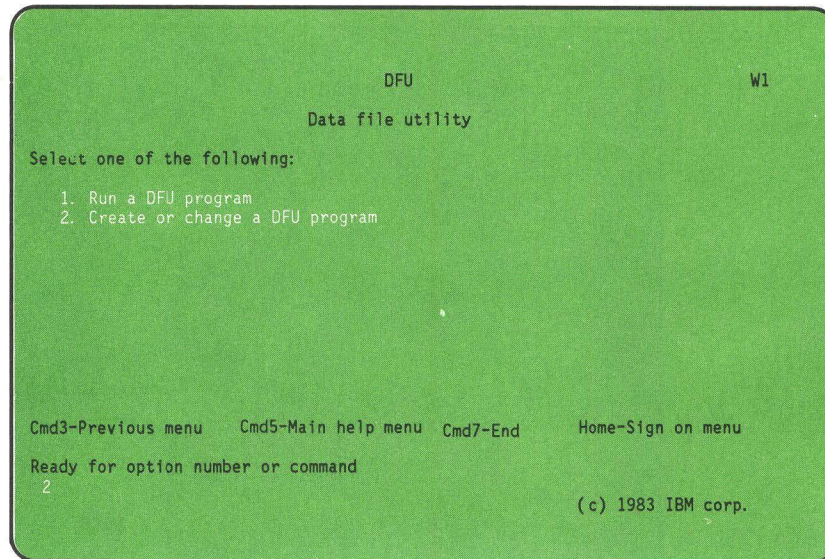
This example shows you how to create a program that will display the data in your file like this:
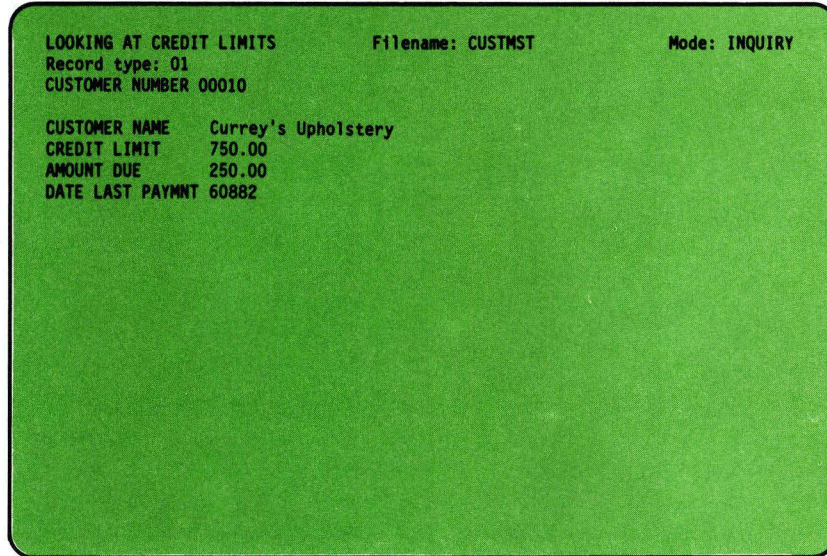
```
LOOKING AT CREDIT LIMITS          Filename: CUSTMST          Mode: INQUIRY
Record type: 01
CUSTOMER NUMBER 00010

CUSTOMER NAME     Currey's Upholstery
CREDIT LIMIT      750.00
AMOUNT DUE        250.00
DATE LAST PAYMNT 60882
```

Once you have signed onto DFU, the DFU menu is displayed.

DFU Menu

This display asks you whether you are using an existing program or setting up a new one.

```
                              DFU                                    W1
                        Data file utility

Select one of the following:

   1.  Run a DFU program
   2.  Create or change a DFU program




Cmd3-Previous menu    Cmd5-Main help menu  Cmd7-End      Home-Sign on menu

Ready for option number or command
   2
                                              (c) 1983 IBM corp.
```

Since you are setting up a new program, type in option 2 and press the Enter key. The next display is the SETUPDFU Menu.

Note: If you have just completed Example 3, the SETUPDFU menu is displayed. Press the Cmd 3 key to back up to this menu.

SETUPDFU Menu

This display asks you which type of program you are creating.

```
                           SETUPDFU                              W1

                    Create or change a DFU program

Select one of the following:

      1. Create a data file
      2. Update a data file
      3. Display records in a data file
      4. Sort and print a data file










Cmd3-Previous menu    Cmd5-Main help menu  Cmd7-End        Home-Sign on menu

Ready for option number or command
 3

                                              (c) 1983 IBM Corp.
```
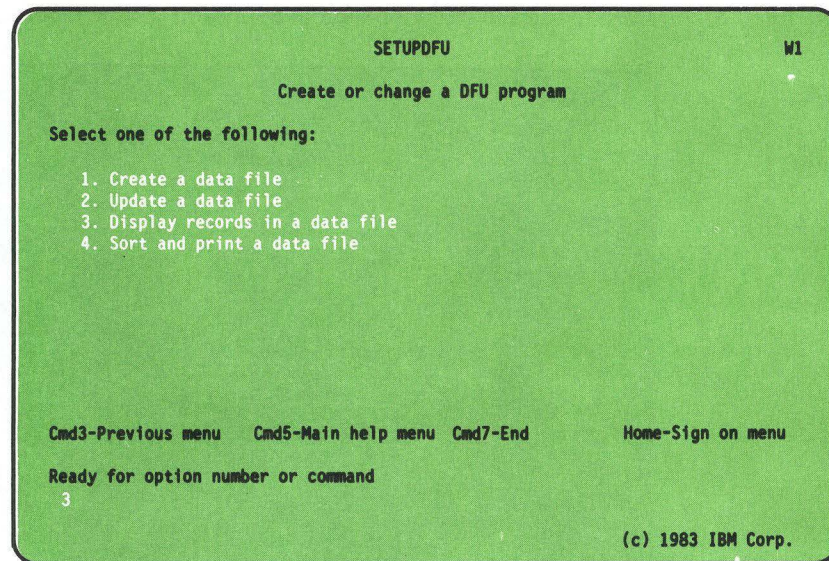
For this example, select option 3 and press the Enter key. The next display is the procedure display.

Procedure Display

This display is the procedure display for the program. It asks you to identify such things as the file you are using, what you want to name the program, where it is stored, and the name of the file definition source member.

```
                          INQUIRY PROCEDURE                    Optional-*

              Selectively displays and prints records in a data file


    Name of file to be displayed . . . . . . . . . . . . . . . . .   CUSTMST
        Name of file on disk, if different . . . . . . . . . . . .             *

    Name of DFU program . . . . . . . . . . . . . . . . . . . . . .  DE970D    *

    Name of library . . . . . . . . . . . . . . . . . . . . . . . .  DFULIB

    Name of file definition source member . . . . . . . . . . . .   FILESRC

    Name of DFU specification source member . . . . . . . . . . .   DE970DS   *

    Name of display source member, if to be saved . . . . . . . .             *



    Cmd3-Previous menu                              (c) 1985 IBM Corp.
```

Enter the responses shown and press the Enter key. The next display is the General Information display.

General Information Display

This display asks you for some general information about the program.

```
                    INQUIRY GENERAL INFORMATION

                 Description of display and printout

Job title . . . . . . . . . . . . . . . . . . . LOOKING AT CREDIT LIMITS

How do you want the data displayed? . . . . . . . . . . 1,2,3  2
   1. Single column
   2. Multiple column
   3. Maximum data

Display numeric fields in edited format? . . . . . . . . N,Y  Y

Spaces between columns of printed data . . . . . . . . . 0-9  3

Printer line width . . . . . . . . . . . . . . . . . . . 60-198  132

Stop printer on unprintable characters? . . . . . . . . . N,Y  N
```

Enter the responses shown and press the Enter key. The next display is the Key Field Selection display.

Key Field Selection Display

This display asks you to enter the names of the fields that make up the record key and the headings you want to appear when the field is printed or displayed.

```
              KEY FIELD SELECTION

         Fields that compose the record key

              *FILE   CUSTMST   256
              *KEY              5        6
        01    *RECORD
                       ARCOD     1        1
                       CUSNO     5        6
                       CUSCOD    3        9
                       CUSNM    25       34
                       CUSA1    25       59
                       CUSA2    25       84
                       CUSA3    25      109

         Key field          Heading

           CUSNO            CUSTOMER NUMBER
```

Type in the responses shown and press the Rec Adv command key (Cmd 12) to continue. The next display is the Record Type Selection display.

Record Type Selection Display

This display is shown for each record type in the file. (The example uses only one record type.) At the top, DFU displays the attributes for the program, which include the record-identifying indicator of the record type and as many fields as possible from the record type. (If all the attributes don't fit on the display, use the roll keys to roll through the attributes.)

When a program uses more than one record type, this display is repeated for each type.

```
                         RECORD TYPE SELECTION              Record type: 01

                 Selection of record types to be processed


            01        *RECORD
                                ARCOD        1       1
                                CUSNO        5       6
                                CUSCOD       3       9
                                CUSNM       25      34
                                CUSA1       25      59
                                CUSA2       25      84
                                CUSA3       25     109
                                STATE        2     111
                                ZIPCD   P    9.0   116



    Process this record type? . . . . . . . . . . . . . . . . Y,N   Y

    Allow lowercase data? . . . . . . . . . . . . . . . . . . N,Y   Y
```

Enter the responses shown and press the Cmd 12 key. The next display is the Data Field Selection display.

Data Field Selection

This display asks you which fields you want displayed and what their headings will be.

```
              DATA FIELD SELECTION                Record type: 01
          Fields in which data is to be viewed
  01      *RECORD
                          ARCOD       1      1
                          CUSNO       5      6
                          CUSCOD      3      9
                          CUSNM      25     34
                          CUSA1      25     59
                          CUSA2      25     84
                          CUSA3      25    109
                          STATE       2    111
                          ZIPCD   P  9.0   116
          Data field         Heading
           CUSNM              CUSTOMER NAME
           CRLIM              CREDIT LIMIT
           AMDUE              AMOUNT DUE
           DLTPM              DATE LAST PAYMNT
```

Enter the data fields and their headings as shown. Press the Cmd 12 key to continue. Because this is the last display that will ask you for information about the program, DFU displays the specifications that now make up the DFU program source.

Update DFU Specifications

The program setup is now complete and DFU displays the specifications. You can review the specifications to make sure they are correct.

```
                          UPDATE DFU SPECIFICATIONS
                          Changes to DFU specifications

                  Field1  Field2  Field3  Field4   Field5
?=Remove line             *INQUIRY*EDIT            *COLUMNS
>=Add lines               *KEY    *FIELDS
                          *       CUSNO    CUSTOMER NUMBER
Press the Enter key to    3   132*TITLE   LOOKING AT CREDIT LIMITS
  accept changes          01      *RECORD *LOWCASE
                          *       CUSNM    CUSTOMER NAME
                          *       CRLIM    CREDIT LIMIT
                          *       AMDUE    AMOUNT DUE
                          *       DLTPM    DATE LAST PAYMNT




Cmd7-End program setup
```

You can also make any additions to the specifications at this time.

For more information on adding or changing specifications, see "Updating DFU Specifications" in Chapter 10.

Before you end the job, press the Print Record command key (Cmd 6) to print the program specifications and attributes. At the end of the job, check the printer attached to your display station for the printouts. The program specifications printout will look similar to this:

```
**  DFU SPECIFICATIONS  **        DATE        TIME        FILE DESC    DFU PROGRAM   DFU SPECS    DSPLY SRCE    MASTER FILE D
                                  12/03/82    11.04.59    FILESRC      DE970D        DE970DS      #DFW11


        *INQUIRY*EDIT                *COLUMNS
        *KEY    *FIELDS
        *        CUSNO     CUSTOMER NUMBER
  3  132*TITLE  LOOKING AT CREDIT LIMITS
  01     *RECORD *LOWCASE
        *        CUSNM     CUSTOMER NAME
        *        CRLIM     CREDIT LIMIT
        *        AMDUE     AMOUNT DUE
        *        DLTPM     DATE LAST PAYMNT
```

The attributes printout will look similar to this:

Press the Display Attr/Spec command key (Cmd 8) to display the attributes.

```
**  DFU ATTRIBUTES  **            DATE        TIME        FILE DESC    DFU PROGRAM   DFU SPECS    DSPLY SRCE    MASTER FILE D
                                  12/03/82    11.04.59    FILESRC      DE970D        DE970DS      #DFW11


        *FILE    CUSTMST    256
        *KEY               5         6
  01    *RECORD
                 ARCOD     1         1
                 CUSNO     5         6
                 CUSCOD    3         9
                 CUSNM     25        34
                 CUSA1     25        59
                 CUSA2     25        84
                 CUSA3     25        109
                 STATE     2         111
                 ZIPCD   P  9.0      116
                 AREAC   P  3.0      118
                 PHONE   P  7.0      122
                 CUSTP      1        123
                 CRLIM   P  7.2      127
                 SLSNO   P  5.0      130
                 AMDUE   P  9.2      135
                 DLTPM   P  7.0      139
```

Because there are no more corrections to make and you have a copy of the program specifications and attributes, press the Cmd 7 key to end the job. DFU now checks the program and allows you to save the source.

The Source Save display is shown:

```
                    DFU PROGRAM SOURCE SAVE DISPLAY

                      Save DFU source specification

Do you want to save the DFU source specifications? . . . Y,N  Y

Name of the member to contain the DFU source. . . . . . . .   DE970DS
    Name of the library to contain the source member . . . .   DFULIB

Replace source member with the same name? . . . . . . . Y,N  Y

Do you want to run the DFU program?  . . . . . . . . . . Y,N  Y








Cmd5-Page back
```
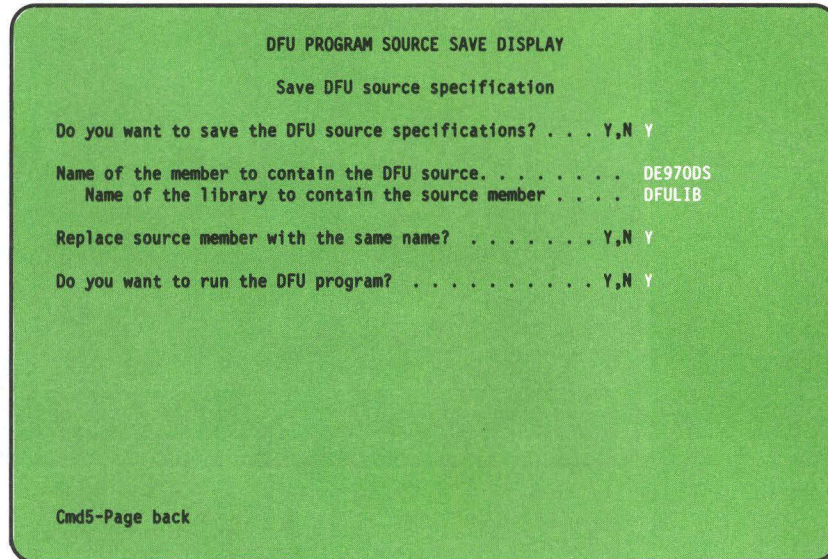
DFU will store the program as load and subroutine members under the name DE97OD. You must now decide whether you want the program source saved.

If you save the source, you can change the source later to create a similar program and avoid the setup steps.

Respond to the prompts and press the Enter key to continue. The following message is displayed.

```
DFU program is being created
```

The next display you see is the first display of your program. It should look like the display you saw at the beginning of the example.

```
LOOKING AT CREDIT LIMITS              Filename: CUSTMST              Mode: INQUIRY
Record type: 01
CUSTOMER NUMBER 00010

CUSTOMER NAME      Currey's Upholstery
CREDIT LIMIT       750.00
AMOUNT DUE         250.00
DATE LAST PAYMNT   60882
```

Notice that the number of the customer record being displayed is in the upper left corner of the display.

To see how the program works, enter the customer number you would like to view next. Enter a number (for example, 00020) to the right of the customer number being displayed. Press the Enter key and the requested record is displayed.

```
LOOKING AT CREDIT LIMITS              Filename: CUSTMST              Mode: INQUIRY
Record type: 01
CUSTOMER NUMBER 00020

CUSTOMER NAME      Connely's Motel & Lounge
CREDIT LIMIT       850.00
AMOUNT DUE         175.25
DATE LAST PAYMNT   61082
```

The record you selected is displayed for your review.

If you need a printed copy of the record, make sure the printer assigned to your display station is working and press the Print Record command key (Cmd 6).

At The End of The Job

When you are finished viewing the file, press the EOJ command key (Cmd 7). The following is displayed:

```
                         END OF JOB REQUEST




    Is this DFU job complete? . . . . . . . . . . . . . . . . .  Y,N   Y
```
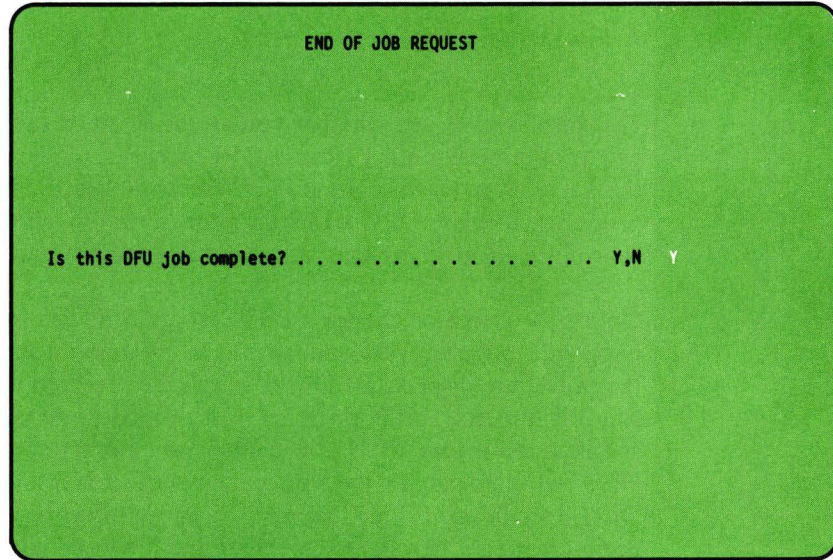
If you select N, DFU returns you to the last record displayed.

If the default (Y) is selected, DFU ends the job. For this example, enter a Y.

You are returned to the SETUPDFU menu display.

Reference Section

This section of the chapter will give you the details about the displays you saw as you went through the example. Each DFU display that you might see as you run an inquiry program is discussed here. Use this reference section to answer your questions.

Note: Any differences in displays for indexed files, or direct or sequential files will be noted.

DFU Menu

This display asks you whether you are using an existing program or creating a new program. Option 1 (Run a DFU program) indicates you will be supplying the name of an existing program. When you supply the program name on the procedure display, DFU will search the library specified for a load and a subroutine member by that name and run the program.

Option 2 (Create or change a DFU program) indicates you will be supplying the name of a program you want to create. When you supply the program name on the procedure display, DFU will search the specified library for the program and run it if it exists. If the program does not exist and you specified a DFU source specification member, DFU will search the library specified for that member. DFU will then display the source member if it is found. (See "How to Change DFU Specifications" in Chapter 7 for more information.) Otherwise DFU will begin creating a new source member and a new program.

Enter the number of the option you choose.

```
                            DFU                              W1

                       Data file utility

  Select one of the following:

     1. Run a DFU program
     2. Create or change a DFU program












  Cmd3-Previous menu    Cmd5-Main help menu    Cmd7-End    Home-Sign on menu

  Ready for option number or command
    2

                                             (c) 1983 IBM Corp.
```

SETUPDFU (or RUNDFU) Menu

This menu asks you to indicate what the DFU program will do: create, update, display records from, or sort and print a data file.

Enter the number of the option you choose.

```
                              SETUPDFU                              W1

                      Create or change a DFU program

        Select one of the following:

            1. Create a data file                        -
            2. Update a data file
            3. Display records in a data file
            4. Sort and print a data file




        Cmd3-Previous menu    Cmd5-Main help menu  Cmd7-End       Home-Sign on menu

        Ready for option number or command
        3

                                                          (c) 1983 IBM Corp.
```

Procedure Display

This display will differ slightly depending on how you are using DFU. It asks you to identify such things as what the file name is, what you want to name the program, where the program is to be stored, and the name of the file definition.

```
                      INQUIRY PROCEDURE                   Optional-*

              Selectively displays and prints records in a data file


        Name of file to be displayed  . . . . . . . . . . . .   CUSTMST
             Name of file on disk, if different  . . . . . . . .         *

        Name of DFU program . . . . . . . . . . . . . . . . .   DE971D    *

        Name of library . . . . . . . . . . . . . . . . . . .   DFULIB

        Name of file definition source member . . . . . . . .   FILESRC

        Name of DFU specification source member . . . . . . .   DE971DS   *

        Name of display source member, if to be saved . . . .             *


        Cmd3-Previous menu

                                                          (c) 1985 IBM Corp.
```

Using DFU to Look at Data In Files   5-17

Name of file to be displayed

> This is the name of the file you want to view. You can enter up to eight characters for this name.

Name of file on disk, if different

> This is the name of the file on the disk (the file label). You must enter this name if it is different from the name of file to be displayed.

Name of DFU program

> This is the name of the program you are using or creating. The program contains information about the file, how the file is to be processed, and the displays the operator will see. Enter the name of the program you are either using or setting up. An entry in this field is optional.

Name of library

> This is the name of the library in which the program is or will be stored. If no library is specified, DFU stores the program in the library you are currently using.
>
> If you specify a user library on this display, the file definition must be stored in that library. If you did not identify a user library, DFU uses the library that you are currently using.
>
> Any load, subroutine, or source members created by DFU are stored in this library.

Name of file definition source member

> This is the name of the source member containing the RPG specifications that describe the file you are viewing. It can contain one or more sets of F- and I-specifications or an entire RPG program. (The F- and I-specifications that describe your file will be used by DFU.)
>
> If you specify a user library on this display, the file definition source member must be stored in that same library. If you did not identify a user library, DFU searches the library that you are currently using.

Name of DFU specification source member

> This is the name of the source member that contains or will contain the DFU specifications for this program.
>
> If you identified a user library, DFU searches for or stores the program specifications in this library. If you do not specify a user library, DFU stores the specifications in the library you are currently using.
>
> *Note:* You can also change the DFU specification source member name and library name on the source save display when program setup is complete.

Name of display source member, if to be saved

Information you supply during program setup, such as how you want the data displayed and the names of the fields and their headings, all affect what the program display looks like to the operator.

DFU generates specifications describing the program displays that are similar to those you can create using the Screen Design Aid (SDA). These specifications can be altered by you if changes to the display are necessary. Changing display specifications requires a great deal of care and only the most experienced users should attempt to change the specifications. Chapter 10 in this manual describes DFU limitations on changing display specifications. Before attempting to change the specifications, refer to the *Creating Displays: Screen Design Aid and System Support Programming* manual.

General Information Display

This display asks you for information on how you want the file to be displayed and printed when you run the program.

```
              INQUIRY GENERAL INFORMATION

              Description of display and printout

Job title . . . . . . . . . . . . . . . . . . .   LOOKING AT CREDIT LIMITS

How do you want the data displayed? . . . . . . . . . .   1,2,3  2
   1. Single column
   2. Multiple column
   3. Maximum data

Display numeric fields in edited format? . . . . . . . .  N,Y  Y

Spaces between columns of printed data . . . . . . . . .  0-9  3

Printer line width . . . . . . . . . . . . . . . . . . .  60-198  132

Stop printer on unprintable characters? . . . . . . . . .  N,Y  N
```

Job Title

The name you enter here is the name of the job that will appear on the printout and the display. The name can be up to 24 characters long. If you leave this blank, there will be no name on your printout to identify the job.

How do you want the data displayed?

Enter 1, 2, or 3 to indicate how you want the data displayed. Data is displayed to the right of its heading.

1: Single column means DFU will put as much data on the display as it can in one column, then continue on a second display.

2: Multiple columns means DFU will put as much data on the display as it can fit in one column, then continue in another column (up to 4 columns), before going to a second display.

3: Maximum data means DFU will fit as much data on the display as possible without being restricted to a column format.

Note: Even though you can choose a multiple columns display format, data will be displayed in a single column if there is not enough data to fill a column.

Display numeric fields in edited format?

If you enter Y, DFU removes any leading zeros (for example, 00600 becomes 600), moves the number to the left margin of the field, inserts decimal points, and displays the negative sign (-) if the number is negative.

N, the default, means DFU will not edit the fields.

Spaces between columns of printed data

This specifies the number of spaces that will be left between the fields on the printout if a record is printed. You can specify 0 through 9 spaces. If you leave this blank, DFU will put one space between the columns. Use as much space as possible between printed columns to make the printout more readable at the end of the job.

Printer line width

This specifies how long you want the lines on the printout. If you do not enter a response, DFU will print lines that are 132 characters wide. Widths greater than 132 positions require special consideration. See the discussion of printer line width in Chapter 7.

Stop printer on unprintable characters

If you enter a Y, the printer stops and a system message is issued to indicate that characters that cannot be printed are in the data to be printed.

If you enter an N, the printer will not stop when it finds a character that cannot be printed; instead it prints a blank in that position.

An entry in this field is optional, the default is N.

Key Field Selection Display

You must supply the names of the fields that make up the record key and the headings you want for those fields.

```
                        KEY FIELD SELECTION

                Fields that compose the record key

                  *FILE    CUSTMST    256
                  *KEY                  5        6
        01        *RECORD

                           ARCOD        1        1
                           CUSNO        5        6
                           CUSCOD       3        9
                           CUSNM       25       34
                           CUSA1       25       59
                           CUSA2       25       84
                           CUSA3       25      109

                  Key field         Heading

                     CUSNO          CUSTOMER NUMBER
```

Key Field

This is the name of the field(s) that makes up the record key. The name you enter for key field must be typed exactly as shown in the attributes at the top of the display.

A maximum of ten fields can be used to make up the key field. Alphameric fields cannot have a length of more than 30 bytes. Numeric fields can be a maximum of 15 bytes long. The maximum size of the combined key fields is 99 bytes.

You can specify two or three non-contiguous keys, with the same restrictions as above. If you want to use non-contiguous keys you must have specified them in the file specification member.

Note: The field(s) you name on this display must make up the entire key area defined in the file definition.

Heading

This is the key field heading you want to appear on the display for the operator. A heading can be a maximum of 16 characters long. If you do not enter a heading for the field, DFU uses the field name specified in the file definition.

Note: If you type in fields and press the Enter key, DFU will redisplay the Key Field display for more fields making up the record key, unless ten fields have already been specified.

If you press the Enter key or the Rec Adv command key (Cmd 12) without entering data, DFU takes the record key definition from the I-specifications. The record key will then consist of one field. (You must then continue with a Record Key Description display.) For a non-contiguous keyed file the record key will consist only of the primary key, which will be displayed as one field.

Record Key Description Display

This display is shown only when DFU is generating record keys for you or you did not specify any fields for the record key on the last display. You must describe how you want the record key to be processed.

```
                        RECORD KEY DESCRIPTION

                    Description of the record key

                *FILE    CUSTMST    256
                *KEY                  5        6
        01      *RECORD
                         ARCOD        1        1
                         CUSNO        5        6
                         CUSCOD       3        9
                         CUSNM       25       34
                         CUSA1       25       59
                         CUSA2       25       84
                         CUSA3       25      109


    Record key heading . . . . . . . . . . . . . . . . .   RECORD KEY IS:
```

Record key heading

You can enter a heading up to 16 characters long that you want used to identify the record key when it is displayed or printed.

If you do not enter a heading, DFU will display *KEY.

Is the record key numeric?

Note: This prompt is only shown when DFU is not generating record keys and when you have not specified a field or fields to be used as keys on the Key Field Selection Display. If the file has packed keys, you will not see this prompt, and the key will be numeric.

Enter a Y to indicate that all keys are numeric fields.

Enter an N to indicate that all keys are alphameric fields.

Considerations for Record Key Headings

For an indexed file, the key area begins on line three of the display and can be made of up to ten fields for the record key displayed. There is also a space next to the displayed record key where you can enter the key of the next record you want to see. Each field of the key area is on a separate line, so the key area can consist of lines three to twelve. The cursor is moved to the first field of the blank record key space so you can request the next record key.

Record Number Description

This display occurs instead of the Record Key Description display when you are using a sequential or direct file. The display asks how you want to be prompted for the record number field. The record number displayed when the program is run is the actual record number in the file, not the value that is in the record number field. This prompt allows you to name the field in the record that holds the record number.

```
                    RECORD NUMBER DESCRIPTION              Optional-*

              Description of the record number

               *FILE   FILE       256
         01    *RECORD
               *CODE    C      H             1
                        CODE      1          1
                        CUSTNO    5.0        6
                        ORDNO     6.3        12
                        CUSORD    5          17
                        DATE      6          23
                        SHPTO     2          27
                        SHPVIA    48         75

 Record number heading . . . . . . . . . . . . . . . . . . . . . . *RECNUM

 Name of the field to contain record number  . . . . . . . . .
```

Record number heading

This specifies the heading you want displayed when the operator is prompted for the record number. You can enter a maximum of 16 characters for this name. If you do not enter a heading, DFU uses *RECNUM as the heading.

Name of the field to contain record number

This names the field that holds the record number when displaying a record. This field must exist in every record type to be processed. The length of the field determines the length of the record number prompt. The maximum field length is eight positions (unpacked) or five positions (packed). If you do not enter a field name, the record number prompt will be 8 positions long.

Considerations for Record Number Headings

If you want a numeric field to be negative, the "FIELD -" control key places a minus sign after the last digit.

For a sequential or direct file, line 3 contains the record number of the current record on display, and a space where you can enter the record number of the next record desired. The cursor is placed at this record number request area.

Record Type Selection Display

This display allows you to indicate whether you want this record type processed. The record type is shown in the upper right corner of the display. As many fields as possible are displayed from this record type at the top of the display.

This display will be repeated for each record type described in the file definition.

```
                    RECORD TYPE SELECTION              Record type: 01

           Selection of record types to be processed


     01        *RECORD
                         ARCOD          1       1
                         CUSNO          5       6
                         CUSCOD         3       9
                         CUSNM         25      34
                         CUSA1         25      59
                         CUSA2         25      84
                         CUSA3         25     109
                         STATE          2     111
                         ZIPCD    P    9.0     116


     Process this record type? . . . . . . . . . . . . . . . . . . Y,N  Y

     Allow lowercase data? . . . . . . . . . . . . . . . . . . . . N,Y  Y
```

Process this record type?

Y indicates that the record type displayed is to be processed.

N indicates that the record type displayed is not to be processed.

If there are more record types in the file, this prompt will be repeated for the next defined record type.

For any record type, only 60 fields (including the record key or record number) can be processed at a time. If printing is requested for a record, DFU will print only the first 16 lines of edited data. Data that will not fit on the first 16 print lines will be placed in the record but will not be printed.

Note: If you respond Y, you must enter at least one data field on the Data Field Selection display or you will not have any fields to look at for that record type when the program is run.

Allow lowercase data?

N indicates you can type only uppercase data for this record type.

Y indicates you can type uppercase and lowercase data for this record type. You must shift to uppercase as needed.

Note: Be sure you enter a Y if you will be updating alphameric fields that will need lowercase letters.

Data Field Selection Display

This display allows you to select which fields from the record type will be displayed when the program is run. Only the fields you select will be displayed to the operator. The record type is shown in the upper right corner of the display.

You can enter one field per line. If you enter fields and then press the Rec Adv command key (Cmd 12), the data field specifications for this record type are considered complete. DFU will then display the program specifications for updating if there are no more record types, or redisplay the Record Type display for another record type.

If you type in a data field and press the Enter key, another Data Field Selection display appears for you to continue entering more fields unless the maximum of 60 fields have been specified.


```
                    DATA FIELD SELECTION          Record type: 01
              Fields in which data is to be viewed
        01        *RECORD
                          ARCOD      1       1
                          CUSNO      5       6
                          CUSCOD     3       9
                          CUSNM     25      34
                          CUSA1     25      59
                          CUSA2     25      84
                          CUSA3     25     109
                          STATE      2     111
                          ZIPCD   P  9.0    116
        Data field          Heading
          CUSNM             CUSTOMER NAME
          CRLIM             CREDIT LIMIT
          AMDUE             AMOUNT DUE
          DLTPM             DATE LAST PAYMNT
```

Data field

This is the name of the fields to be processed. These fields cannot overlap the record key when you are processing an indexed file.

Heading

This is the heading for the fields that will be displayed or printed out. If you do not enter a heading, DFU uses the field name from the file definition. The maximum length is 16 characters.

Note: For any record type, only 60 fields including the record key or record number fields can be processed at a time. If data is to be printed, DFU will print up to 16 lines of edited data for a record.

Update DFU Specifications

The program setup is now complete and this display lets you review the DFU program specifications before the program is created.

```
                           UPDATE DFU SPECIFICATIONS
                          Changes to DFU specifications

                       Field1  Field2  Field3  Field4  Field5
   ?=Remove line                *INQUIRY*EDIT           *COLUMNS
   >=Add lines                  *KEY    *FIELDS
                                *       CUSNO   CUSTOMER NUMBER
   Press the Enter key to   3   132*TITLE LOOKING AT CREDIT LIMITS
     accept changes         01      *RECORD *LOWCASE
                                *       CUSNM   CUSTOMER NAME
                                *       CRLIM   CREDIT LIMIT
                                *       AMDUE   AMOUNT DUE
                                *       DLTPM   DATE LAST PAYMNT




   Cmd7-End program setup
```

To change any of the data, move the cursor to the field you want to change and type the correct data.

To delete a line of data, move the cursor to the line you want to remove and type a question mark (?) in the first position of Field 1. When you press the Enter key, DFU removes the line.

To add a line of data to the specifications, move the cursor to the line you want the new data to follow and type a greater than sign (>) in the first position of Field 1. The following display allows you to enter the new DFU specifications.

For more information on changing specifications, refer to Chapter 10.

Add DFU Specifications

This display allows you to add DFU specifications. It is displayed only when you type a > in the first position of a DFU specification line.

```
                    ADD DFU SPECIFICATIONS
                   Additions to DFU specfications


             Field1  Field2  Field3  Field4  Field5
Press the Enter key to        *       CUSNM   CUSTOMER NAME
  accept additions                    CRLIM   CREDIT LIMIT












Cmd7-End program setup
```

Enter one specification per line. If you press the Enter key, DFU adds the new specification and returns you to the Update DFU Specifications display. If you fill every line of the Add DFU Specifications display, the display is repeated for more additions.

Correct DFU Specifications

This display is shown only when DFU finds an error in the DFU specifications. If this happens, DFU highlights the error and the cursor is moved to the error. An error message is displayed on the last line of the display to identify the error.

```
                    CORRECT DFU SPECIFICATIONS
                   Corrections to DFU Specifications

              Field1  Field2  Field3  Field4  Field5
?=Remove line                 CRLIM   CREDIT LIMIT
>=Add lines           *ADD    AMDUE   AMOUNT DUE
                       *      DLTPM   DATE LAST PAYMNT
Press the Enter key to *K     SLSNO   SALESMAN NUMBER
  accept changes




  -



Cmd7 -End program setup
Cmd12-Accept with error
Cmd19-Cancel setup

DFU-0115 Invalid operation code in field 2
```

If the error is a syntax error, the highlighted specifications containing the error must be corrected or deleted in order to continue.

When a required specification is missing, the specification in its place is highlighted. For some errors, several specifications may together be causing the error. Only one of the specifications is highlighted at a time. Refer to the *Utilities Messages* for more information.

You can press the Accept with Error command key (Cmd 12) and DFU will save the DFU specifications as a source member, but will not create the program. DFU will continue with the next display (the Source Save display).

DFU Program Source Save Display

This display allows you to name the source member that will contain the DFU program specifications. If you pressed Cmd 12 on the earlier display, DFU allows you to save the specifications for later update and use. If you pressed Cmd 7 on the earlier display, you can specify to run the program immediately.

```
                    DFU PROGRAM SOURCE SAVE DISPLAY

                     Save DFU source specification

Do you want to save the DFU source specifications? . . . Y,N  Y

Name of the member to contain the DFU source. . . . . . .    DE970DS
    Name of the library to contain the source member . . . . DFULIB

Replace source member with the same name?  . . . . . . . Y,N  Y

Do you want to run the DFU program?  . . . . . . . . . . Y,N  Y








Cmd5-Page back
```

Do you want to save the DFU source specifications?

Enter Y or N to tell DFU if you want to save the source for this program.

If you want to save the source, enter Y. You can use the source for a similar program and avoid the setup procedure by updating the source.

If you do not want DFU to save the source for this program, enter N.

Name of the member to contain the DFU source

You can enter up to eight characters for a member name. The name you specified on the DFU procedure display when setting up this program is displayed for you. You can change the name displayed and DFU will store the source member under the new name.

Enter a new name if you have used an existing source member to create a second program. The original source member is still saved under the original name and the new, updated source member will be saved under the new name.

Name of the library to contain the source member

Enter the name of the library where DFU is to store the source member. The name of the library you are currently using is displayed for you. You can change the library name if you want to store the member in another library.

Replace source member with the same name?

Enter a Y if you want this source member to replace an existing source member (by the same name) in the library.

Enter an N if you do not want the new source member to replace an existing member in the library.

You should also enter an N if you are not sure if there is another source member in the library with this name. If DFU finds another member by the same name, an error message is displayed and the source member name is highlighted. You should then change the member name or change your response to Y.

Do you want to run the DFU program?

This prompt is only shown if you pressed Cmd 7 on the Update DFU Specifications display.

If you enter a Y (which is the default), DFU will create the program and then run the program.

If you enter an N, DFU will create the program and end the job. The program is stored as a load member and subroutine member in the library you specified.

End of Job Request Display

If you select N, DFU returns you to the program.

If the default (Y) is selected, DFU ends the job.

You are returned to the DFU menu display.

```
                        END OF JOB REQUEST




   Is this DFU job complete? . . . . . . . . . . . . . . . . Y,N   Y
```
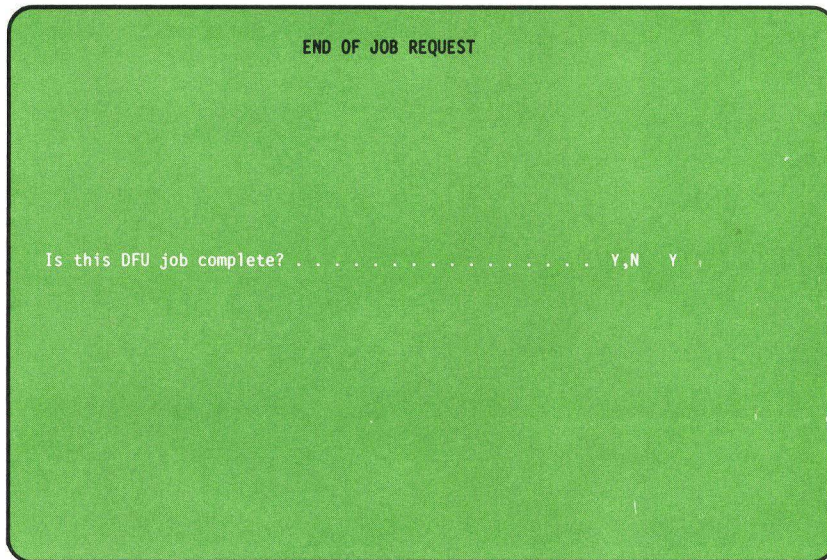
Chapter 6. Creating DFU List Programs to Print Reports

You can use the DFU list program to print a report and format it the way you want. List makes it possible for you to sort data from your file, select only certain fields to print, and indicate how you want the data printed on the report.

Three Types of Reports (Lists)

There are three types of reports you can create using a DFU list program. All have different formats and contents. The three types are:

- Record list: All selected records are printed, including all the fields you selected. Headings for each field are printed for each record.

- Summary with detail printing: All selected records are printed, including all the fields you specified and all the fields that are accumulated.

- Summary without detail: Only field headings and totals for selected fields are printed.

Example Section

This chapter includes three examples; one for each type of report. The examples will show you how to set up a program to create each type of report. Each example will use the same file, called CUSTMAST, so that you can see the same data but in three different formats.

The examples are in the first section of the chapter. You can follow along at your display station and enter the example as shown. The entries you should make are highlighted.

More detail on each of the displays is included in the second section of the chapter. This reference section will discuss the possible entries for each prompt and any limitations.

Example 5. How to Set Up a Program to Create a Record List

When you set up a program to create a record list, you specify which records and which fields within those records you want printed.

You can sort the records before they are printed and include only certain records in the list. Records are printed by record types.

To better illustrate what a list program can do for you, it is necessary to use a file of records that has several more fields. Throughout Chapter 6 a file named CUSTMAST will be used. The file definition for CUSTMAST is called LISTSRC and looks like this:

```
MEMBER      LISTSRC  LIBRARY      DFULIB        SEU EOJ PRINTOUT           DATE  12/03/82      TIME  12.4

                                                IBM SYSTEM/36 SOURCE ENTRY UTILITY

        FCUSTMASTU            256  8 I       2 DISK
        ICUSTMAST       01
        I                                                  1     1 ARCOD
        I                                                  2     9 CUSNO
        I                                                 10    34 CUSNM
        I                                                 35    59 CUSA1
        I                                                 60    84 CUSA2
        I                                                 85   109 CUSA3
        I                                                110   111 STATE
        I                                              P 112  1160ZIPCD
        I                                              P 117  1180AREAC
        I                                              P 119  1220PHONE
        I                                                123   123 CUSTP
        I                                              P 124  1270CRLIM
        I                                              P 128  1300SLSNO
        I                                              P 131  1352AMDUE
        I                                              P 136  1390DLTPM
        I                                              P 140  1442LSTAP
        I                                              P 145  1492PRBAL
        I                                              P 150  1542CHGTD
        I                                              P 155  15920VR30
        I                                              P 160  16420VR60
        I                                              P 165  16920VR90
        I                                              P 170  1742CRDTD
        I                                              P 175  1792ADJTD
        I                                              P 180  1842SLSLY
        I                                              P 185  1880DTLOR
        I                                              P 189  1920MDATE
        I                                              P 193  1960RRFST
        I                                              P 197  2000RRLST
        I                                                201   256 BUFFR
                        **** E N D  O F  S E U  P R I N T O U T ****
```

Assume your company is going to contact all your customers in a telephone survey. It is necessary to sort your customer listing by state so that each sales manager can be sure all the customers in his state have been contacted.

It is also necessary for the caller to know how much the customer purchased last year in order to know that customer's needs.

When you have completed the example, the printout will be similar to this:

```
12/15/82                        STATE LIST/PHONE SURVEY                        PAGE    1

STATE       CUSTOMER NAME                  AREA CODE     PHONE NUMBER     SALES LAST YEAR
  IA        Ransom's Home Center              515          5559160             0.00
  IA        Schaefer Decorator's              712          5556240           355.55

            SALES LAST YEAR

                 355.55 *


STATE       CUSTOMER NAME                  AREA CODE     PHONE NUMBER     SALES LAST YEAR
  KS        Currey's Upholstery               912          5556040          1555.55

            SALES LAST YEAR

                1555.55 *


STATE       CUSTOMER NAME                  AREA CODE     PHONE NUMBER     SALES LAST YEAR
  MN        John Day & Associates             507          5550660           669.99
  MN        Republic Savings & Loan           507          5559820           532.22

            SALES LAST YEAR

                1202.21 *


STATE       CUSTOMER NAME                  AREA CODE     PHONE NUMBER     SALES LAST YEAR
  MO        Connely's Motel                   816          5553010          1234.33

            SALES LAST YEAR

                1234.33 *


STATE       CUSTOMER NAME                  AREA CODE     PHONE NUMBER     SALES LAST YEAR
  ND        Strand's Restaurant               701          5552110             0.00

            SALES LAST YEAR

                   0.00 *


STATE       CUSTOMER NAME                  AREA CODE     PHONE NUMBER     SALES LAST YEAR
  NE        Davies' Realty                    308          5551320             0.00

            SALES LAST YEAR

                   0.00 *


STATE       CUSTOMER NAME                  AREA CODE     PHONE NUMBER     SALES LAST YEAR
  SD        Gladwin & Sons Inc                605          5554300           352.22

            SALES LAST YEAR

                 352.22 *


STATE       CUSTOMER NAME                  AREA CODE     PHONE NUMBER     SALES LAST YEAR
  WI        Garth Insurance                   414          5550060           788.88
  WI        Groelle's Inn                     414          5553640             0.00

            SALES LAST YEAR

                 788.88 *
                5488.74 **


      11 RECORDS PROCESSED
```

Once you have signed on to the system, begin by entering:

DFU

The following DFU menu is displayed.

DFU Menu

This display asks you whether you are using an existing program or setting up a new program.

```
                              DFU                              W1
                        Data file utility

      Select one of the following:

         1. Run a DFU program
         2. Create or change a DFU program




      Cmd3-Previous menu   Cmd5-Main help menu   Cmd7-End        Home-Sign on menu

      Ready for option number or command
       2

                                                    (c) 1983 IBM Corp.
```

Because you are setting up a new program, select option 2 and press the Enter key. The next display is the SETUPDFU Menu.

SETUPDFU Menu

This display asks you which type of program you are creating.

```
                          SETUPDFU                              W1

                  Create or change a DFU program

Select one of the following:

    1. Create a data file
    2. Update a data file
    3. Display records in a data file
    4. Sort and print a data file




Cmd3-Previous menu    Cmd5-Main help menu    Cmd7-End      Home-Sign on menu

Ready for option number or command
4
                                                (c) 1983 IBM Corp.
```

For this example, select option 4 and press the Enter key. The next display is the procedure display.

Procedure Display

This display asks you for information such as the file you are printing, what you want to name the program, where it is stored, and the name of the file definition source member.

```
                          LIST PROCEDURE                    Optional-*

                  Sorts and prints data files in various formats


Name of file to be printed . . . . . . . . . . . . . . . . . . .  CUSTMAST
     Name of file on disk, if different  . . . . . . . . . . . .           *

Name of DFU program . . . . . . . . . . . . . . . . . . . . . .  DE902D    *

Sort File . . . . . . . . . . . . . . . . . . . .  NOSORT,SORT  SORT

Name of master file . . . . . . . . . . . . . . . . . . . . . .            *

Name of library . . . . . . . . . . . . . . . . . . . . . . . .  DFULIB

Name of file definition source member . . . . . . . . . . . .  LISTSRC

Name of DFU specification source member . . . . . . . . . . .              *



Cmd3-Previous menu     Cmd4-Put on job queue           (c) 1985 IBM Corp.
```

Enter the responses shown and press the Enter key. The next display is the General Information display.

Note: Once you press the Enter key, DFU briefly displays the following message before continuing to the General Information display.

```
DFU attributes are being built
```

General Information

This display asks you for some general information about the program.

```
                   LIST GENERAL INFORMATION

              Description of printout for index files

Job title . . . . . . . . . . . . . . . . .  STATE LIST/PHONE SURVEY

How do you want the data printed? . . . . . . . . . . . . 1,2,3  1
    1. Record list
    2. Summary list, with detail printing
    3. Summary list, without detail printing

Print the record key first before the record data?  . . . . N,Y  N

Spaces between columns of printed data  . . . . . . . . . . 0-9  5

Printer line spacing  . . . . . . . . . . . . . . . . . . 1,2,3  1
    1. Single space
    2. Double space
    3. Triple space

Printer line width . . . . . . . . . . . . . . . . .  60-198  132

Stop printer on unprintable characters? . . . . . . . . . . N,Y  N
```

Enter the responses shown and press the Enter key. The next display is the
Record Type Selection display.

Record Type Selection Display

This display is shown for each record type in the file. At the top, DFU displays the attributes for the program, which include the record-identifying indicator of the record type and as many fields as possible from the record type. (If all the attributes don't fit on the display, use the Roll keys to roll through the attributes.)

When a program uses more than one record type, this display is repeated for each type.

```
                        RECORD TYPE SELECTION                    Record type: 01

              Selection of record types to be processed


      01        *RECORD
                         ARCOD           1        1
                         CUSNO           8        9
                         CUSNM          25       34
                         CUSA1          25       59
                         CUSA2          25       84
                         CUSA3          25      109
                         STATE           2      111
                         ZIPCD    P     9.0     116
                         AREAC    P     3.0     118


      Process this record type? . . . . . . . . . . . . . . . . . Y,N   Y
```

Enter the response shown and press the Record Advance command key (Cmd 12). The next display is the Data Field Selection display.

Data Field Selection

This display asks you which fields you want printed, what the headings will be, and what functions you want the fields to have. To better understand the responses for this display, refer back to the printout you saw at the beginning of this example.

You do not need to enter a heading for the STATE field. If you do not enter a heading, DFU will use the field name from the attributes shown at the top of the display.

Notice that the sales last year field (SLSLY) is an accumulated field. That is, DFU will add together any values entered in this field. This will give your sales manager the total of sales for his state last year.

```
                        DATA FIELD SELECTION              Record type: 01
                         Fields to be printed
              01     *RECORD
                              ARCOD        1        1
                              CUSNO        8        9
                              CUSNM       25       34
                              CUSA1       25       59
                              CUSA2       25       84
                              CUSA3       25      109
  +  Result field             STATE        2      111
  *  Continue heading         ZIPCD   P   9.0     116
                              AREAC   P   3.0     118
  Data field          Heading                Functions:  A=Accumulate
    STATE                                                 Z=Blank if zero
    CUSNM             CUSTOMER NAME
    AREAC             AREA CODE
    PHONE             PHONE NUMBER
    SLSLY             SALES LAST YEAR            A
```

Enter the responses shown and press the Rec Adv command key (Cmd 12) to continue. The next display is the Sort Field Selection display.

Sort Field Selection Display

This display appears for any type of list. You can specify one sort field per line. The records in this example are to be sorted using the STATE and CUSNM fields.

```
                         SORT FIELD SELECTION

                Order in which records are to be sorted
                Field entered first will be sorted first

                *FILE    CUSTMAST   256
                *KEY                  8      9
         01     *RECORD
                         ARCOD        1      1
                         CUSNO        8      9
                         CUSNM       25     34
                         CUSA1       25     59
                         CUSA2       25     84
                         CUSA3       25    109
                         STATE        2    111

         Sort field              Sequence:   A=Ascending
           STATE                     A       D=Descending
           CUSNM                     A
                                     A
                                     A
                                     A
```

Enter the responses shown and press the Cmd 12 key to continue. The next display is the Control Field Selection display.

Control Field Selection Display

This display appears for any type of list. A control field is a field you specify to cause a break (or blank line) in the printout. If you specify control fields, DFU will print a subtotal of any accumulated fields on your report whenever the value of those fields change.

```
                        CONTROL FIELD SELECTION

            Description of the field that causes subtotals to printed
                Field entered first will be subtotaled first

                    *FILE    CUSTMAST    256
                    *KEY                   8      9
            01      *RECORD
                            ARCOD          1      1
                            CUSNO          8      9
                            CUSNM         25     34
                            CUSA1         25     59
                            CUSA2         25     84
                            CUSA3         25    109
                            STATE          2    111

        Control break field                  Start new page? (Y,N)
            STATE                                     N
                                                      N
                                                      N
                                                      N
                                                      N
```

The example shows that DFU will leave a blank line whenever the state changes.

Enter the responses as shown and press the Cmd 12 key to continue.

Record Selection Test

This display appears for every type of list. You can select a subset of your records to be printed by specifying record selection tests. Fields are selected based on conditions that you set up that must be met for the record to be printed.

```
                          RECORD SELECTION TEST
              Conditions that must be satisfied for a record to be printed
                    *FILE   CUSTMAST  256
                    *KEY              8      9
              01    *RECORD
                      ARCOD       1      1
                      CUSNO       8      9
                      CUSNM      25     34
                      CUSA1      25     59
                      CUSA2      25     84
                      CUSA3      25    109
                      STATE       2    111
  OR/AND       Test field      EQ/NE/GT/LT/GE/LE       Compare field/'CONSTANT'
```

This example does not show any selection tests. Press the Cmd 12 key to continue.

| Updating the DFU Specifications

Setting up the program is now complete; the following display appears so that you can update the DFU specifications before running the report. You can review the specifications to make sure they are correct.

Chapter 7 describes how to update the DFU specifications.

```
                            UPDATE DFU SPECIFICATIONS
                           Changes to DFU specifications

                    Field1  Field2  Field3  Field4  Field5
                            *LIST   *RECORD
?=Remove line               *KEY
>=Add lines
                    5,1 132*TITLE   STATE LIST/PHONE SURVEY
Press the Enter key to  01  *RECORD
  accept changes            *       STATE   STATE
                            *       CUSNM   CUSTOMER NAME
                            *       AREAC   AREA CODE
                            *       PHONE   PHONE NUMBER
                            *ADD    SLSLY   SALES LAST YEAR
                            *SORTA  STATE
                            *SORTA  CUSNM
                            *TOTAL  STATE




Cmd7-End program setup
```

There are no corrections to make to the specifications, so press the End-of-Job command key (Cmd 7) to continue. The next display is the DFU Program Source Save Display.

| DFU Program Source Save Display

This display asks whether you want to save the DFU source program member and what to name the source. Because this type of list is probably only used once, it is not necessary to save the source for this program.

```
             DFU PROGRAM SOURCE SAVE DISPLAY

                Save DFU source specification

Do you want to save the DFU source specifications? . . . Y,N  N

Name of the member to contain the DFU source. . . . . . .
    Name of the library to contain the source member . . . .  DFULIB

Replace source member with the same name?  . . . . . . . Y,N  N

Do you want to run the DFU program?  . . . . . . . . . . Y,N  Y




Cmd5-Page back
```

Respond to these prompts as shown and press the Enter key. DFU displays the following messages:

```
Your data file is now being sorted
```

then,

```
Your data file is now being printed
```

Once these messages are displayed, the program is ended. You are returned to the SETUPDFU Menu you saw at the beginning of the example.

The report printed by the List program should look like the sample report you saw at the beginning of the example. Compare the two to make sure the program is correct.

This is the end of Example 5.

Example 6. How to Set Up a Program to Create a Summary with Detail List

When you set up a program to create a summary list with details, you specify which records and which fields within those records you want printed.

You can sort the records before they are printed and include only certain records in the list. All selected records are printed along with field totals and control fields.

For this example, each time the customer number changes, DFU will print a total for that customer number before printing out the selected fields for the next customer number.

The example assumes a file definition source member called LISTSRC exists.

```
MEMBER     LISTSRC LIBRARY      DFULIB          SEU EOJ PRINTOUT           DATE 12/03/82     TIME 13.43

                                            IBM SYSTEM/36 SOURCE ENTRY UTILITY

        FCUSTMASTU           256  8 I      2 DISK
        ICUSTMAST      01
        I                                        1    1 ARCOD
        I                                        2    9 CUSNO
        I                                       10   34 CUSNM
        I                                       35   59 CUSA1
        I                                       60   84 CUSA2
        I                                       85  109 CUSA3
        I                                      110  111 STATE
        I                                    P  112  116OZIPCD
        I                                    P  117  118OAREAC
        I                                    P  119  122OPHONE
        I                                      123  123 CUSTP
        I                                    P  124  127OCRLIM
        I                                    P  128  130OSLSNO
        I                                    P  131  135ZAMDUE
        I                                    P  136  139ODLTPM
        I                                    P  140  144ZLSTAP
        I                                    P  145  149ZPRBAL
        I                                    P  150  154ZCHGTD
        I                                    P  155  159ZOVR30
        I                                    P  160  164ZOVR60
        I                                    P  165  169ZOVR90
        I                                    P  170  174ZCRDTD
        I                                    P  175  179ZADJTD
        I                                    P  180  184ZSLSLY
        I                                    P  185  188ODTLOR
        I                                    P  189  192OMDATE
        I                                    P  193  196ORRFST
        I                                    P  197  200ORRLST
        I                                      201  256 BUFFR
                    **** E N D  O F  S E U  P R I N T O U T ****
```

When you have completed the example, the printout will be similar to this:

```
12/15/82                 SUMMARY LIST WITH DETAIL             PAGE     1


CUSTOMER NUMBER          CUSTOMER NAME                    AMOUNT DUE
          300            Gladwin & Sons Inc                   224.55
         1000            Groelle's Inn                        252.00
          900            Strand's Restaurant                  423.95
          200            Connely's Motel                      799.50
          100            Currey's Upholstery                 1095.00
          500            Schaefer Decorator's                2000.00
          400            Republic Savings & Loan             2225.50
          600            Garth Insurance                     5433.95

                                                          12454.45 *


     8 RECORDS PROCESSED
```

Once you have signed on to DFU, the following DFU menu is displayed.

DFU Menu

This display asks you whether you are using an existing program or setting up a new program.

```
                              DFU                              W1

                        Data file utility

Select one of the following:

   1. Run a DFU program
   2. Create or change a DFU program







Cmd3-Previous menu    Cmd5-Main help menu    Cmd7-End    Home-Sign on menu

Ready for option number or command
   2

                                               (c) 1983 IBM Corp.
```

Because you are setting up a new program, select option 2 and press the Enter key. The next display is the SETUPDFU Menu.

SETUPDFU Menu

This display asks you which type of program you are creating.

```
                          SETUPDFU                              W1

                   Create or change a DFU program

Select one of the following:

    1. Create a data file
    2. Update a data file
    3. Display records in a data file
    4. Sort and print a data file






Cmd3-Previous menu   Cmd5-Main help menu    Cmd7-End      Home-Sign on menu

Ready for option number or command
4

                                              (c) 1983 IBM Corp.
```

For this example, select option 4 and press the Enter key. The next display is the procedure display.

Procedure Display

This display asks you for information such as the file you are printing, what you want to name the program, where it is stored, and the name of the file definition source member.

```
                        LIST PROCEDURE                      Optional-*

              Sorts and prints data files in various formats


  Name of file to be printed . . . . . . . . . . . . . . . . . . CUSTMAST
         Name of file on disk, if different . . . . . . . . . . .            *

  Name of DFU program . . . . . . . . . . . . . . . . . . . . . . DE990D     *

  Sort File . . . . . . . . . . . . . . . . . . . NOSORT,SORT  SORT

  Name of master file . . . . . . . . . . . . . . . . . . . . . .            *

  Name of library . . . . . . . . . . . . . . . . . . . . . . . . DFULIB

  Name of file definition source member . . . . . . . . . . . .  LISTSRC

  Name of DFU specification source member . . . . . . . . . . .  DE990DS    *



  Cmd3-Previous menu      Cmd4-Put on job queue            (c) 1985 IBM Corp.
```

Enter the responses shown and press the Enter key. The next display is the General Information display.

Note: Once you press the Enter key, DFU briefly displays the following message before continuing to the General Information display:

```
DFU attributes are being built
```

General Information

This display asks you for some general information about the program.

```
                    LIST GENERAL INFORMATION

                Description of printout for index files

Job title . . . . . . . . . . . . . . . . .   SUMMARY LIST WITH DETAIL

How do you want the data printed? . . . . . . . . . . . 1,2,3  2
  1. Record list
  2. Summary list, with detail printing
  3. Summary list, without detail printing

Print the record key first before the record data? . . . . N,Y  Y

Spaces between columns of printed data . . . . . . . . . . 0-9  5

Printer line spacing  . . . . . . . . . . . . . . . . . 1,2,3  1
  1. Single space
  2. Double space
  3. Triple space

Printer line width . . . . . . . . . . . . . . . . . 60-198  132

Stop printer on unprintable characters? . . . . . . . . . . N,Y  N
```

Enter the responses shown and press the Enter key. Because you entered a Y in response to *Print the record key first before the record data*, the next display is the Record Key Description display.

Record Key Description Display

This display asks you for a heading to be displayed when the program is prompting for the record key field.

```
                        RECORD KEY DESCRIPTION

                   Description of the record key

                   *FILE    CUSTMAST   256
                   *KEY                  8        9
          01       *RECORD
                             ARCOD        1        1
                             CUSNO        8        9
                             CUSNM       25       34
                             CUSA1       25       59
                             CUSA2       25       84
                             CUSA3       25      109
                             STATE        2      111


  Record key heading . . . . . . . . . . . . . . . . .     CUSTOMER NUMBER

  Is the record key numeric?  . . . . . . . . . . . Y,N   Y
```

Enter the heading shown and indicate that the key field is numeric (the customer number). Press the Enter key. The next display is the Record Type Selection display.

Record Type Selection Display

This display is shown for each record type in the file. At the top, DFU displays the attributes for the program, which include the record-identifying indicator of the record type and as many fields as possible from the record type. (If all the attributes don't fit on the display, use the Roll keys to roll through the attributes.)

When a program uses more than one record type, this display is repeated for each type.

```
                              RECORD TYPE SELECTION                    Record type: 01

                      Selection of record types to be processed


                  01        *RECORD
                                    ARCOD        1         1
                                    CUSNO        8         9
                                    CUSNM       25        34
                                    CUSA1       25        59
                                    CUSA2       25        84
                                  . CUSA3       25       109
                                    STATE        2       111
                                    ZIPCD    P   9.0     116
                                    AREAC    P   3.0     118


    Process this record type? . . . . . . . . . . . . . . . . . . Y,N  Y
```

Enter the response shown and press the Rec Adv command key (Cmd 12). The next display is the Data Field Selection display.

Data Field Selection

This display asks you which fields you want printed, what the headings will be, and what functions you want the fields to have. To better understand the responses for this display, look back at the printout you saw at the beginning of this example.

Notice that the amount due field (AMDUE) is an accumulated field. That is, DFU will add together any values entered in this field for each record.

```
                      DATA FIELD SELECTION
                      Fields to be printed
              01      *RECORD
                              ARCOD        1        1
                              CUSNO        8        9
                              CUSNM       25       34
                              CUSA1       25       59
                              CUSA2       25       84
                              CUSA3       25      109
   + Result field            STATE        2      111
   * Continue heading        ZIPCD    P   9.0      116
                             AREAC    P   3.0      118
   Data field         Heading              Functions:  A=Accumulate
     CUSNM            CUSTOMER NAME                     Z=Blank if zero
     AMDUE            AMOUNT DUE               A
```

Enter the responses shown and press the Rec Adv command key (Cmd 12) to continue.

Sort Field Selection

This display appears for any type of list. You can specify one sort field per line. The records in this example are to be sorted using the amount due field.

```
                    SORT FIELD SELECTION

          Order in which records are to be sorted
          Field entered first will be sorted first


              *FILE   CUSTMAST   256
              *KEY                  8        9
    01        *RECORD
               ARCOD              1        1
               CUSNO              8        9
               CUSNM             25       34
               CUSA1             25       59
               CUSA2             25       84
               CUSA3             25      109
               STATE              2      111


     Sort field              Sequence:    A=Ascending
      AMDUE                      A         D=Descending
                                A
                                A
                                A
                                A
```

Enter the responses shown and press the Cmd 12 key to continue. The next display is the Control Field Selection display.

Control Field Selection

This display appears for any type of list. A control field is a field you specify to cause a break (or blank line) in the printout when the value of that field changes. If you specify control fields, DFU will print a subtotal of any accumulated fields on your report whenever the value of that field changes.

```
                    CONTROL FIELD SELECTION

          Description of the field that causes subtotals to printed
               Field entered first will be subtotaled first

               *FILE   CUSTMAST   256
               *KEY                 8        9
        01     *RECORD
                        ARCOD        1        1
                        CUSNO        8        9
                        CUSNM       25       34
                        CUSA1       25       59
                        CUSA2       25       84
                        CUSA3       25      109
                        STATE        2      111

       Control break field                Start new page? (Y,N)
                                                     N
                                                     N
                                                     N
                                                     N
                                                     N
```

The example does not use control fields, so leave this display blank.

Press the Cmd 12 key to continue.

Record Selection Test

This display appears for every type of list. You can select a subset of your records to be printed by specifying record selection tests. Fields are selected based on conditions that you set up that must be met for the record to be printed.

```
                          RECORD SELECTION TEST
           Conditions that must be satisfied for a record to be printed
                        *FILE    CUSTMAST   256
                        *KEY                  8         9
              01        *RECORD
                                 ARCOD        1         1
                                 CUSNO        8         9
                                 CUSNM       25        34
                                 CUSA1       25        59
                                 CUSA2       25        84
                                 CUSA3       25       109
                                 STATE        2       111
 OR/AND          Test field     EQ/NE/GT/LT/GE/LE      Compare field/'CONSTANT'
                 AMDUE               GT                '50.00'
```
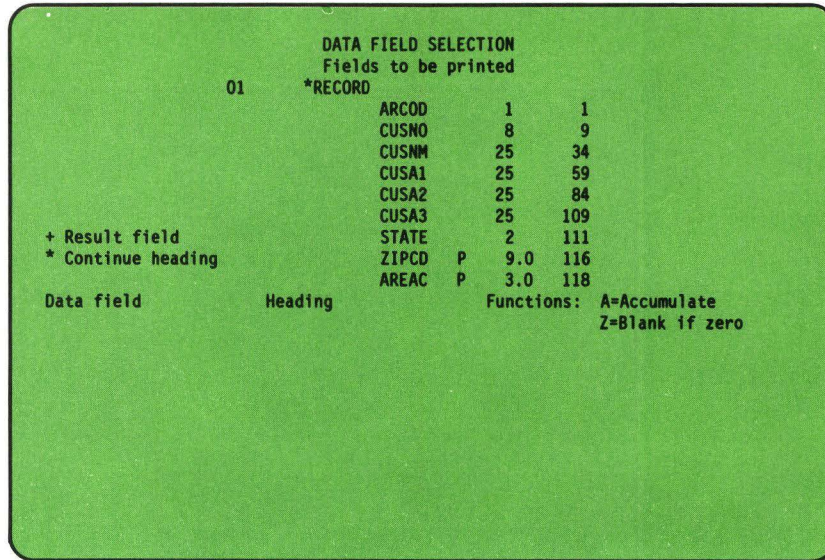
The example shows that DFU will print only those records that have more than $50 in the AMDUE field. Press the Cmd 12 key to continue.

| DFU Program Source Save Display

This display asks whether you want to save the DFU source program member and what to name the source. If you want to save the source member you must enter a name for the member.

```
                   DFU PROGRAM SOURCE SAVE DISPLAY

                    Save DFU source specification

Do you want to save the DFU source specifications? . . . Y,N  Y

Name of the member to contain the DFU source. . . . . . .  DE990DS
   Name of the library to contain the source member . . . .  DFULIB

Replace source member with the same name?  . . . . . . . Y,N  Y

Do you want to run the DFU program?  . . . . . . . . . . Y,N  Y












Cmd5-Page back
```

Respond to these prompts and press the Enter key. DFU displays the following messages:

```
Your data file is now being sorted
```

then,

```
Your data file is now being printed
```

Once these messages are displayed, the program is ended. You are returned to the SETUPDFU Menu you saw at the beginning of the example.

Because this is a list program, the report you designed begins running as soon as you press the Enter key on the last display. The report should look like the sample report you saw at the beginning of the example. Compare the two to make sure the program is correct.

This is the end of Example 6.

Example 7. Setting Up a Program to Create a Summary Without Detail List

When you set up a program to create a summary list without details, you specify what data you want printed from the records in the file.

You can sort the records before the data is printed and include only data from certain records in the list. Only the headings of the fields you choose are printed along with any totals for accumulated fields.

This is a simplified list, no records are printed.

This example assumes a file definition source member called LISTSRC exists.

```
MEMBER      LISTSRC  LIBRARY      DFULIB          SEU EOJ PRINTOUT              DATE  12/03/82      TIME  14.0:

                                           IBM SYSTEM/36 SOURCE ENTRY UTILITY

          FCUSTMASTU          256  8 I      2 DISK
          ICUSTMAST     01
          I                                            1    1 ARCOD
          I                                            2    9 CUSNO
          I                                           10   34 CUSNM
          I                                           35   59 CUSA1
          I                                           60   84 CUSA2
          I                                           85  109 CUSA3
          I                                          110  111 STATE
          I                                       P  112 1160ZIPCD
          I                                       P  117 1180AREAC
          I                                       P  119 1220PHONE
          I                                          123  123 CUSTP
          I                                       P  124 1270CRLIM
          I                                       P  128 1300SLSNO
          I                                       P  131 1352AMDUE
          I                                       P  136 1390DLTPM
          I                                       P  140 1442LSTAP
          I                                       P  145 1492PRBAL
          I                                       P  150 1542CHGTD
          I                                       P  155 15920VR30
          I                                       P  160 16420VR60
          I                                       P  165 16920VR90
          I                                       P  170 1742CRDTD
          I                                       P  175 1792ADJTD
          I                                       P  180 1842SLSLY
          I                                       P  185 1880DTLOR
       .  I                                       P  189 1920MDATE
          I                                       P  193 1960RRFST
          I                                       P  197 2000RRLST
          I                                          201  256 BUFFR
                          **** E N D   O F   S E U   P R I N T O U T ****
```

When you have completed the example, the printout will be similar to this:

```
12/15/82                  SUMMARY LIST/NO DETAIL              PAGE     1

CUSTOMER NUMBER           AMOUNT DUE        INTEREST          TOTAL DUE
          100               1095.00           10.95           1105.95 *
          200                799.50            7.99            807.49 *
          300                224.55            2.24            226.79 *
          400               2225.50           22.25           2247.75 *
          500               2000.00           20.00           2020.00 *
          600               5433.95           54.33           5488.28 *
          700                 25.55            0.25             25.80 *
          800                 21.15            0.21             21.36 *
          900                423.95            4.23            428.18 *
         1000                252.00            2.52            254.52 *
         1100                 31.15            0.31             31.46 *
                           12532.30          125.28          12657.58 **

     11 RECORDS PROCESSED
```

Once you have signed on to DFU, the DFU menu is displayed.

DFU Menu

This display asks you whether you are using an existing program or setting up a new program.

```
                              DFU                              W1

                        Data file utility

Select one of the following:

     1. Run a DFU program
     2. Create or change a DFU program












Cmd3-Previous menu    Cmd5-Main help menu   Cmd7-End        Home-Sign on menu

Ready for option number or command
  2

                                                    (c) 1983 IBM Corp.
```

Because you are setting up a new program, select option 2 and press the Enter key. The next display is the SETUPDFU Menu.

SETUPDFU Menu

This display asks you which type of program you are creating.

```
                            SETUPDFU                           W1

                     Create or change a DFU program

Select one of the following:

     1. Create a data file
     2. Update a data file
     3. Display records in a data file
     4. Sort and print a data file










Cmd3-Previous menu    Cmd5-Main help menu Cmd7-End          Home-Sign on menu

Ready for option number or command
  4

                                                    (c) 1983 IBM Corp.
```
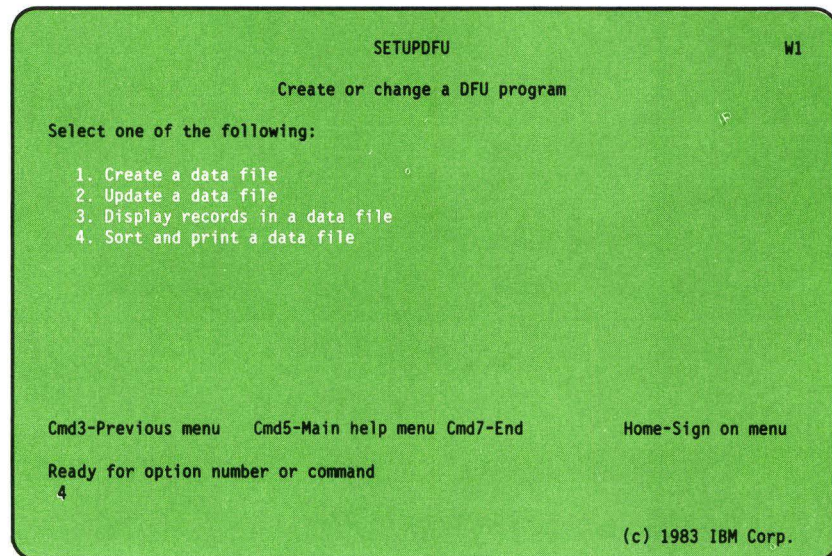
For this example, select option 4 and press the Enter key. The next display is the procedure display.

Procedure Display

This display asks you for information such as what file you are printing, what you want to name the program, where it is stored, and the name of the file definition source member.

```
                       LIST PROCEDURE                    Optional-*

             Sorts and prints data files in various formats


    Name of file to be printed . . . . . . . . . . . . . . . . .   CUSTMAST
          Name of file on disk, if different . . . . . . . . . .              *

    Name of DFU program . . . . . . . . . . . . . . . . . . . .   DE996D      *

    Sort File . . . . . . . . . . . . . . . . . . . NOSORT,SORT   SORT

    Name of master file . . . . . . . . . . . . . . . . . . . .               *

    Name of library . . . . . . . . . . . . . . . . . . . . . .   DFULIB

    Name of file definition source member . . . . . . . . . . .   LISTSRC

    Name of DFU specification source member . . . . . . . . . .   DE996DS     *




    Cmd3-Previous menu     Cmd4-Put on job queue          (c) 1985 IBM Corp.
```

Enter the responses shown and press the Enter key. The next display is the General Information display.

General Information Display

This display asks you for some general information about the program.

```
                      LIST GENERAL INFORMATION

                Description of printout for index files

    Job title . . . . . . . . . . . . . . . . . . SUMMARY LIST/NO DETAIL

    How do you want the data printed? . . . . . . . . . . . . 1,2,3   3
      1. Record list
      2. Summary list, with detail printing
      3. Summary list, without detail printing

    Print the record key first before the record data?  . . . . N,Y   N

    Spaces between columns of printed data . . . . . . . . . . 0-9   5

    Printer line spacing  . . . . . . . . . . . . . . . . . . 1,2,3   2
      1. Single space
      2. Double space
      3. Triple space

    Printer line width . . . . . . . . . . . . . . . . . . . 60-198  132

    Stop printer on unprintable characters? . . . . . . . . . . N,Y   N
```

Enter the responses shown and press the Enter key. The next display is the Record Type Selection display.

Record Type Selection Display

This display is shown for each record type in the file. At the top, DFU displays the attributes for the program, which include the record-identifying indicator of the record type and as many fields as possible from the record type. (If all the attributes don't fit on the display, use the Roll keys to roll through the attributes.)

When a program uses more than one record type, this display is repeated for each type.

```
                    RECORD TYPE SELECTION              Record type: 01

           Selection of record types to be processed


      01      *RECORD
                      ARCOD         1        1
                      CUSNO         8        9
                      CUSNM        25       34
                      CUSA1        25       59
                      CUSA2        25       84
                      CUSA3        25      109
                      STATE         2      111
                      ZIPCD   P   9.0      116
                      AREAC   P   3.0      118


  Process this record type? . . . . . . . . . . . . . . . . . . Y,N  Y
```

Enter the response shown and press the Rec Adv command key (Cmd 12). The next display is the Data Field Selection display.

Data Field Selection Display

This display asks you which fields you want printed, what the headings will be, and what functions you want the fields to have. To better understand the responses for this display, look back at the printout you saw at the beginning of this example.

Notice that the amount due field (AMDUE) is an accumulated field. That is, DFU will add together any values entered in this field for each record.

Also, if you want to do any mathematic calculations later in the program (this example has the amount due field multiplied by 1 percent to figure the amount of interest on that value), you must specify a *result field*. You specify a result field so that DFU will print the results of the calculations you wanted.

You tell DFU you need a result field by typing a plus sign (+) on the last line of Data Field Selection display and entering a heading for this field. (The result field is not a field described in the file definition.)

```
                         DATA FIELD SELECTION
                          Fields to be printed
              01      *RECORD
                              ARCOD         1         1
                              CUSNO         8         9
                              CUSNM        25        34
                              CUSA1        25        59
                              CUSA2        25        84
                              CUSA3        25       109
                              STATE         2       111
 + Result field               ZIPCD   P   9.0       116
 * Continue heading           AREAC   P   3.0       118

 Data field          Heading              Functions:  A=Accumulate
   CUSNO             CUSTOMER NUMBER                  Z=Blank if zero
   AMDUE             AMOUNT DUE              A
   +                 INTEREST               A
```

Enter the responses shown and press the Rec Adv command key (Cmd 12) to continue. The next display is the Result Field Specification display.

Result Field Specification Display

This display is shown because you requested a result field as the last data field you specified on the previous display.

Enter the responses as shown. You do not have to enter a result field name unless you want to use this field in later calculations.

```
                      RESULT FIELD SPECIFICATION
          Calculation combines fields and constants with '+', '-', '*', '/'

           01        *RECORD
                              ARCOD        1        1
                              CUSNO        8        9
                              CUSNM       25       34
                              CUSA1       25       59
                              CUSA2       25       84
                              CUSA3       25      109
                              STATE        2      111
                              ZIPCD     P  9.0     116
                              AREAC     P  3.0     118

    Result field Heading:     INTEREST


    Result field name . .     MOINT
    Field length  . . 0-15    6
    Decimal position . 0-9    2
    Calculation  . . . . .    AMDUE * .01
```

The available mathematic signs are displayed at the top of the display (+, -, *, and /). The calculation AMDUE * .01 tells DFU to multiply (identified by the *) AMDUE by 1 percent. The result will be the monthly interest (MOINT).

Press the Cmd 12 key to continue. The next display is the Data Field Selection display. The Data Field Selection display is repeated after the Result Field display so that you can enter more data or result fields.

Note: For the rest of program setup, if you press the Enter key instead of Cmd 12, the display will be repeated. Then you must press the Enter key again to continue.

Indicate another result field by again entering a plus sign and naming the result field TOTAL DUE.

```
                    DATA FIELD SELECTION
                    Fields to be printed
           01     *RECORD
                           ARCOD       1       1
                           CUSNO       8       9
                           CUSNM      25      34
                           CUSA1      25      59
                           CUSA2      25      84
                           CUSA3      25     109
 + Result field            STATE       2     111
 * Continue heading        ZIPCD   P   9.0   116
                           AREAC   P   3.0   118
 Data field             Heading             Functions:  A=Accumulate
     +                  TOTAL DUE                A      Z=Blank if zero
```

Type the responses shown and press the Enter key. The next display is again the Result Field Specification display.

```
                  RESULT FIELD SPECIFICATION
         Calculation combines fields and constants with '+', '-', '*', '/'

           01     *RECORD
                           ARCOD       1       1
                           CUSNO       8       9
                           CUSNM      25      34
                           CUSA1      25      59
                           CUSA2      25      84
                           CUSA3      25     109
                           STATE       2     111
                           ZIPCD   P   9.0   116
                           AREAC   P   3.0   118

 Result field Heading:    TOTAL DUE


 Result field name . .
 Field length  . . 0-15  10
 Decimal position . 0-9   2
 Calculation . . . . .    AMDUE + MOINT
```

To calculate the total amount due, including interest, you must add AMDUE and MOINT. Type the responses shown and press the Enter key. The next display is the Data Field Selection display.

```
                    DATA FIELD SELECTION
                    Fields to be printed
         01    *RECORD
                          ARCOD        1      1
                          CUSNO        8      9
                          CUSNM       25     34
                          CUSA1       25     59
                          CUSA2       25     84
                          CUSA3       25    109
   + Result field         STATE        2    111
   * Continue heading      ZIPCD    P   9.0  116
                          AREAC    P   3.0  118
   Data field         Heading           Functions:  A=Accumulate
                                                     Z=Blank if zero
```

You have no more data fields or result fields to specify for this example. Press
the Cmd 12 key to continue. The Sort Field Selection display is shown next.

Sort Field Selection

This display appears for any type of list. You can specify one sort field per line.
The records in this example are to be sorted using the customer number field.

```
                    SORT FIELD SELECTION

              Order in which records are to be sorted
              Field entered first will be sorted first

              *FILE    CUSTMAST   256
              *KEY                  8      9
         01   *RECORD
                          ARCOD        1      1
                          CUSNO        8      9
                          CUSNM       25     34
                          CUSA1       25     59
                          CUSA2       25     84
                          CUSA3       25    109
                          STATE        2    111

         Sort field            Sequence:   A=Ascending
         CUSNO                     A       D=Descending
                                   A
                                   A
                                   A
                                   A
                                   A
```

Enter the responses shown and press the Cmd 12 key to continue. The next
display is the Control Field Selection display.

Control Field Selection

This display appears for any type of list. A control field is a field you specify to cause a break (or blank line) in the printout. If you specify control fields, DFU will print a subtotal of any accumulated fields on your report whenever the value of that field changes.

```
                        CONTROL FIELD SELECTION

         Description of the field that causes subtotals to printed
              Field entered first will be subtotaled first

                    *FILE   CUSTMAST   256
                    *KEY                 8      9
              01    *RECORD
                       ARCOD             1      1
                       CUSNO             8      9
                       CUSNM            25     34
                       CUSA1            25     59
                       CUSA2            25     84
                       CUSA3            25    109
                       STATE             2    111

         Control break field                    Start new page? (Y,N)
              CUSNO                                      N
                                                        N
                                                        N
                                                        N
                                                        N
```

The example shows that DFU will leave a blank line whenever the customer number changes. DFU will also print the values in the amount due field and print the results of AMDUE * .01 for that field.

Enter the responses as shown and press the Cmd 12 key to continue.

Record Selection Test

This display appears for every type of list. You can select a subset of your records to print by specifying record selection tests. Fields are selected based on conditions that you set up that must be met for the record to be printed.

```
                        RECORD SELECTION TEST
          Conditions that must be satisfied for a record to be printed
                        *FILE    CUSTMAST   256
                        *KEY                  8        9
             01         *RECORD
                                  ARCOD       1        1
                                  CUSNO       8        9
                                  CUSNM      25       34
                                  CUSA1      25       59
                                  CUSA2      25       84
                                  CUSA3      25      109
                                  STATE       2      111
   OR/AND          Test field        EQ/NE/GT/LT/GE/LE      Compare field/'CONSTANT'
```

There are no record selection tests for this example, press the Cmd 12 key to continue.

Updating DFU Specifications

Setting up the program is now complete; the following display appears so that you can update the DFU specifications before running the report. You can review the specifications to make sure they are correct.

Chapter 7 describes how to update the DFU specifications.

```
                          UPDATE DFU SPECIFICATIONS
                         Changes to DFU specifications

                     Field1  Field2  Field3  Field4  Field5
  ?=Remove line               *LIST   *SUMMARY
  >=Add lines                 *KEY
                     5,2  132*TITLE   SUMMARY LIST/NO DETAIL
  Press the Enter key to  01 *RECORD
    accept changes             *       CUSNO   CUSTOMER NUMBER
                              *ADD     AMDUE   AMOUNT DUE
                     6.2  *ADD     +MOINT  INTEREST
                     ADD           AMDUE
                     MULT          .01
                     10.2 *ADD     *RESULT TOTAL DUE
                     ADD           AMDUE
                     ADD           MOINT
                              *SORTA  CUSNO
                              *TOTAL  CUSNO




  Cmd7-End program setup
```

There are no corrections to make to the specifications, so press the End-of-Job command key (Cmd 7) to continue. The next display is the DFU Program Source Save display.

DFU Program Source Save Display

This display asks whether you want to save the DFU source program member and what to name the source.

```
                    DFU PROGRAM SOURCE SAVE DISPLAY

                      Save DFU source specification

Do you want to save the DFU source specifications? . . . Y,N  Y

Name of the member to contain the DFU source. . . . . . .   DE996DS
    Name of the library to contain the source member . . . .  DFULIB

Replace source member with the same name?  . . . . . . . . Y,N  Y

Do you want to run the DFU program?  . . . . . . . . . . Y,N  Y.




Cmd5-Page back
```

Respond to these prompts and press the Enter key. DFU displays the following message:

```
Your data file is now being sorted
```

then,

```
Your data file is now being printed
```

Once these messages are displayed, the program is ended. You are returned to the SETUPDFU Menu you saw at the beginning of the example.

Because this is a list program, the report you designed begins running as soon as you press the Enter key on the last display. The report should look like the sample report you saw at the beginning of the example. Compare the two to make sure the program is correct.

This is the end of Example 7.

Before Creating the Program Decide How You Want the Report to Look

Before setting up your own list program, consider what you want your report to look like. Here is a sample to show you some of the things your report can contain.

```
■ 12/15/82            SUMMARY LIST WITH DETAIL          PAGE    1


■ CUSTOMER NUMBER    ■ CUSTOMER NAME                    AMOUNT DUE

         300           Gladwin & Sons Inc            ■ 224.55
        1000           Groelle's Inn                    252.00
         900           Strand's Restaurant              423.95
         200           Connely's Motel                  799.50
         100           Currey's Upholstery             1095.00
         500           Schaefer Decorator's            2000.00
         400           Republic Savings & Loan         2225.50
         600           Garth Insurance                 5433.95

                                                      12454.45 *


      8 RECORDS PROCESSED
```

1   Each new page begins with a title line. The date is edited and left-aligned. A title of up to 24 characters is centered on the longest detail line. The page number is right-aligned on the longest detail line.

2   If the column heading for a field is longer than the field, the field is centered under the heading.

3   If the column heading is less than or equal to the field length, the heading is left-aligned over an alphameric field or right-aligned over a numeric field.

4   A numeric field with decimal positions prints with a decimal point and, if negative, a trailing minus sign. Leading zeros through the tens' position are blanked.

Each time the record key or number changes, a new column heading identifies the record being printed. The detail information prints under its associated column heading. If the detail information does not fit on one print line, the first line is left-aligned and all succeeding lines are right-aligned.

Sort Prior to List

Records can be sorted before they are listed, but this does not rearrange the file. Instead, a temporary file is created and then deleted after the printout is complete. The file can be sorted on five different fields, each one in ascending or descending order. The fields sorted on must be present in each record type printed.

DFU runs a sort program in two separate job steps: (1) the file is sorted, and (2) the file data is printed in the sorted order. Because DFU can use a shared file, another user can change any of the sort fields between these two steps (sort and print). Although DFU sorts the records using the *original* data in the record, it prints the *latest* data in the record. Therefore, this could cause an error in your sorted printout.

You Can Select Records Based on Field Value

On the Record Selection Test display, records can be selected for printing based on conditions specified at program setup. That is, at program setup, you can specify that a field in the record be compared to another field in the record, to a constant value, or to the current date, year, month, or day. If it satisfies a condition you specify (EQ = equal, NE = not equal, GT = greater than, LT = less than, GE = greater than or equal, LE = less than or equal), the record will be printed. A field compared to a constant value cannot be greater than 20 characters.

Ten conditions (or tests) can be specified for a list. For more information on the selection tests that can be specified, see *Record Selection Test* later in this chapter.

Number of Records Processed

The last line of any list output is the total number of the records included in the printout. If no records are processed, only a title line is printed with the record count.

Single, Double, or Triple Spacing

You can specify single, double, or triple spacing between records on the listing when you set up the program. Multiple lines within a record are single spaced unless you specify otherwise.

Headings Can Be More Than One Line

If all the data for a record can be printed on a single line, up to three lines can be used for any field heading that is to be printed. You can specify a continued heading on the Data Field Selection display. This allows for more descriptive headings.

```
09/03/82                                              PAGE 1

CUSTOMER NAME                  AMOUNT DUE              TOTAL        TOTAL
                                                  INTEREST BY      INTEREST BY
                                                 CUSTOMER NAMES    CUSTOMER NAMES

Currey's Upholstery              250.00               2.50

Connely's Hotel                  175.25               1.75

Gladwin & Sons Inc                85.00               0.85
```

Printer Line Width

DFU allows you to specify a printer line width of 60 to 198 positions. A printer line width greater than 132 positions requires special considerations. See *Printer Line Width* in Chapter 7 for more details.

Errors You May Encounter

When sorting before printing a report, it is possible to get sort message SORT-7725. This message is issued when the sort job is too big for the amount of main storage you have available. If this message occurs, increase the region size to the maximum size that is allowed on your system. Refer to the *Region Statement* section in the *System Reference* manual. Then run the list job again. If the problem occurs again, call your system engineer or program support representative.

Another error that can occur during a sort job with DFU list is SORT-7732 (output file too small). This error occurs when the sorted output contains more records than will fit in the temporary sort file created by DFU.

DFU creates a temporary sort output file large enough to contain all of the records that were in the file when your list job was started. However, if records were added to the file by another job before the sort was completed, the temporary sort output file might be too small to contain all the records. Run the list job again, making sure that no other operator is adding records to the file while you are trying to print it.

Reference Section

This section of the manual will give you the details about the displays you saw as you went through the example. Each DFU display that you might see as you run a list program is discussed here. Use this section to answer your questions.

Note: The displays for all types of lists are similar. Any differences in the three types of lists will be noted.

DFU Menu

The display asks you to indicate what you are going to do. Option 1 (Run a DFU program) indicates you will be supplying the name of an existing program. When you supply the program name on the procedure display, DFU will search the library specified for a load member by that name and run the program.

Option 2 (Create or change a DFU program) indicates you will be supplying the name of a program you want to create. When you supply the program name on the procedure display, DFU will search the specified library for the program and run it if it exists. If the program does not exist and you specified a DFU source specification member, DFU will search the library specified for that member. DFU will then display the source member if it is found. (See *How to Change DFU Specifications* in Chapter 7 for more information.) Otherwise DFU will begin creating a new source member and a new program.

Enter the number of the option you choose.

```
                              DFU                                    W1
                        Data file utility
    Select one of the following:

       1. Run a DFU program
       2. Create or change a DFU program












    Cmd3-Previous menu    Cmd5-Main help menu    Cmd7-End    Home-Sign on menu

    Ready for option number or command
     2
                                                (c) 1983 IBM corp.
```

SETUPDFU (or RUNDFU) Menu

This menu asks you to indicate what the DFU program will do.

Enter the number of the option you choose.

```
                            SETUPDFU                              W1

                   Create or change a DFU program

    Select one of the following:

         1. Create a data file
         2. Update a data file
         3. Display records in a data file
         4. Sort and print a data file














    Cmd3-Previous menu    Cmd5-Main help menu    Cmd7-End    Home-Sign on menu

    Ready for option number or command
       4
                                                    (c) 1983 IBM Corp.
```

Procedure Display

This display will differ slightly depending on how you are using DFU. It asks
you to identify such things as what the file name is, what you want to name the
program, where the program is to be stored, and the name of the file definition.

```
                          LIST PROCEDURE                      Optional-*

                Sorts and prints data files in various formats


    Name of file to be printed . . . . . . . . . . . . . . .   CUSTMAST
         Name of file on disk, if different . . . . . . . . .              *

    Name of DFU program . . . . . . . . . . . . . . . . . .   DE902D      *

    Sort File . . . . . . . . . . . . . . . .  NOSORT,SORT   SORT

    Name of master file . . . . . . . . . . . . . . . . . .              *

    Name of library . . . . . . . . . . . . . . . . . . . .   DFULIB

    Name of file definition source member . . . . . . . . .   LISTSRC

    Name of DFU specification source member . . . . . . . .              *



    Cmd3-Previous menu      Cmd4-Put on job queue        (c) 1985 IBM Corp.
```

Name of file to be printed

> This is the name of the file you want to print.

Name of file on disk, if different

> This is the name of the file on the disk (the file label). You must enter this name if it is different from the name of file to be printed.

Name of DFU program

> This is the name of the program you are using or creating to print the file. The program contains the information you supply about the file and how the file is to be processed.
>
> Enter the name of the program you are either using or setting up. An entry in this field is optional.

Sort file

> This indicates whether you want the records sorted before they are printed. This sort does not rearrange the file; a temporary data file of relative record numbers is created, then removed when the file is printed.

Name of master file

> While running a list program, you can also include data from a second related file. This second file or master file often contains details or additional information about a record. If you specify a master file, DFU goes to that file and adds information from the master file to each printed record. The master file must be an indexed file.

Name of library

> This is the name of the library in which the program is or will be stored. If no library is specified, DFU stores the program in the library you are currently using.
>
> If you specify a user library on this display, the file definition must be stored in that library. If you did not identify a user library, DFU uses the library that you are currently using.
>
> Any subroutine or source members created by DFU when the program load member is created are stored in this library.

Name of file definition source member

> This is the name of the source member containing the RPG specifications that describe the file you want to print. It can contain one or more sets of F- and I-specifications or an entire RPG program. (The F- and I-specifications that describe your file will be used by DFU.)
>
> If you specify a user library on this display, the file definition source member must be stored in that same library. If you did not identify a user library, DFU searches the library that you are currently using.

Name of DFU specification source member

> This is the name of the source member that contains or will contain the DFU specifications for this program.

> If you identified a user library, DFU searches for or stores the program specifications in this library. If you do not specify a user library, DFU stores the specifications in the library you are currently using.

> *Note:* You can also change the DFU specification source member name and library name on the source save display when program setup is complete.

Master File Display

> This display is shown only when you specify a related master file name on the List procedure display.

```
              MASTER FILE INFORMATION

         Description of the data in the master file CUSTMST


Name of the source member
  containing the master file description . . . . . . . . . . .

Field name in the list file used as
  a key to select master records . . . . . . . . . . . . . . .
```
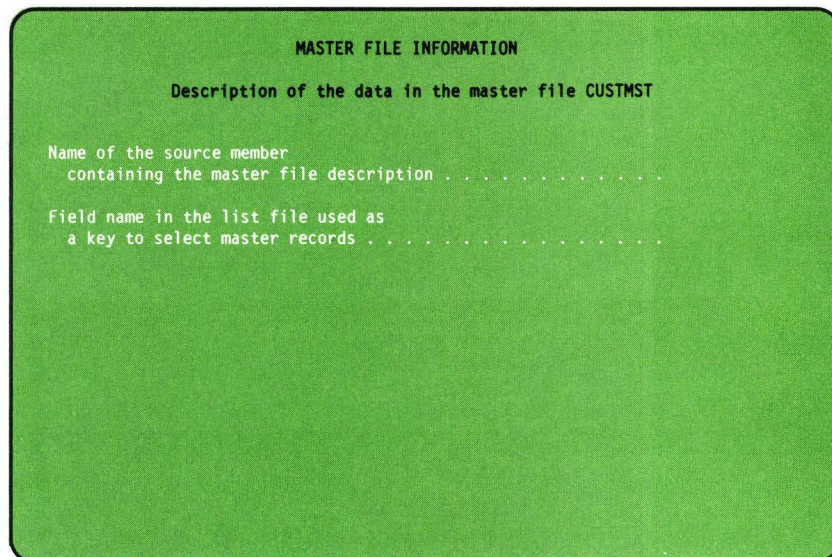
Name of the source member containing the master file description

> This is the name of the source member that contains the file description that describes the master file.

> If you specified a user library on the procedure display, the master file description must be stored in that same library. If you did not identify a user library, DFU searches the library you are currently using.

Field name in the list file used as a key to select master records

This is the name of the field in the file you are going to print that will be used as a key to select records from the indexed master file.

Data from the master file can then be printed, used as factors in a result field, or as control fields.

If using non-contiguous keys, the transaction file must include a field containing the composite key of the master file. Specify this field name here. (In this case, the field length must be the total length of the composite key.)

General Information Display

This display asks you for information on how you want the file to be displayed and printed when you run the program.

```
            LIST GENERAL INFORMATION

         Description of printout for index files

Job title . . . . . . . . . . . . . . . . . . .    STATE LIST/PHONE SURVEY

How do you want the data printed? . . . . . . . . . . .  1,2,3
   1. Record list
   2. Summary list, with detail printing
   3. Summary list, without detail printing

Print the record key first before the record data?  . . . . N,Y

Spaces between columns of printed data . . . . . . . . . . 0-9

Printer line spacing  . . . . . . . . . . . . . . . .   1,2,3
   1. Single space
   2. Double space
   3. Triple space

Printer line width  . . . . . . . . . . . . . . . .   60-198

Stop printer on unprintable characters? . . . . . . . . . . N,Y
```
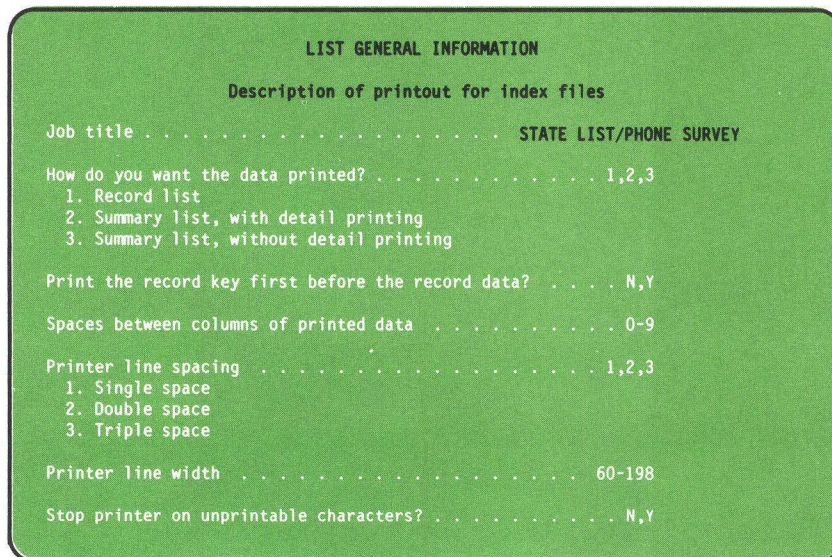
Job Title

Specifies the title that appears on the printed output for this job. You can enter a maximum of 24 characters for the name. An entry in this field is optional. If no title is entered, the printed output will have no title.

How do you want the data printed?

1. Record List.

   This is a printout of all the selected records. A separate heading is printed for each record type. Record types are determined by record identification codes specified on the I-specification for the file you want printed. As each record is read from the file, its record type is determined. If the record type has changed from the previous record, or the record is the first on a new page, the heading for that record type is printed. The selected fields for that record follow the heading.

2. Summary List with Detail Printing.

   This is a printout of all the records in the file along with any totals. Headings for the record type are printed whenever the record type has changed from the previous record, a new page is started, or a control field has changed, causing totals to be printed. Each record is read, edited, and printed. If the record does not contain all fields to be listed, blanks are printed in the missing fields.

3. Summary List without Detail Printing.

   This is a printout of only headings and the field totals. Totals are printed for the selected fields whenever the control field changes.

Print the record key first before the record data?

This prompt is only shown for indexed files.

Y indicates the record key will be printed as the first field of each data line.

N specifies the record key will not be printed as the first field of each data line (although it can be specified as one or more of the list fields later on the Data Field Specification display).

Print the record number first before the record data?

This prompt is only shown for direct or sequential files.

Y indicates the record number will be printed as the first field of each data line.

N specifies the record number will not be printed as the first field of each data line (although it can be specified as one or more of the list fields later on the Data Field Specification display).

Spaces between columns of printed data

This specifies the number of spaces that will be left between the fields on the printout. You can specify 0 through 9 spaces. If you leave this blank, DFU puts one space between the fields.

Printer line spacing

You can specify single, double, or triple spacing between records on the printout. Single space means no blank lines are left between lines of data. Double spacing means one blank line is left between lines of data, and triple spacing means two blank lines are left between lines of data.

Printer line width

You can specify 60 through 198 character positions in the printer line width. However, lines wider than 132 positions require special consideration. For more information, see *Printing Records* in Chapter 7.

Stop printer on unprintable characters?

Y indicates that the printer will stop and a system message will be issued when characters that cannot be printed are in the data to be printed.

N indicates that the printer will not stop when these characters are in the data to be printed. Instead, DFU prints blanks in those positions.

Record Key Description Display

The file definition specifies which field is the key field for this file. DFU locates the key field and asks you for a heading for this field.

```
                        RECORD KEY DESCRIPTION

                   Description of the record key

                   *FILE    CUSTMAST    256
                   *KEY                   8       9
            01     *RECORD
                        ARCOD           1       1
                        CUSNO           8       9
                        CUSNM          25      34
                        CUSA1          25      59
                        CUSA2          25      84
                        CUSA3          25     109
                        STATE           2     111


   Record key heading . . . . . . . . . . . . . . . . .  CUSTOMER NUMBER

   Is the record key numeric?  . . . . . . . . . . .  Y,N
```

Record key heading

This specifies the heading for the record key. The maximum length is 16 characters. If you do not enter a heading for this field, DFU displays *KEY.

Is the record key numeric?

Y indicates that the record key is a positive numeric field with no decimal positions.

N indicates that the record key is alphameric.

You must enter a response to this prompt.

Considerations for Record Key

You can specify that DFU prints the record key as the first field in each record. For indexed data files, the actual record key is printed. Specifications of fields within the record key, as in enter/update or inquiry, are not allowed in list. Any fields defined on the RPG input specifications, including fields which are part of the record key, can be named as one of the fields to be listed.

Record Number Description Display

This display is shown when you are using a sequential or direct file and you requested on the General Information display that you want the record numbers printed.

```
                        RECORD NUMBER DESCRIPTION              Optional-*

                     Description of the record number

                     *FILE   FILE      256
            01       *RECORD
                     *CODE    C     H           1
                              CODE      1        1
                              CUSTNO    5.0      6
                              ORDNO     6.3     12
                              CUSORD    5       17
                              DATE      6       23
                              SHPTO     2       27
                              SHPVIA    48      75

  Record number heading . . . . . . . . . . . . . . . . . . . *RECNUM

  Record number print option . . . . . . . . . . . . . . 1,2
    1. Actual record number
    2. DFU generated sequence numbers
```

Record number heading

This specifies the heading you want printed. You can enter a maximum of 16 characters for this name. If you do not enter a heading, DFU uses *RECNUM as the heading.

Record number print option

When you enter a 1, the actual record number of the detail record being printed will be printed as the first field of that record. This field is 7 characters long.

When you enter a 2, DFU generates a 5-digit sequence number and prints that number as the first field for each detail record.

Considerations for Record Number

You can specify that DFU will print the record number as the first field in each record. For sequential or direct files, you can specify that DFU print the actual record number of the record in the file, or generate a 5-byte sequence number starting at 00010 and increasing the number by 10 for each following record.

Note: The generated sequence number has no relation to the record's position in the file.

Record Type Selection Display

This display follows the Record Number or Record Key Description display. This display allows you to indicate whether you want this record type processed. The record type is shown in the upper right corner of the display. As many fields as possible are displayed from this record type at the top of the display.

```
                    RECORD TYPE SELECTION            Record type: 01

            Selection of record types to be processed


        01        *RECORD
                           ARCOD        1      1
                           CUSNO        8      9
                           CUSNM       25     34
                           CUSA1       25     59
                           CUSA2       25     84
                           CUSA3       25    109
                           STATE        2    111
                           ZIPCD   P   9.0   116
                           AREAC   P   3.0   118



      Process this record type? . . . . . . . . . . . . . . . . . Y,N  Y
```

Process this record type?

Y indicates that the record type is to be printed. This display will be repeated for every defined record type.

N indicates that the record type is not to be printed. If there are more record types in the file, this prompt will be repeated for the next defined record type.

Data Field Selection Display

This display allows you to select which fields for each record type you want printed when the program is run. Only the fields you select will be printed.

```
                    DATA FIELD SELECTION                    Record type: 01
                    Fields to be printed
        01    *RECORD
                            ARCOD        1        1
                            CUSNO        8        9
                            CUSNM       25       34
                            CUSA1       25       59
                            CUSA2       25       84
                            CUSA3       25      109
    + Result field          STATE        2      111
    * Continue heading      ZIPCD   P   9.0     116
                            AREAC   P   3.0     118

    Data field         Heading              Functions:  A=Accumulate
      STATE                                             Z=Blank if zero
      CUSNM            CUSTOMER NAME
      AREAC            AREA CODE
      PHONE            PHONE NUMBER
      SLSLY            SALES LAST YEAR          A
```

If you enter data fields and press the Enter key, DFU will redisplay the Data Field Selection display for more fields *unless* the maximum of 60 fields (including the record key or record number) have already been specified.

Note: For any record type, only as many fields as will fit on 16 print lines can be processed at one time, up to a maximum of 60 fields (including any record key or record number fields).

Data Field

Field name indicates that the field is to be printed. The field can be from the master file.

A + indicates that this field is a result field.

An * indicates that the heading is to be continued on another line. An * is not allowed on accumulated fields or on the first input line.

Only heading continuation lines can follow a result field request.

Heading Continuation (Record List)

Continuation headings cannot be specified if the record list field is also to be accumulated. As many as two continuation headings can be specified for any other field. You must align the headings as they are to appear when printed. Functions cannot be specified on a heading continuation line.

Heading Continuation (Summary List)

Up to two heading continuations can be specified for each summary list field. You must align the headings as they are to appear when printed. A heading continuation is not allowed on accumulated fields in a record list or on the first input line.

Heading

This specifies the heading for the field. You can enter a maximum of 16 characters for the heading name. If you do not enter a heading, DFU uses the name of the field from the file definition or *RESULT if the field is a result field.

No default is assumed when using heading continuations.

A indicates that the field is to be accumulated.

Z indicates that the field will be printed as blanks whenever it has a zero value. Z can only be used for a numeric field.

Up to ten fields can be specified, during program setup, to be accumulated. If the same field name occurs in different record types, the value of the fields in all the record types used are totaled in one field. Any numeric field can be accumulated; alphameric fields must be less than 16 characters to be accumulated. Unpredictable results can occur when a field to be accumulated contains alphameric data.

DFU calculates the accumulator length to be the length of the accumulator field plus 2 positions to a maximum of 15 positions. For packed fields, the length used is the length of the accumulator field when it is unpacked. Accumulated values larger than the calculated target cause the fields to overflow.

Data Field Display Considerations

You can enter one field per line, up to the last line on the display. Enter the responses as shown and press the Rec Adv command key (Cmd 12). The data field specifications are considered complete for this record type.

If you enter a + under FIELD to indicate a result field, DFU processes any fields prior to the + and then prompts you on the next display for the result field description. You can request only one result field at a time and it must be the last field requested on that display.

If you want a heading to continue on more than one line, enter an * under the corresponding field to indicate a continuation, and then type the heading under HEADING.

If you press either the Enter key or the Rec Adv Cmd key (Cmd 12) without typing in data, the data field prompting ends for this record type.

Note: When you enter data fields and press the Enter key, DFU will redisplay the Data Field Selection display for more fields *unless* the maximum of 60 fields (including the record key or record number) has already been specified.

Result Field Specification

A list program can create and print result fields. Result fields are created by combining information from fields in a record, and/or operator-specified constant data. The fields can be in the list file or a related indexed master file.

```
                      RESULT FIELD SPECIFICATION
         Calculation combines fields and constants with '+', '-', '*', '/'

         01        *RECORD
                              ARCOD        1         1
                              CUSNO        8         9
                              CUSNM       25        34
                              CUSA1       25        59
                              CUSA2       25        84
                              CUSA3       25       109
                              STATE        2       111
                              ZIPCD   P   9.0      116
                              AREAC   P   3.0      118

   Result field Heading:     INTEREST


   Result field name . .     MOINT
   Field length  . . 0-15    6
   Decimal position . 0-9    2
   Calculation . . . . .     AMDUE * .01
```

For any detail record, you can specify a maximum of 24 result fields to be printed; the maximum number of factors used in the calculations is also 24. Mathematical operations can be specified to combine information into a result field. One level of parentheses can be used to group factors in a mathematical expression. The generated result field can be named and used as a factor in succeeding result fields for the current record.

Any result field can be specified as one of the 10 accumulator fields. Subtotals and final totals are printed as on a normal list. A result field operand cannot exceed 15 positions. If a divide by zero occurs when the program is run, slashes (/) are printed for the result. If the factors of a result field calculation contain nonnumeric data, the results of the calculation are unpredictable.

Result field heading

This is the heading you specified on the previous Data Field Selection display.

Result field name

This indicates that the result of the calculation you specify on this display can be used as a factor in later result fields for this record. This name cannot be the name of a field in a record type being listed.

If you do not enter a result name, the result of this operation will not be used in later result fields. For example, if this is a subtotal and you do not enter a result name, the subtotal will not be used for a final total.

Field length

This indicates the length of the result field. It can be up to 15 characters long.

Decimal position (0-9)

This indicates how many decimal positions there will be in the result field. You can have a maximum of 9 positions.

Calculation

You must enter an arithmetic expression that describes how the fields or constants are to be combined for the result.

For example:

```
PRICE * QTY      (price multiplied by quantity)

PRICE * 10

(PRICE * QTY) * 10
```

How To Do This Calculation

The rules for specifying this calculation are:

1. DFU will process the factors in the exact order they are specified. Except for parentheses, all operations are performed left to right (see rule 4).

   ```
   Thus if A = 1, B = 2, C = 3
   A + B * C = 9
   Then A + (B * C) = 7
   ```

   Note: A result field operand cannot exceed 15 positions.

2. An arithmetic operation code must have at least one blank before and after it.

3. A negative numeric constant is indicated by placing a minus sign directly after the last digit (or possible decimal point) in the constant; there can be no intervening blanks.

4. Factors can be grouped with only one level of parentheses (thus a left parenthesis must have a right parenthesis before another left parenthesis can be specified).

5. Factors can be: a field from the input file, a field from a master file, a previously named result field from the current record, or a numeric constant.

6. The mathematical expression can be up to 137 characters long.

7. Twenty-four result field factors can be specified during program setup for each detail record printed in a list. These factors can be specified in any manner. For example, one record could have 24 result fields of one factor each, or 12 result fields of two factors each.

Result Field Rounding

DFU calculates all result fields using as many significant digits as possible. Once the result is determined, the field is shortened to the number of decimal positions you specified. If you want the result to be rounded upward, specify an add of some power (one decimal position larger than the desired position) of ten times 0.5 for your last calculation. For example:

```
  1.4451    DFU calculation.
+  .005     You specified this add for your final calculation
            (to be rounded up to 2 decimal positions).
  _____
  1.45      This is the result of DFU shortening and
            rounding your number upward.
```

Note: This method to round upward will not work with negative results.

Result Field Precision

When adding or subtracting, DFU determines which of the two factors involved has the greatest number of decimal positions, and then carries the results out to that number of decimal positions. For example:

```
  1.0               1.253
- .999            + 3.8
  _____             _____
  0.001             5.053
```

When multiplying, DFU carries out the results to the sum of the decimal positions in the two factors. For example:

```
  1.25
x 1.2
  _____
  1.500   Result is carried out to 3 decimal positions.
```

When dividing, DFU carries out the results to the largest number of decimal positions in a factor encountered up through the division operation, or the number of decimal positions indicated on the specification display (whichever is the largest). For example: Assume you specified that the final result is to print with 1 decimal position.

```
                    10.2 * 12 / 5 + .05
Multiply:           10.2 * 12 = 122.4
Divide:             122.4 / 5 = 24.4
Add:                24.4 + .05 = 24.45
```

Thus, the final result is = 24.4.

Assume the factors are the same but specified as:

```
                    .05 + (10.2 * 12 / 5)
Add:                0 + .05
Multiply:           10.2 * 12 = 122.4
Divide:             122.4 / 5 = 24.48
Add:                .05 + 24.48 = 24.53
```

Two decimal positions are used because .05 was used first in the calculation.

Thus, the final result is = 24.5. Notice this result is different from the first result because the order of the factors was changed, causing DFU to encounter a different number of decimal positions in the first factor used.

Sort Field Selection

You specify on this display the order in which records are to be sorted. The fields
will be sorted in the order you enter them. The first field you enter will be sorted
first, the second field sorted second, and so on.

```
                    SORT FIELD SELECTION

           Order in which records are to be sorted
           Field entered first will be sorted first

                *FILE    CUSTMAST   256
                *KEY                  8        9
           01   *RECORD
                          ARCOD       1        1
                          CUSNO       8        9
                          CUSNM      25       34
                          CUSA1      25       59
                          CUSA2      25       84
                          CUSA3      25      109
                          STATE       2      111

           Sort field              Sequence:   A=Ascending
             STATE                     A        D=Descending
             CUSNM                     A
                                       A
                                       A
                                       A
```

Sort Field

This is the name of the fields you want to use for the sort. A maximum of five
entries is allowed. These fields cannot be selected from the master file.

Sequence

A is for ascending order (1 through 10).

D is for descending order (10 through 1).

Considerations for Sort

If you type in fields, then press the Enter key, DFU saves those fields and
prompts you for more (unless five sort fields have been specified). But if you
press the Rec Adv command key (Cmd 12), the sort selections will be considered
complete.

If you press the Enter key or the Rec Adv command key without typing in data,
the sort field prompting ends, and records will not be sorted before being printed.
If you specified SORT on the first setup display, at least one sort field must be
specified. If you specified NOSORT, any entries on this screen will cause an
error. Press Cmd 12 or ENTER to bypass this screen.

A maximum of 256 characters can be sorted. For example, five fields of 60
characters each will cause an error.

Control Field Selections

Specifying a control field causes a break (or blank line) in the printout. Whenever DFU finds a control field, a blank line is left in the printout and totals, or subtotals are printed for any accumulated fields.

```
                        CONTROL FIELD SELECTION

            Description of the field that causes subtotals to printed
                Field entered first will be subtotaled first

                    *FILE    CUSTMAST    256
                    *KEY                   8        9
        01          *RECORD
                      ARCOD      1        1
                      CUSNO      8        9
                      CUSNM     25       34
                      CUSA1     25       59
                      CUSA2     25       84
                      CUSA3     25      109
                      STATE      2      111

        Control break field                  Start new page? (Y,N)
                STATE                                 N
                                                      N
                                                      N
                                                      N
                                                      N
```

Control break field

This specified field becomes the control field. You can enter a maximum of five control fields.

Start new page? (Y,N)

Y indicates that DFU skips to a new page after a control break occurs in this field.

N indicates that DFU does not skip to a new page.

Considerations for Control Fields

Up to five fields can be specified during program setup to be control fields. These control fields, along with accumulator fields, give group totals for a series of related records. A control field can be a field in the list file or a related indexed master file. The first control field specified is the first field to be subtotaled; the second control field is subtotaled second, and so on.

Whenever a control field value changes, a total is printed for each level of the control fields. The first line printed is the lowest level, and each succeeding line printed contains the next higher level, up to the major control field.

Each subtotal printed is added to the previous total and the accumulator is reset to zero. There can be up to five subtotals plus a final total for all the records. For each control break line, a number of asterisks (*) is printed to the right of the last field on the line. The first control field will have one asterisk printed, the second control field will have two asterisks printed, and so on.

When you specify a control field, you can also indicate if DFU should skip to a new page after that control field changes value when the program is run.

You can specify one control field per line, up to and including the last line. If you then press the Enter key, DFU saves those fields and prompts for more (unless five levels of fields have been specified). If you press the Rec Adv command key (Cmd 12), the control field specification will be considered complete.

If you press the Enter key or the Rec Adv command key (Cmd 12) without typing any data, the prompting ends and no control fields are generated.

Record Selection Test

These are conditions that must be satisfied before a record is selected for printing.

```
                         RECORD SELECTION TEST
         Conditions that must be satisfied for a record to be printed
                         *FILE    CUSTMAST   256
                         *KEY                  8       9
             01          *RECORD
                              ARCOD           1       1
                              CUSNO           8       9
                              CUSNM          25      34
                              CUSA1          25      59
                              CUSA2          25      84
                              CUSA3          25     109
                              STATE           2     111
     OR/AND          Test field      EQ/NE/GT/LT/GE/LE       Compare field/'CONSTANT'
```

Or/And

This tells DFU how the next selection test is related to the last test.

OR indicates only *one* of the conditions (or selection tests) must be met for the record to be printed.

AND indicates *both* conditions must be met for the record to be printed.

Test Field

This is the field that is to be tested. The field cannot be a field from the master file or a result field.

The field name specified should appear in each record type associated with this condition.

If the field name specified does not appear in a particular record type, this record and any test conditions connected to it with an AND condition are ignored when DFU processes that record type.

EQ: Equal to the compare value
NE: Not equal to the compare value
LT: Less than the compare value
GT: Greater than the compare value
LE: Less than or equal to the compare value
GE: Greater than or equal to the compare value

Compare field CONSTANT

DFU compares the selected field to this value. A field cannot be from the master file and cannot be one of the named result fields. A constant must be entered in single quotes ('CONSTANT'). The maximum length of a constant is 20.

A field name indicates that the select field will be compared to another field in the record.

The field name specified should appear in each record type associated with this condition. If the field name specified does not appear in a particular record type, this record select criteria and any other connected to it with an AND condition are ignored when processing that record type.

A constant indicates that the select field will be compared to the constant data.

Note: Constants can only be entered in uppercase. Do not compare a constant to a field containing lowercase data.

A date keyword indicates the select field is compared to the current program date, or a portion of that date (UDATE = date, UYEAR = year, UMONTH = month, UDAY = day).

Note:

1. For UDATE, the field in the record to be checked must be in the same format as the stored program date (MMDDYY, YYMMDD, or DDMMYY).

2. DFU does not rearrange data in descending order of importance for UDATE comparisons. Thus, if the stored program date is not YY/MM/DD (year/month/day), any compare criteria other than an EQ (equal) and NE (not equal) can give unpredictable results.

You can define one record selection criterion per line, up to and including the next to the last line on the display. If you then press the Enter key, DFU saves those fields and prompts you for more (unless 10 fields have been defined). If you press the Rec Adv command key (Cmd 12), the select field specifications are considered complete.

If you press the Enter key or the Rec Adv command key (Cmd 12) without typing in data, DFU ends this prompt and there is no record selection based on field value.

Update DFU Specifications

The program setup is now complete and this display lets you review the DFU program specifications before the program is created.

```
                         UPDATE DFU SPECIFICATIONS
                        Changes to DFU specifications

                  Field1  Field2  Field3  Field4  Field5
?=Remove line             *LIST   *RECORD
>=Add lines               *KEY
                  5,1  132*TITLE   STATE LIST/PHONE SURVEY
Press the Enter key to  01  *RECORD
   accept changes             *       STATE   STATE
                              *       CUSNM   CUSTOMER NAME
                              *       AREAC   AREA CODE
                              *       PHONE   PHONE NUMBER
                              *ADD    SLSLY   SALES LAST YEAR
                              *SORTA  STATE
                              *SORTA  CUSNM
                              *TOTAL  STATE




Cmd7-End program setup
```

To change any of the data, move the cursor to the field you want to change and type the correct data.

To delete a line of data, move the cursor to the line you want to remove and type a question mark (?) in the first position of Field 1. Press the Enter key and DFU removes the line.

To add a line of data to the specifications, move the cursor to the line you want the new data to follow and type a greater than sign (>) in the first position of Field 1. The following display allows you to enter the new DFU specifications.

Add DFU Specifications

This display allows you to add DFU specifications. It is displayed only when you type a > in the first position of a DFU specification line.

```
                          ADD DFU SPECIFICATIONS
                        Additions to DFU specfications

                  Field1  Field2  Field3  Field4  Field5
 Press the Enter key to           *       CUSNM   CUSTOMER NAME
 accept additions                         CRLIM   CREDIT LIMIT















 Cmd7-End program setup
```

Enter one specification per line. If you press the Enter key, DFU adds the new specification and returns you to the Update DFU Specifications display. If you fill every line of the Add DFU Specifications display, the display is repeated for more additions.

Correct DFU Specifications

This display is shown only when DFU finds an error in the DFU specifications. If an error is found in the specifications, DFU highlights the error and the cursor is moved to the error. An error message is displayed on the last line of the display to identify the error.

```
                          CORRECT DFU SPECIFICATIONS
                        Corrections to DFU Specifications

                    Field1  Field2  Field3  Field4  Field5
?=Remove line                       CRLIM   CREDIT LIMIT
>=Add lines                 *ADD    AMDUE   AMOUNT DUE
                            *       DLTPM   DATE LAST PAYMNT
Press the Enter key to      *K      SLSNO   SALESMAN NUMBER
  accept changes




Cmd7 -End program setup
Cmd12-Accept with error
Cmd19-Cancel setup

DFU-0115 Invalid operation code in field 2
```

If the error is a syntax error, the highlighted specifications containing the error must be corrected or deleted to continue.

When a required specification is missing, the specification in its place is highlighted. For some errors, several specifications may together be causing the error. Only one of the specifications is highlighted at a time. Refer to the *Utilities Messages* guide for more information.

You can press the Accept with Error command key (Cmd 12) and DFU will save the DFU specifications as a source member, but will not create the program. DFU will continue with the next display (the Source Save display).

DFU Program Source Save Display

This display allows you to name the source member that will contain the DFU program specifications. If you pressed the Cmd 12 key on the earlier display, DFU allows you to save the specifications for later update and use. If you pressed the Cmd 7 key on the earlier display, DFU will create and run the program.
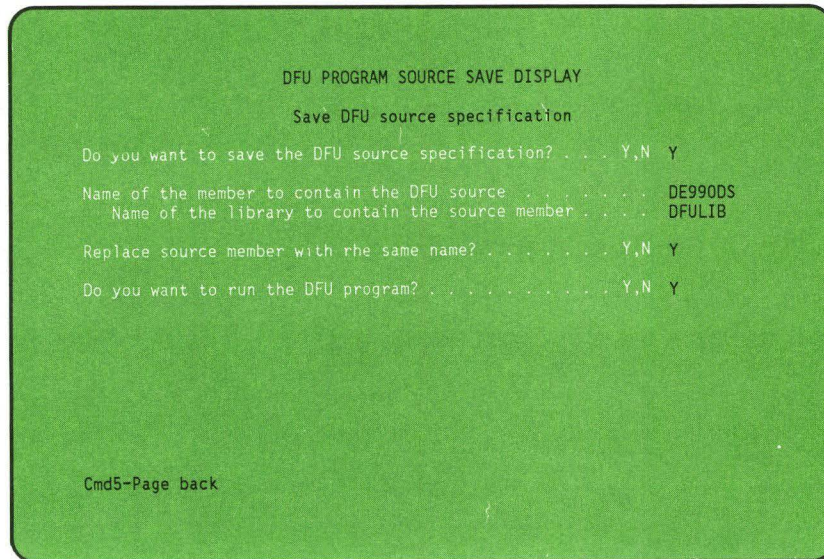
```
                    DFU PROGRAM SOURCE SAVE DISPLAY

                     Save DFU source specification

Do you want to save the DFU source specification? . . . Y,N  Y

Name of the member to contain the DFU source . . . . . .     DE990DS
   Name of the library to contain the source member . . .    DFULIB

Replace source member with rhe same name? . . . . . . .  Y,N  Y

Do you want to run the DFU program? . . . . . . . . . .  Y,N  Y







Cmd5-Page back
```

Do you want to save the DFU source specifications?

Enter Y or N to tell DFU if you want to save the source for this program.

If you want to save the source, enter Y. You can use the source for a similar program and avoid the setup procedure by updating the source.

If you do not want DFU to save the source for this program, enter N.

Name of the member to contain the DFU source

You can enter up to eight characters for a member name. The name you specified on the DFU procedure display when setting up this program is displayed for you. You can change the name displayed and DFU will store the source member under another name.

Enter a new name if you have used an existing source member to create a second program. The original source member is still saved under the original name and the new, updated source member is saved under the new name.

Name of the library to contain the source member

> Enter the name of the library where DFU is to store the source member. The name of the library you are currently using is displayed for you. You can change the library name if you want to store the member in another library.

Replace source member with the same name?

> Enter a Y if you want this source member to replace an existing source member by the same name in the library.
>
> Enter an N if you do not want the new source member to replace an existing member in the library.
>
> You should enter an N if you are not sure if there is another source member in the library with this name. If DFU finds another member by the same name, an error message is displayed and the source member name is highlighted. You should then change the member name or change your response to this prompt to Y.

Do you want to run the DFU program?

> This prompt is only shown if you pressed the Cmd 7 key on the Update DFU Specifications display.
>
> If you enter a Y, DFU will create the program and then run the program.
>
> If you enter an N, DFU will create the program and end the job. The program is stored as a subroutine member in the library you specified.

Updating DFU Specifications

Setting up the program is now complete; the following display appears so that you can update the DFU specifications before running the report. You can review the specifications to make sure they are correct.

Chapter 7 describes how to update the DFU specifications.

```
                              UPDATE DFU SPECIFICATIONS
                             Changes to DFU specifications

                        Field1  Field2  Field3  Field4  Field5
   ?=Remove line                *LIST   *SUMMARY*DETAIL
   >=Add lines                  *KEY    *NUMERICCUSTOMER NUMBER
                        5,1 132*TITLE   SUMMARY LIST WITH DETAIL
   Press the Enter key to  01   *RECORD
     accept changes             *       CUSNM   CUSTOMER NAME
                                *ADD    AMDUE   AMOUNT DUE
                                *SORTA  AMDUE
                                *SELECT AMDUE   GT
                                        50.00








   Cmd7-End program setup
```

There are no corrections to make to the specifications, so press the End-of-Job command key (Cmd 7) to continue. The next display is the DFU Program Source Save display.

Chapter 7. Attention Operators

After following the examples in earlier chapters, you may have some general questions about DFU. That's what this chapter is for. It will answer such questions as:

- What's at the top of the display?

- What about the program information; how do I save it, why and where is it saved?

- How can I change a program: before it's stored and after?

- What are the function keys used by DFU?

- What are the command keys used by DFU? How can they help me look at the DFU attributes and specifications?

- How can I page through the records?

- What about printing my records?

At the Top of the Display

The two lines at the top of the display (below the status line) contain the information about your job. This data is for your information only; you cannot type over this information except to change the current record type.

Although the information displayed on these two lines will vary depending on how you are using DFU, it will be similar to the following:

6 Automatic Duplication Indicator

4 Record Type   **5** Last Record Type

1 Job Title   **2** Name of File   **3** Mode

```
   UPDATING CUSTMST              Filename: CUSTMST           Mode: UPDATE
Record type: 01              Last record type: 01           Auto-dup: OFF
RECORD KEY IS: 00030

CUSTOMER NAME      Gladwin & Sons Inc
CREDIT LIMIT       0065000
AMOUNT DUE         000008500
DATE LAST PAYMNT   0071482
SALESMAN NUMBER    48224
```
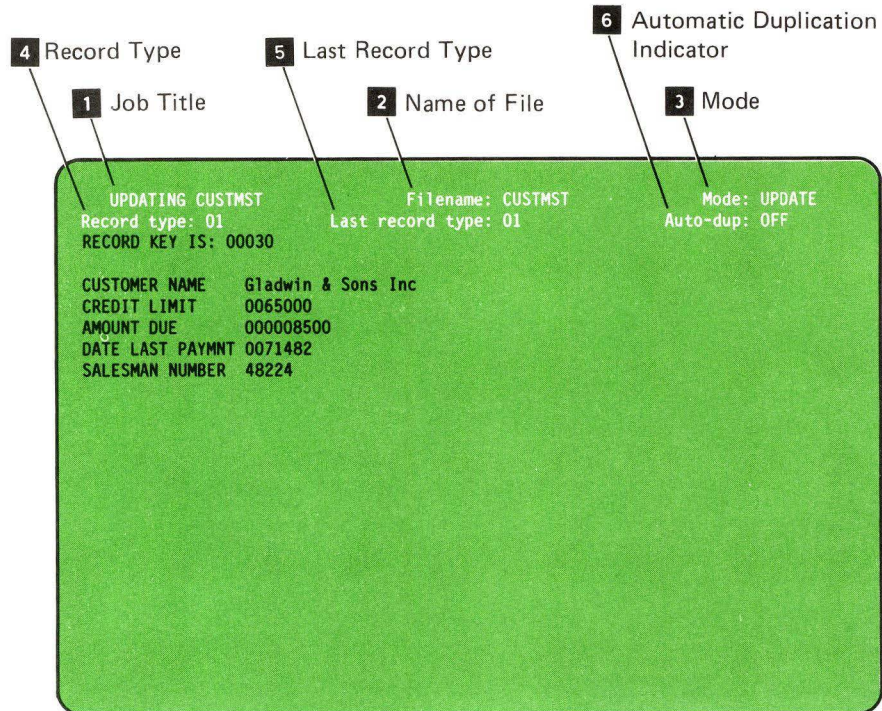
Job Title ■1

This is the job title you specified on the General Information display. This title also appears on any printout for the job.

Name of File ■2

This is the name of the file being used.

Mode ■3

Enter and update can operate in three different modes. (See Chapter 4 for details when using enter or update.)

Enter: a new record is being created

Update: an existing record is being changed

Insert: a new record is being added

Record Type ■4

This is the record-identifying indicator of the record type being processed. You can change this value by typing a new value after moving the cursor to this field. Pressing the Select Record Type command key (Cmd 3) moves the cursor here when automatic record sequencing is not in effect.

Last Record Type ■5

This is the record-identifying indicator of the last record type processed. It is blank for the first entry processed. It is also blank if a record is retrieved while DFU is in update mode and unable to determine the record type.

Automatic Duplication Indicator ■6

This field is either on or off to indicate whether automatic duplication is in effect. You can change this field by pressing the Auto Dup command key (Cmd 1).

Saving Information About Your Program

DFU takes your responses to all the displays and creates a description of the program called *DFU specifications*. As Chapter 1 explained, once you have supplied a complete program description, DFU takes the DFU specifications and combines them with the file definition you identified on the Procedure display to create the DFU program that allows you to do your job.

As you describe the DFU program you are also defining what you will see on the display when the program is used. DFU automatically creates another source member of specifications describing the display formats for the program. These specifications are called the *display source*.

The following shows you which members are created by DFU from information you supply on the Procedure display:

If you supply a name for this.

DFU creates these members, using that name.

```
                          ENTER PROCEDURE                        Optional-*

                          Creates data files


Name of file to be created  . . . . . . . . . . . . . . . . . . . .
    Name of file on disk, if different  . . . . . . . . . . . .*

Name of DFU program . . . . . . . . . . . . . . . . . . . . .* Subroutine and
                                                               Load Member

Number of records to be in file . . . . . . . . . . . 1-8000000

Name of library . . . . . . . . . . . . . . . . . . . . . . . DFULIB

Name of file definition source member . . . . . . . . . . . .

Name of DFU specification source member    . . . . . . . . .* Source Member

Name of display source member, if to be saved . . . . . . . .* Source Member



Cmd3-Previous menu


                                              (c) 1985 IBM Corp.
```

*For Enter, Update and Inquiry Only

Your Program Won't Be Saved If You Don't Give It a Name

If you want to save information about your program for later use, you must supply a name when you are prompted for it on the Procedure display.

Why Save the DFU Program?

When you have a program that is run regularly, such as a weekly report, there is no need to set up the program each week. Or, if you have a program that created a file, you can use the same program to update or list the file. If you save the program the first time you set it up, it can be used by other people for several jobs as long as the files are set up the same.

Why Save DFU Specifications?

DFU specifications can be used for similar programs, if they are tailored for the particular need of each program. For example, assume that each of three departments has a department list, updated monthly, that has the employee name and phone number. However, one of the departments also wants to include a field for the employee's job title. If you save the DFU specifications when you originally set up the program for the department list, you can change this source member to tailor it to the third department's needs. The third department would use the new program.

Display Source Member

If you supplied a display source member name on the Procedure display, these specifications are stored as a source member and can be changed if necessary. Refer to "Changing Stored Display Source" in Chapter 10 before making any changes.

How to Change DFU Specifications

DFU specifications are the source member for a DFU program. The specifications can be changed before or any time after the program is created (if you save the specifications).

At the end of program setup, DFU displays the specifications for your review; you can make changes at that time.

Later, if you want to create another similar program, you can call out the DFU program specifications, change them to fit the new program, and restore the changed specifications for the new program under a new name. See "Reusing DFU Specifications" in Chapter 10 for more details.

Whenever you change the specifications, the changes are made the same way. During the original program setup, DFU displays the specifications at the end of the setup. When you are using existing specifications to create a new program, you must identify to DFU the existing DFU source member which contains the specifications. DFU displays the specifications as if you were at the end of program setup.

The following is an example of what you enter to use existing specifications:

```
                        LIST PROCEDURE                  Optional-*

            Sorts and prints data files in various formats


     Name of file to be printed . . . . . . . . . . . . . . . . . .   CUSTMAST
          Name of file on disk, if different . . . . . . . . . . .              *

     Name of DFU program . . . . . . . . . . . . . . . . . . . . .   NEWNAME    *

     Sort File . . . . . . . . . . . . . . . . . . . . NOSORT,SORT   SORT

     Name of master file . . . . . . . . . . . . . . . . . . . .                *

     Name of library . . . . . . . . . . . . . . . . . . . . . . .   DFULIB

     Name of file definition source member . . . . . . . . . . . .   LISTSRC

     Name of DFU specification source member . . . . . . . . . . .   DE903DS    *



     Cmd3-Previous menu      Cmd4-Put on job queue          (c) 1985 IBM Corp.
```

DFU locates the existing source member and displays the specifications associated with the DFU program like this.

Correcting Specifications

```
                         UPDATE DFU SPECIFICATIONS
                        Changes to DFU specifications

                    Field1  Field2  Field3  Field4  Field5
?=Remove line               *LIST   *SUMMARY
>=Add lines                 *KEY
                    1,1  132*TITLE   SUMMARY LIST/NO DETAIL
Press the Enter key to 01   *RECORD
  accept changes            *       CUSNM   CUSTOMER NAME
                            *       CUSNO   CUSTOMER NUMBER
                            *ADD    AMDUE   AMOUNT DUE
                    10.2    *ADD    +MOINT  TOTAL INTEREST
                    ADD             AMDUE
                    MULT            .01
                            *SORTA  CUSNO
                            *TOTAL  CUSNO
                            *SELECT AMDUE   GT
                                    50.00



Cmd7-End program setup
```

When the specifications are displayed, move the cursor at the field you want to correct and make the correction. For example, change AMOUNT DUE to TOTAL AMOUNT DUE, then press the Enter key.

```
                         UPDATE DFU SPECIFICATIONS
                        Changes to DFU specifications

                    Field1  Field2  Field3  Field4  Field5
?=Remove line               *LIST   *SUMMARY
>=Add lines                 *KEY
                    1,1  132*TITLE   SUMMARY LIST/NO DETAIL
Press the Enter key to 01   *RECORD
  accept changes            *       CUSNM   CUSTOMER NAME
                            *       CUSNO   CUSTOMER NUMBER
                            *ADD    AMDUE   TOTAL AMOUNT DUE
                    10.2    *ADD    +MOINT  TOTAL INTEREST
                    ADD             AMDUE
                    MULT            .01
                            *SORTA  CUSNO
                            *TOTAL  CUSNO
                            *SELECT AMDUE   GT
                                    50.00



Cmd7-End program setup
```

The change is entered.

Removing Lines

If you want to remove a line of data when the specifications are displayed, move the cursor to the first position in Field 1 and type a ? at the line you want to remove. Press the Enter key and DFU removes the line of data. For example, if you want to remove the line containing CUSNO, enter a ? as shown and press the Enter key.

```
                    UPDATE DFU SPECIFICATIONS
                    Changes to DFU specifications

                 Field1  Field2  Field3  Field4  Field5
 ?=Remove line            *LIST   *SUMMARY
 >=Add lines              *KEY
                 1,1  132*TITLE   SUMMARY LIST/NO DETAIL
 Press the Enter key to  01  *RECORD
   accept changes             *       CUSNM    CUSTOMER NAME
                 ?        *       CUSNO    CUSTOMER NUMBER
                          *ADD    AMDUE    TOTAL AMOUNT DUE
                 10.2     *ADD    +MOINT   TOTAL INTEREST
                 ADD              AMDUE
                 MULT             .01
                          *SORTA  CUSNO
                          *TOTAL  CUSNO
                          *SELECT AMDUE    GT
                                  50.00



 Cmd7-End program setup
```

The line of data is removed.

```
                    UPDATE DFU SPECIFICATIONS
                    Changes to DFU specifications

                 Field1  Field2  Field3  Field4  Field5
 ?=Remove line            *LIST   *SUMMARY
 >=Add lines              *KEY
                 1,1  132*TITLE   SUMMARY LIST/NO DETAIL
 Press the Enter key to  01  *RECORD
   accept changes             *       CUSNM    CUSTOMER NAME
                          *ADD    AMDUE    TOTAL AMOUNT DUE
                 10.2     *ADD    +MOINT   TOTAL INTEREST
                 ADD              AMDUE
                 MULT             .01
                          *SORTA  CUSNO
                          *TOTAL  CUSNO
                          *SELECT AMDUE    GT
                                  50.00



 Cmd7-End program setup
```

Adding Lines

If you want to add a line to the DFU specifications, move the cursor to the line after which you want the new line to be added. Type a > (greater than sign) in position 1 of Field 1.

```
                         UPDATE DFU SPECIFICATIONS
                        Changes to DFU specifications

                    Field1  Field2  Field3  Field4  Field5
 ?=Remove line              *LIST   *SUMMARY
 >=Add lines                *KEY
                    1,1  132*TITLE  SUMMARY LIST/NO DETAIL
 Press the Enter key to  01 *RECORD
   accept changes        >     *     CUSNM   CUSTOMER NAME
                              *ADD   AMDUE   TOTAL AMOUNT DUE
                    10.2  *ADD  +MOINT  TOTAL INTEREST
                    ADD           AMDUE
                    MULT          .01
                              *SORTA  CUSNO
                              *TOTAL  CUSNO
                              *SELECT AMDUE  GT
                                     50.00




 Cmd7-End program setup
```

When you press the Enter key, DFU displays an Add DFU Specifications display:

```
                         ADD DFU SPECIFICATIONS
                        Additions to DFU specifications

                    Field1  Field2  Field3  Field4  Field5
 Press the Enter key to       *     CUSNM   CUSTOMER NAME
   accept additions










 Cmd7-End program setup
```

Enter the new specifications as shown and press the Enter key.

```
                    ADD DFU SPECIFICATIONS
                  Additions to DFU specifications

                    Field1  Field2  Field3  Field4  Field5
    Press the Enter key to          *       CUSNM   CUSTOMER NAME
      accept additions              *       AMDUE   TOTAL AMOUNT DUE

 Cmd7-End program setup
```
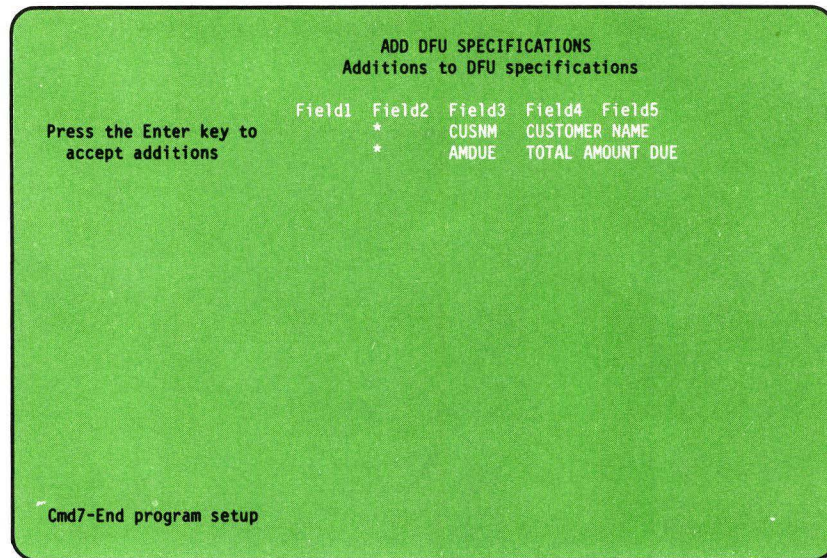
The new specifications are added and changed to fit a new program without your having to go through all the setup displays for a program.

You can save the specifications for the new program as well as the original program. Enter a new name for the source member at the end of the job on the Source Save display.

Note: You can use the roll keys to view all the specifications for this program.

Function Keys

Function keys are located on the keyboard of the display station. The exact layout of the keyboard will depend on the display station you are using.
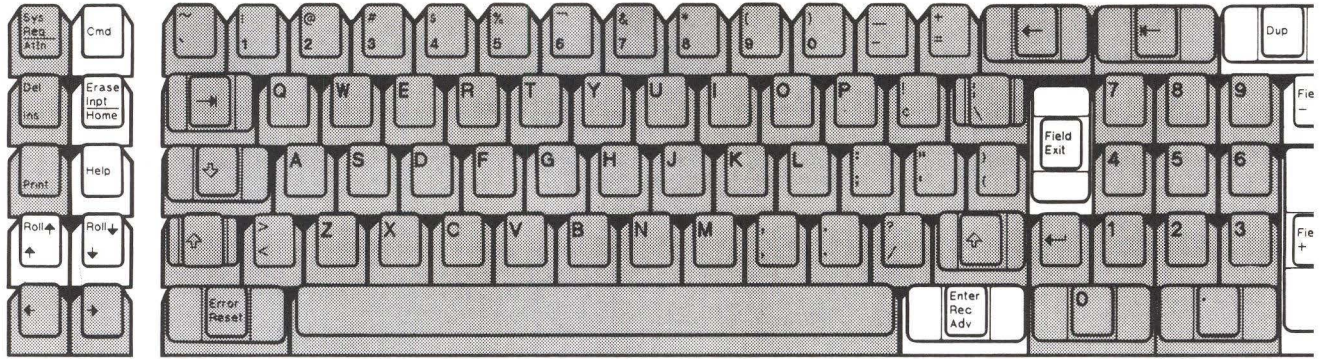
The following describes each function key that is used by DFU.

Cmd Key

Pressing this function key and one of the command keys causes the function of the command key to be performed. (See *Command Keys* later in this chapter.)

Dup Key

The Dup key can be used two ways: to duplicate data while entering data, or to cancel a change in a field while updating it.

Pressing the Dup key when you are entering a record duplicates all or part of a field from the previous record into the field you are entering.

For example, assume you are entering several records of customers whose address is in the same state. When you enter the first record, you enter the state.

```
   ENTER CUSTMSTR                  Filename: CUSTMST              Mode: ENTRY
   Record type: 01            Last record type: 01            Auto-dup: OFF
   RECORD KEY IS: 00080

   CUSTOMER NAME      Currey's Upholstery
   ADDRESS            100 SW Carlton St
   CITY               Plainville
   STATE              KS
   ZIP CODE           000056040
```

When you reach the state field of the second record, you press the Dup key, and the state you entered in the first record is duplicated into the state field of the second record. The display shows an overscored asterisk (⊛) in the positions that will contain data from the previous record and the cursor moves to the next field in the record.

Note: When you are duplicating data in the last field on a display and press the Dup key, you are advanced to the next display.

```
   ENTER CUSTMSTR                  Filename: CUSTMST              Mode: ENTRY
   Record type: 01            Last record type: 01            Auto-dup: OFF
   RECORD KEY IS: 00090

   CUSTOMER NAME      Snider Printing Co.
   ADDRESS            217 2nd St
   CITY               Ridgeway
   STATE              **
   ZIP CODE
```

The duplicated data is actually entered when you press either the Enter or Field Exit key to enter the entire second record.

```
   ENTER CUSTMSTR               Filename: CUSTMST          Mode: ENTRY
   Record type: 01          Last record type: 01        Auto-dup: OFF
   RECORD KEY IS: 00090

   CUSTOMER NAME     Snider Printing Co.
   ADDRESS           217 2nd St
   CITY              Ridgeway
   STATE             KS
   ZIP CODE          54068
```

You can continue using the Dup key at each state address field as long as you want the state to remain the same.

When the cursor is at the beginning of a field, pressing the Dup key fills the field with data from that corresponding field in the previous record. When the cursor is not at the beginning of a field, pressing the Dup key fills the cursor position and the rest of the field with data from the corresponding positions in the previous record. Changes remain in the data you just typed up to the cursor position.

If you press the Dup key when you are entering the first record in a member, DFU fills the field with blanks (or zeros) because there is no previous record.

This key works if at least one record has been processed previously and at least one of the following situations is present:

- The field being duplicated is not a record key or record number field.

- The previous record type is the same as the current record type.

- The previous record type is different from the current record type, but the field of the current record type was defined as an automatic duplication field and the automatic duplication indicator is off.

Canceling Your Changes While Updating a Field

Pressing the Dup key when you are updating a field within a record does *not* duplicate data from the previous record.

Instead, the Dup key acts as a cancel key by ignoring your update to that field and restoring the data to its original state. For example, if you are making updates to a record and accidentally begin making changes in the wrong field, return the cursor to the first position of the field and press the Dup key. DFU ignores the changes you just made to that field and restores the original data so that you don't have to try to remember what was in the field. You can then go on to the correct field and make the change.

Enter/Rec Adv

Pressing this key allows DFU to process the data on the current display and advances you to the next display.

Home

The Home key can be used when you are running a program.

How this key works depends on where the cursor is and what is being displayed when the key is pressed.

1. If the cursor is not in the first position where you can enter data for the current display, the cursor returns to the first position.

2. If the cursor is at the first cursor position, the following occurs:

    a. If the first display of a record being updated is being displayed, pressing the Home key returns the data on the display to its original values before any updates were made.
    b. If a record requires more than one display, and the first display of the record is not being shown, pressing the Home key returns you to the previous display for that record; any data typed on the other display is lost.

Field Exit

If you are running a DFU program in enter, update, or inquiry mode, and the cursor is in the record type field, the Field Exit key works the same as the Enter/Rec Adv function key. Also, when you are entering data in the last data field on the display, Field Exit works the same as the Enter/Rec Adv key and advances you to the next display.

This key moves the cursor to the first position of the next unprotected field on the display.

For alphameric fields, characters from the cursor position to the right margin are blanked out.

For numeric fields, pressing this key causes the field to be right-adjusted and leading zeros inserted.

Note: Do not use this key when updating fields. For example, assume that the value in a field is 00345 and you replace the 3 with a 2. If you pressed the Field Exit key now, the 45 would be blanked out, the data in the field would be right-adjusted, and the value would incorrectly be 00002.

Field-

This key creates a negative numeric field by placing a negative sign at the rightmost position in the current numeric field (the key is only valid for numeric fields); this key then works like the Field Exit key and advances you to the next field.

Field+

This key creates a positive numeric field by placing a blank in the rightmost position of the current numeric field; it then works like the Field Exit key and advances you to the next field.

Roll Up

How this key works depends on whether you are setting up or running a program:

When you are setting up a program:

The Roll Up key causes the next set of DFU attributes or specifications to be displayed.

When you are running a program:

- In update or inquiry mode for a sequential or direct file, the Roll Up key displays the next nonblank record in the file.

- In update or inquiry mode for an indexed file, the Roll Up key displays the next record in key sequence in the file.

- If you are using a delete-capable file, the Roll Up key displays the next non-deleted record.

Note: If you know only the first few digits of a record number or record key, enter these digits and DFU will roll to the first record number or record key that begins with these digits.

Roll Down

The Roll Down key operates just the opposite of the Roll Up key. How this key works depends on whether you are setting up or running a program:

When you are setting up a program:

The Roll Down key causes the preceding set of DFU attributes or specifications to be displayed.

When you are running a program

- In update or inquiry mode for a sequential or direct file, the Roll Down key gets the nonblank record previous to the record currently being displayed. If you are using a delete-capable file, DFU displays the previous non-deleted record.

- In update or inquiry mode for an indexed file, the Roll Down key displays the record with the record key previous to the record currently being displayed.

Note: If you know only the first few digits of a record number or record key, enter these digits and DFU will roll to the previous record number or record key that begins with these digits.

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Using the Roll Keys

When using the roll keys, you might think of the records in the file as being on the outside surface of a drum or cylinder. As the drum is rolled forward or back you can view a specific part of the file.
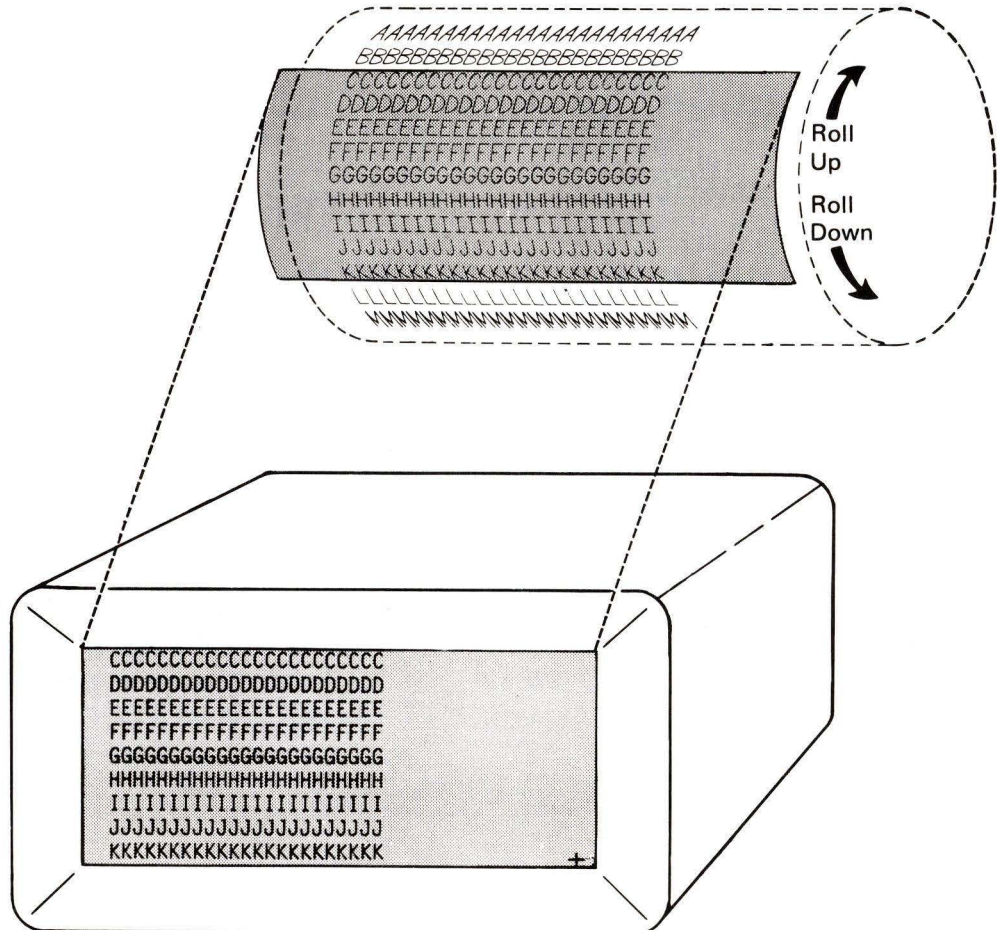
Help

When you press the Help key, the display you were using is replaced by information about that display. The help information explains the prompts on the display you were using and includes a list of command keys that can be used from that display.

If there is a + in the lower right corner, press the Roll Up key to display more help information on a following display.

Press the Enter key to leave the help information and return to the display you were using.

Press one of the available command keys and DFU will process that key and any data you had typed on the original display.

Command Keys

Command keys are identified on the System/36 Command Keyboard Template. These keys are used with the Cmd function key and allow functions defined by DFU.
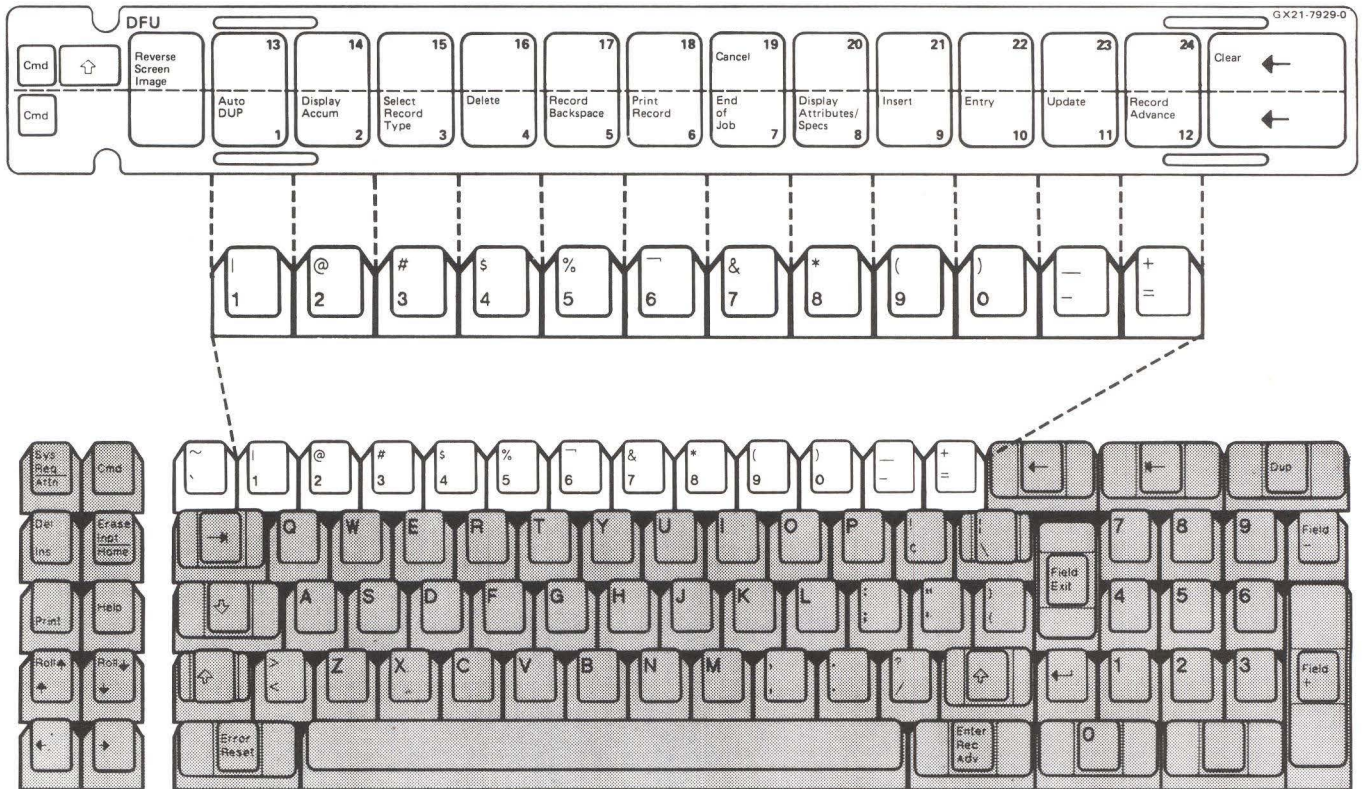
Auto Dup (Cmd 1)

When you are setting up your program, you can specify fields as automatic duplication fields. Then when you run the program, data from the corresponding positions of the previously processed record will be inserted into the current record field if you have turned automatic duplication on using the Cmd 1 key.

For example, if you are entering records for a transaction file, you could automatically duplicate the date field when entering the day's receipts. However, make sure that the data type in the previous record is the same type as the data of the automatic duplication field (packed/unpacked or alphabetic/numeric). Using a different type of data may cause an error.

Duplication occurs whenever the automatic duplication indicator is on and you have processed at least one record. You cannot enter data into an automatic duplication field unless the automatic duplication indicator is off. The status of this indicator is reversed each time the Auto Dup command key is pressed.

At least one of the fields of the record key for an indexed file must not be an automatic duplication field. (See *Key Field Specification* in Chapter 4, 5, or 6 for more details on the use of key fields for particular details.)

It is best not to designate the last field on a display as an automatic duplication field. DFU specifies the last field on the display as an automatic record advance field. That is, when you press the Field Exit key on the last field, you automatically advance to the next record. If you specify this last field as an automatic duplication field, you must press the Enter key or the Field Exit key to complete the display and advance to the next record. Try specifying all your automatic duplication fields first when you set up the program.

Note: If you define all the fields in the record (except the key field) as automatic duplication fields, DFU will initialize the entire file when you turn on the automatic duplication indicator.

Display Accum (Cmd 2)

When entering or updating records, the Display Accumulator command key displays the current values of the batch accumulators and resets the batch accumulators to zero after adding the values to the total accumulators. These values will be printed if a printer has been used with the job. See *Batch and Total Accumulators* in Chapter 4 for more details.

Select Rec Type (Cmd 3)

When entering, updating, or inquiring into a file, the Select Record Type command key moves the cursor to the record type field (record-identifying indicator) so you can request a new record type.

If you are in entry mode and the program has sequenced record types, this key automatically displays the next record type in the sequence.

However, you can move the cursor to the record type field and type in a different record type without pressing the Select Record Type command key.

Delete (Cmd 4)

When you are entering or updating a file, the Delete command key marks the current record for removal. On the General Information display, you can designate a certain delete character and its position. Make sure that the position of the character you use is not part of the record key field.

Note: Records marked for deletion are not actually removed from the file until you run the SAVE or COPYDATA procedure against the file. See the *System Reference* manual for more details about this procedure.

Rec Bksp (Cmd 5)

When you are entering, updating, or inquiring into a file, the Record Backspace command key does one of the following:

- If the current record requires more than one display and the first display is not currently being shown, this key displays the first display for the record.

- If the first display for a record is being shown and you press this key, any data typed on this display is ignored and one of the following occurs:

  - If you are in update mode, the record is ignored and a new record key is prompted for.
  - If you are in entry or insert mode, the previously processed record is displayed and you are placed in update mode so you can change the record. When the record is completed and you press the Enter key, you return to the previous mode.
  - If the first display of the previous record is already being shown, the Record Backspace command key is ignored.
  - If you are in inquiry mode, processing is reset to the start of the current record.

Print Rec (Cmd 6)

When you are setting up any program, the Print Record command key indicates that the DFU attributes and specifications are to be printed.

When you are running an inquiry job, the currently displayed record is to be printed.

End Of Job (Cmd 7)

When you are setting up a program, the End-of-Job command key tells DFU that you have completed setup. DFU can now check the program for errors before creating the program.

When you are running a program to enter, update, or inquire into a file, the End-of-Job key ends the program and displays the end of job display.

Display Attr/Spec (Cmd 8)

Whenever you press the Cmd 8 key during program setup, you will alternately display either the DFU attributes or the specifications for your program. If either the attributes or the specifications will not fit on the display space provided, use the roll keys to roll through them. After you press a roll key or the Cmd 8 key, DFU moves the cursor to the next line of the display on which data can be entered.

Insert (Cmd 9)

When you are entering or updating data, the Insert command key changes the mode to insert and allows a new record to be inserted into the file.

Note: If DFU is supplying record keys during the program, you must supply a record key for any new records you insert. The record key must be less than the next DFU-supplied record key.

If you are using a direct file, the record number you supply must be a blank record.

You cannot insert data into a sequential file.

For more information about DFU-supplied record keys and numbers, refer to Chapter 4.

Entry (Cmd 10)

When you are entering or inserting data, the Entry command key changes the mode to entry and allows records to be added to the file.

For indexed files, the record key entered must not already exist in the file. For direct files, the record to be added must currently be blank.

If DFU is supplying record keys or record numbers, pressing this key causes the next sequential record key or record number in the file to be supplied.

Update (Cmd 11)

When you are entering or inserting data, the Update command key changes the mode to update and allows records in the existing file to be changed.

For indexed files, the record key entered must exist in the file. For sequential or direct files, the record to be changed must not currently be blank.

Rec Adv (Cmd 12) or Accept With Error (Cmd 12)

When you are setting up or running a program to enter, update, or inquire into a file, the Rec Adv command key indicates that the current record or display is complete.

During program setup, when the DFU specifications are in error and are displayed for you to correct, the Cmd 12 key allows you to save the program specifications even though the specifications might contain errors. When you are running a program, to enter or update records in a file, the Accept with Error command key can also be used to indicate that the data is to be saved as is.

Cancel (Cmd 19)

The Cancel command key cancels the job. Any responses you have entered up to this point in the program setup are lost. DFU then returns you to the DFU Menu.

Printing Selected Records

When setting up a program, you can select one of the following print options on the General Information display for DFU when running the program:

- Print no records

- Print only new records

- Print only updated/deleted records

- Print both new and updated/deleted records.

All printing goes to the printer assigned to your display station. Data is printed without leading zeros for numeric data that is entered or updated during the program.

If updated records are printed, the first line shows the record before any changes were made. Following lines contain only the changed fields. If a field has been changed to all blanks, asterisks (*) are printed in the updated area to indicate that the field was changed.

If you've pressed the Delete command key (Cmd 4) and records marked for deletion are printed, the record to be deleted is followed by a line with the words *record deleted*. However, records marked for deletion are not actually removed until the SAVE procedure is run against the file.

Note: When the data to be printed contains characters that cannot be printed, blanks are inserted if you specified this on the General Information display. Otherwise DFU will stop printing when it encounters these characters.

Printer Line Width

DFU lets you specify a printer line width from 60 positions to 198 positions. To specify a printer line width, you must have a printer capable of printing more than 132 print positions per line. If your DFU program will print more than 132 positions per line, change the printer density to 15 characters per inch. Use the LINES procedure, or use the FORMS or PRINTER OCL statements to change the print density.

Limitations on Printing Records

When running a program to enter, update, or inquire into a file, DFU will process up to 60 fields per record type (including the record key or record number). However, if printing is requested while the program is running, only the data that will fit on 16 edited print lines will be printed; all 60 fields may still be processed and displayed at the display station.

The same 60-field restriction applies when you are printing a file; but DFU will let you define only those jobs whose edited output will fit on 16 lines.

The amount of data that can be printed on 16 lines is reduced by field editing. Things that will subtract from the available data space are:

- The edited field or its column heading (whichever is longer)

- Column spaces between fields

- Spaces lost at the end of print lines (because DFU will not separate data and continue an item on the next line)

- Space left by DFU for a possible negative sign in numeric fields

- Decimal points (if any).

Ideographic Considerations For Operators

If you have ideographic characters in the displays or data files of your DFU program, you must consider the special requirements for the usage of these characters. Ideographic character usage has hardware and software requirements, as well as operating and programming considerations.

Hardware Requirements

Ideographic hardware consists of a keyboard, display station, and printer.

Entering ideographic characters from an ideographic keyboard is explained in the display station operators manual.

Displaying ideographic characters requires an ideographic-capable display station.

Printing ideographic characters requires an ideographic-capable printer. Other printers will treat ideographic characters as unprintable.

Software Requirements

When operating a DFU program that uses ideographic characters, you must:

- Have the ideographic feature SSP on your system

- Sign on at an ideographic-capable display station

- Have ideographic sort in your library or #LIBRARY if your program sorts

- Make sure any printed output is sent to an ideographic-capable printer

- Make sure that each ideographic character string starts with an SO and ends with an SI.

In ideographic mode, DFU prompts, DFU informational messages, and output page headings will be ideographic.

Operating Considerations

After you sign on to an ideographic-capable display station, when an ideographic character is on the display, press the DSPLY OE/OF key. You will see a hexadecimal character at either end of the ideographic character string. The hexadecimal character 0E is the shift out character (SO). The hexadecimal character 0F is the shift in character (SI). Each string of ideographic characters must start with a SO character of one position, followed by ideographic characters of two positions each, followed by a SI character of one position.

You cannot enter the wrong type of data in a field, but you can enter ideographic characters so that the SO or SI are lost. Displaying the SO and SI characters may help you prevent this error from occurring.

When you are in SETUP mode for DFU ENTER, DFU UPDATE, DFU INQUIRY, or DFU LIST on a Kanji keyboard, you can no longer enter Kanji data as soon as you hit ROLL-UP or ROLL-DOWN (you will get a keyboard error). You must press ERASE EOF to continue.

The function keys and the command keys on the ideographic keyboard work the same as the function keys and the command keys on the alphameric keyboard.

Programming Considerations

See "Ideographic Considerations For Programmers" in Chapter 8 for programming considerations using ideographic characters in DFU programs.

Chapter 8. Attention Programmers

This chapter includes more detail on programming considerations. It will discuss such things as:

- Procedure commands

- Setup sheets

- Programming considerations such as:

    - Job queue
    - Sorting
    - Displaying data
    - Printing records
    - Filling data fields
    - Record sequencing
    - Automatic record codes.

- File processing

- Naming members

- Storage requirements

- Self-checking.

DFU Procedure Commands

This section discusses each of the DFU procedure commands: ENTER, UPDATE, INQUIRY, LIST.

Although you are not prompted for the necessary parameters, you can call DFU by entering one of the four DFU commands. Refer to the following sample procedure command as you review the command parameters.

The ENTER command is used as the sample here:

```
ENTER      file name,DFU program name,[file source member name],


           number of records,⎡D⎤,⎡NN⎤,[DFU source member name], ,
                              ⎢Z⎥  ⎢NY⎥
                              ⎣B⎦  ⎢YN⎥
                                   ⎢YY⎥
                                   ⎣GO⎦


           ⎡library name  ⎤,[display source member name],[name of file on disk]
           ⎣current library⎦
```

Default values are underlined.

More information on procedure commands can be found in the the *System Reference* manual. The four procedure commands (ENTER, UPDATE, INQUIRY, and LIST) and their parameters are included in the following chart. Default values for each command are underlined.

Command	Parameter 1	Parameter 2	Parameter 3[1]	Parameter 4	Parameter 5[1]	Parameter 6[1]	Parameter 7[1]	Parameter 8	Parameter 9[1]	Parameter 10[1]	Parameter 11[1]
ENTER	File name	DFU program name	File source member name	Number of records	Fill character D/Z/B	DFU source processing	DFU source member name		Library name	Display source member name	Name of File on Disk
UPDATE	File name	DFU program name	File source member name	Number of records to extend 0	Fill character D/Z/B	DFU source processing	DFU source member name		Library name	Display source member name	Name of File on Disk
INQUIRY	File name	DFU program name	File source member name		Fill character D/Z/B	DFU source processing	DFU source member name		Library name	Display source member name	Name of File on Disk
LIST	File name	DFU program name	File source member name	SORT/ NOSORT	Fill character D/Z/B	DFU source processing	DFU source member name	Master file name	Library name		Name of File on Disk

[1] Optional parameters.
Defaults are underlined.

Notes:

1. *The master file name parameter is not used for the ENTER, UPDATE, or INQUIRY command, but a comma must be inserted for it as the eighth parameter if you are entering parameters 9 or 10.*
2. *A library name may be entered for the ENTER, UPDATE, INQUIRY or LIST commands, if the program, file definition, and DFU specifications are in that library or to be placed in that library. The current library is used if this parameter is omitted.*
3. *The number of records (parameter 4) specifies the number of records to extend the file when it is full when you are using the UPDATE procedure command.*
4. *The number of records (parameter 4) is not used for the INQUIRY command, but a comma must be entered for that parameter if you are entering parameters 5 through 10.*
5. *The fill character (except LIST) parameter (parameter 5) will accept only a D, B, Z, or blank if you enter the DFU command with the parameters. If you want numeric fields to be filled with zeros rather than blanks when no values are entered, enter a Z for that parameter.*
6. *The name of file on disk (parameter 11), also referred to as the file label, must be specified if it is different from the file name (parameter 1).*

For example, to update a file named CUSTMST, using program DE960D, add 100 records to the file, have numeric fields filled with zeros rather than blanks, and the necessary members are in the library called DFULIB, you would enter:

```
UPDATE CUSTMST,DE960D,,100,Z,,,,DFULIB
```

DFU Procedure Command Parameters

The following parameters make up the DFU commands. For any DFU command, DFU prompts you for all the parameters (except parameters 5 and 6: fill character and source processing) if you do not enter the file name and program name.

File Name

This is the name of the file to be processed.

Program Name

Note: A program for the enter, update, and inquiry functions consists of a subroutine member and a load member. For the list function, it is only the subroutine member.

This is the name of the program you are using or setting up. If the program does not exist in the library, DFU starts the setup and creates it. If the program does exist, DFU runs it.

If running an enter, update, or inquiry job, you must ensure that both the subroutine and the load members with the same name as the DFU program exist. If either of the members are missing, DFU issues an error message and the job is terminated.

If a user library is specified on the command, the program must be in that library. If a user library is not specified, the program must be in the current library.

DFU prompts you for all parameters if you omit this parameter on the command. If you do not enter a program name, DFU generates a temporary name by combining: #DF + display station ID + 1 (if the display station is not in system inquiry mode), or 2 (if the display station is in system inquiry mode). DFU removes the temporary program from the library at the end of the job.

DFU also creates a source member describing the displays associated with each DFU program for enter, update, or inquiry. If a name is specified in parameter 10 (name of display source member), DFU creates and saves the source specifications under that name. If the display source name is not specified in the command, DFU generates a name for the source member, and then removes the member after the corresponding load member has been created.

DFU generates a name for this member by combining: #DF + display station ID + 1 (if the display station is not in system inquiry mode) or 2 (if the display station is in system inquiry mode).

File definition source member name

This is the name of the source member containing RPG specifications (F- and I-specifications) that describe the file to be processed. This member can contain one or more sets of file description and input specifications, or an entire RPG program. The file description and input specifications that correspond to the file are taken as the data description.

This parameter is prompted for if it is needed but was not specified on the command or on the DFU procedure display. This parameter is required if the specified program does not exist.

This member must be in the library being used. If a user library is not specified, this member must be in the current library.

Number of Records

This specifies the maximum number of records you want to enter in the file. If it is missing on the ENTER command or on the DFU procedure display, this parameter will be prompted for. When you are creating a file, DFU allows a maximum of eight million records within that file.

When used with the UPDATE command, this parameter specifies the number of records to extend a file when it is full. Values of zero or blank indicate that no file extension is required. For more information on data management, see the *Concepts and Programmer's Guide*.

SORT/NOSORT

This parameter (used only with the LIST command) indicates whether the file is to be sorted before it is printed. The default is NOSORT.

Fill Character

This parameter indicates filling numeric fields with zeros if no values are entered.

A character B or D for this parameter indicates that you want numeric fields to be filled with blanks (X'40') if no values are entered.

A character Z for this parameter indicates that you want numeric fields to be filled with zeros (X'F0') if no values are entered.

Note: DFU never prompts you for this parameter.

If you want the zero fill option, you must specify character Z for this parameter in the ENTER, UPDATE, or INQUIRY procedure commands at the time the program is created. The program will then always run with the zero fill option.

This two-character parameter is used if the DFU program does not exist. It indicates whether the DFU specifications for this program are already stored in the library, and whether they are to be stored in the library when program setup is complete. This source member of DFU specifications is stored or looked for in the current library, unless a user library name (parameter 9) is specified.

Note: This parameter is not prompted for on the DFU procedure display. You can tell DFU to save the source member at the end of program setup.

First Character (Input Indication)

N   DFU specifications do not exist for this program. The operator is prompted to create DFU specifications.

Y   DFU specifications exist in the library for this program. The operator is not prompted, but can update the stored specifications to describe a new program. The DFU source member name must be specified.

Second Character (Output Specification)

N   The DFU specifications for this job are not to be stored as a source member when program setup is complete.

Y   The DFU specifications for this program are to be saved as a source member when program setup is complete. A DFU source member name must be specified if you want the member saved.

GO can also be entered. The following describes the combinations of the Y and N subparameters as well as the GO parameter:

NN Stored DFU specifications are not used for this program setup. The operator is prompted to create the specifications but they are not saved in the library.

YN Stored DFU specifications are used for this program setup. The operator is not prompted, but can update the specifications before the program is created. If the operator changes the specifications at the display station, only this run of the program is affected; the changes are not stored in the library.

YY Stored DFU specifications are used for this program setup. The operator is not prompted, but can update the specifications before the program is created. The specifications in the library are replaced by the updated specifications.

NY Stored DFU specifications are not used for this program setup. The operator is prompted to create the specifications; once created, they are stored in the library.

GO Stored DFU specifications are used for this program setup. The operator is not prompted and cannot update the specifications

before the program is created unless errors are found. If
errors are found in the specifications, the operator must
correct the specification before the program is created.
However, the stored DFU specifications are not changed.

DFU Source Member Name

This is the name of the source member that contains, or will contain, saved DFU
specifications. This parameter is required if the stored DFU specification source
member is to be used for this program setup.

If a source name is given, DFU will look for the source member in the user
library. If a user library is not specified, the current library is searched. If the
member is not found, DFU will go through program setup.

If the DFU specifications are to be saved, DFU stores the source member in the
user library, or in the current library if a user library is not specified.

Master File Name

This parameter is used only with the LIST command. It is the name of the
indexed file containing the master file information for the file to be listed. If
omitted on the command, or in response to the LIST procedure display, this
parameter is not prompted for; DFU assumes there is no master file to process.

Library Name

This is the name of the library you want to use. All library members associated
with the DFU job are looked for, or stored, in this library. If this parameter is
not specified, DFU uses the current library.

Display Source Member Name

This is the name of the member in which DFU is to store the display format
source specifications when setting up an enter, update, or inquiry job. If omitted
on the initial command or procedure display, DFU generates a default name for
the member, and removes the source member from the library after the
specifications have been converted to the display load member.

If this parameter is specified, you can change the generated display source
specifications at another time, compile them to replace an existing display load
member, and then run the same DFU job with the data displayed in the changed
format. Refer to "Changing Stored Display Source" in Chapter 10 for more
information.

Name of File on Disk

This is the name of the file on disk if it is different from the name of the file to be processed. Name of file on disk is also referred to as file label.

File label is an optional parameter, but it must be specified if the name of the file on disk is different from the file name specified in parameter 1. If file label is not provided, the name of the file on disk will be the same as the name of the file to be processed.

A DFU Setup Sheet

You may want to design a DFU setup sheet to simplify instructions necessary for someone else to set up a program for you. An example of a setup sheet follows showing entries you might supply.

S/36 DFU ENTER/UPDATE SETUP SHEET
(INDEXED)

PROGRAMMER ___B. Smith___   PAGE _1_ OF _1_

ENTER: DFU
DFU MENU OPTION: 1 OR②
SETUP/RUN OPTION:①, 2, 3, 4
ENTER: __CUSTMST__, __DEI00D__, ___20___, __DFULIB__, __FILESRC__, __DEI00DS__, _____

| FILENAME | DFU PROGRAM | NO. OF RECORDS | USER LIB | FILE DEFINITION | SOURCE MEMBER | DISPLAY SOURCE |

● **ENTER/UPDATE GENERAL INFORMATION**

DATA DISPLAY   A = SINGLE COLUMN, ⑧= MULTIPLE COLUMN, C = MAXIMUM DATA

JOB TITLE _ENTER CUSTOMER RECORDS_ _ _ _ _ _ _   DELETE CODE, POSITION %, 1
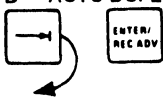
PRINT NEW RECORDS? Ⓨ N   PRINT UPDATED/DELETED RECORDS? Ⓨ N

PRINTER COLUMN SPACING _5_ 1   PRINTER LINE WIDTH (60–198) _ _ _ 132
                       (0-9)
HALT ON UNPRINTABLE CHARACTERS? Y Ⓝ   DFU TO GENERATE KEYS? Ⓨ N

● **KEY FIELD SPECIFICATION** (FOR SINGLE KEYFIELD PRESS [ENTER/REC ADV] OTHERWISE KEY UP TO 5 KEYFIELDS)

DATA FIELD		HEADING		FUNCTIONS	A = ACCUMULATE
_ _ _ _ _	[→]	_ _ _ _ _ _ _ _ _ _ _ _	[→]	_ _ _ _	B = MOD 10 CHECK
_ _ _ _ _		_ _ _ _ _ _ _ _ _ _ _ _		_ _ _ _	C = MOD 11 CHECK
_ _ _ _ _		_ _ _ _ _ _ _ _ _ _ _ _		_ _ _ _	D = AUTO DUPLICATION

@
● **RECORD KEY DESCRIPTION**

KEY HEADING _RECORD KEY IS:_ _ _ _ _ _ _   *KEY

NUMERIC RECORD KEY?   Y   N

● **RECORD TYPE SELECTION**

Ø1 RECORD TYPE   PROCESS THIS RECORD TYPE? Ⓨ N

                      ALLOW LOWERCASE DATA? Ⓨ N

● **DATA FIELD SELECTION**

A = ACCUMULATE
B = MOD 10 CHECK
C = MOD 11 CHECK
D = AUTO DUPLICATION

DATA FIELD		HEADING		FUNCTIONS
CUSNM	[→]	_CUSTOMER NAME_ _ _ _ _ _	[→]	_ _ _ _
CUSA1		_ADDRESS_ _ _ _ _ _ _ _ _		_ _ _ _
CUSA2		_CITY_ _ _ _ _ _ _ _ _ _ _		_ _ _ _
STATE		_STATE_ _ _ _ _ _ _ _ _ _		_ _ _ _
ZIPCD		_ZIP CODE_ _ _ _ _ _ _ _ _		_ _ _ _
_ _ _ _ _		_ _ _ _ _ _ _ _ _ _ _ _		_ _ _ _
_ _ _ _ _		_ _ _ _ _ _ _ _ _ _ _ _		_ _ _ _
_ _ _ _ _		_ _ _ _ _ _ _ _ _ _ _ _		_ _ _ _
_ _ _ _ _		_ _ _ _ _ _ _ _ _ _ _ _		_ _ _ _
_ _ _ _ _		_ _ _ _ _ _ _ _ _ _ _ _		_ _ _ _
_ _ _ _ _		_ _ _ _ _ _ _ _ _ _ _ _		_ _ _ _

NOTES:

Programmer Considerations

These are some considerations you may want to review when using DFU more extensively.

Job Queue and Evoked Programs

Enter, update, and inquiry programs cannot be sent to the job queue, because they require operator action. List programs not requiring operator action, other than responding to prompts for LIST procedure parameters, can be submitted to the job queue (refer to the *System Reference* manual). List programs sent to the job queue must exist in the library. If a list program is submitted to the job queue, all required parameters must be supplied or an error message will be displayed.

Note: In DFU, the terms Job Queue and Evoked Jobs are synonymous.

Sorting before Printing

When you sort your records before printing a file, DFU creates a source member of sort sequence specifications to describe the sort. DFU then generates a name for this source member as follows:

Character	Value
1 through 3	#DF
4 and 5	Display station ID from which the program was startec
6	1-if display is not currently in system inquiry mode
	2-if display is currently in system inquiry mode
	3-if program is run from the job queue
	4-if program has been evoked
7 and 8	Not used (blank)

If a list program with sort is called from a display station before completion of another called list program with sort from the same display station, DFU creates duplicate sort sequence source member names. In this case, the second program that attempted to create the sort source member is halted with message SYS-2510, indicating that an attempt was made to create a member that already exists. When this occurs, wait for the first evoked list program to finish; then respond to the halt message with a 0 option to allow the second program to proceed.

If message SYS-2510 is issued by a called list program that is the only called list program being processed, this means that a source member already exists with the same name that the list program creates. In this case, select one of the following:

- Option 0: Replace the existing member and create new specifications.

- Option 2: Sort the file using the existing source member as sort specifications.

- Option 3: Cancel the list program.

Displaying Data

DFU does not perform data validity checking at execution time. When auto-duplicating data in entry or insert mode, or displaying data in update or inquiry mode, display station errors can occur when DFU displays data with a hexadecimal value of less than hexadecimal 40. This could occur if packed data were processed as an alphameric field, (this may be avoided by defining different types of data as separate fields). If a display error occurs while running in update mode, DFU scans for data that has a hexadecimal value of less than X'40'. Any such data (except X'00', X'0E', and X'0F') is replaced with an X'FF' value and is displayed with DFU error message 0017. The results in these situations must be corrected by the user.

When processing a direct or sequential file, DFU treats the record number field as numeric when displayed, even if it is defined as an alphameric field in the record.

Printing Records

All printing is controlled by the printer data management. All your printouts are printed on the printer currently assigned to your display station. If a list program is sent to the program queue, printing is directed to the system printer. The file name for the printer used by DFU is #DFPRINT. When entering, updating, inquiring, or printing data that is defined as numeric, DFU edits the data as you specified before printing it. For example, DFU removes leading zeros and inserts any decimal points specified.

If the printer is set to print less than six lines per page, the title line is not printed.

Filling Data Fields That Have No Data Entered (INITIALIZATION)

There may be times when you are entering a new record that contains several fields that will not all fit on a single display. If you need to enter data into only some of the fields and do not need to continue through all the displays for the record, you can complete a record without viewing all the displays for that record.

You can skip the remaining displays and advance to the next record by pressing the Record Advance command key (Cmd 12). When you are finished entering data into the display you are using, all remaining fields on the remaining displays will then be filled with the following data:

- Alphameric fields will be filled with blanks.

- Unpacked numeric fields will be filled with blanks or zeros depending on how the fifth parameter (fill character) was specified when the program was setup.

- Packed numeric fields will be filled with a packed value of zero (hexadecimal 0F in the last byte, and hexadecimal 00 in all remaining bytes).

- If the automatic duplication indicator is on, all automatic duplication fields will be duplicated.

Automatic Zeroing of Packed Fields Not Specified for Processing

When you create a new record in a file, DFU automatically puts zeros in the first 100 packed fields not specified for processing at program setup. After the operator has completed typing the record, the packed field is changed if it is not moved to the record key of an indexed record and if the last character in the field is blank. The last character of the field cannot be blank if the beginning of a field specified for processing overlaps the end of the packed field not specified for processing. The packed fields are changed to zeros in the order they are specified in the file definition used for the program. If a record type contains more than 100 packed fields that were not specified as fields to be processed, the excess packed fields remain as blanks in the record.

Record Sequencing

When you have more than one record type and you want each type to appear in a particular order, you can assign each record type a sequence number. You can specify (entry mode only) record sequencing in the file definition when a sequence number (in columns 15 and 16 of the RPG I-specifications) is assigned to some or all of the record types specified.

You can also assign a frequency to sequence records (in column 17 of the I-specification) of:

- 1, which means that the record occurs once in each sequence of records, or

- N, which means that this record occurs more than once in each sequence.

```
           Record              Record
           Sequence  Frequency Type

FCUSTORDSI             256   5 I      50 DISK
ICUSTORDSO11 01        2 CC  3 CU
I                                          1    1 DELET
I                                          2    3 RCODE
I                                          4   90ORDNO
I                                         10  17OCUSNO
I                                         18  23OPONBR
I         021 02       2 CC  3 CS
I                                          1    1 DELET
I                                          2    3 RCODE
I                                          4  11OCUSNO
I                                         12  17OORDNO
I                                         18   37 SHPNM
I                                         60   79 SHIP1
I                                         80   99 SHIP2
I         03N 03       2 CI  3 CT
I                                          1    1 DELET
I                                          2    3 RCODE
I                                          4  11OCUSNO
I                                         12  17OORDNO
I                                         18  20OOLNUM
```

When you use record sequencing, the first record type in the sequence automatically appears first. If you press the Select Record Type command key (Cmd 3), the next type in the sequence appears. If you press the Cmd 3 key when the last record type in the sequence is displayed, the first record type reappears.

If you assign any sequenced record type a frequency of 1, the next record type in the sequence is automatically selected (without pressing the Cmd 3 key) after the record has been completed. If you assign any record type a frequency of N, that record type reappears after each record is completed until the Cmd 3 key is pressed.

To select an unsequenced record type (when some are sequenced) or to select a sequenced record type out of order, you must move the cursor to the record type field and enter the record type you want.

Automatic Record Type Sequencing

If automatic sequencing of record types is defined in the file definition for a program, DFU selects record types beginning with the first record of the first or only type in the sequence.

When you press the Select Record Type command key (Cmd 3) or finish typing a record defined as occurring once in each sequence, DFU automatically displays the next record type in the sequence. If there are no more record types in the sequence, the first record type is again displayed. If two or more record types in the sequence are in an OR relationship, the system displays the next record type that is not included in that OR relationship.

To select a nonsequenced record type, or to select a sequenced record type out of sequence, you must move the cursor to the record type field and enter the desired record type code. If you request a nonsequenced record type, you can enter that record, but upon completion of the record entry, the record type is reset to the last sequenced record type displayed.

Automatic Record Codes

At program setup, you can specify the record types to be processed. Each record type is referred to by a record identifying indicator from 01 to 99, as specified in the RPG I-specifications for the program. Each of these record-identifying indicators has one or more record codes. Record codes are actual data in the record that identify it for future processing.

During program setup of an enter/update job, you do not need to define this record code as one to enter data in. Upon completion of a record, DFU will examine the record to determine if any data has been entered in the record code position. If not, DFU will put the record codes in the record as follows before writing the record in the data file.

For record codes identified by a certain character or its zone or digit portion of that character, DFU will move the character or its specified portion into the record. For record codes identified by the absence of a certain character or its zone or digit portion, DFU will first use the character blank (hexadecimal 40) or the zone or digit portion of the blank for the code. If this does not satisfy the 'NOT' condition, DFU will use the character 1 (hexadecimal F1), or the zone or digit portion of the character 1 for the code. DFU will not put a record code into a character that is in the record key of an indexed record. However, processing continues as if the code were there.

Note: DFU may try to put a record code in a position that is within the key field. This will cause an error.

File Processing

This section describes how DFU processes different disk file types. For a complete description of disk file processing see the *System Reference* manual.

Processing Indexed Files

When entering, updating, or inquiring into an indexed file, you request records by a unique record key associated with each record. To add a record to the file, the record key cannot exist; to change a record in the file, the record key must already exist in the file.

Processing Direct or Sequential Files

When entering, updating, or inquiring into a direct file, you request records by their record number. This is the position of the record in the file. The largest record number that DFU can use is 99,999,999. When a direct file is created, all the records in the file are set to blanks. To add a record to the file, the record corresponding to the record number to be added must be blank; to change a record in the file, the record corresponding to the record number to be changed must not be blank.

When entering, updating, or inquiring into a sequential file, you use the roll keys to roll through the file until you reach the record you want to update or view, or until you reach the end of your records where space is available to enter additional records.

When printing a direct or sequential file, DFU reads the records consecutively until a record is found matching one of the record types defined in the DFU program. In a direct file, blank records are processed as if they were to be printed.

Processing Delete-Capable Files

A delete-capable file is a file from which records can be logically removed without compressing the file.

You cannot create delete-capable files with DFU, and DFU cannot be used to delete records in the manner described for the system delete function in the *System Reference* manual. You can, however, update, list, and inquire into delete-capable files in a manner similar to that used for files that are not delete-capable. For indexed files, you cannot use a record that has previously been deleted. For sequential and direct files, records are processed as follows:

• You can put new records in the file only if the existing record is blank or if the record is a system-deleted record.

• You can use records for update or display only if the record is not blank and is not a system-deleted record.

Multiple Indexed Files

Multiple indexes for a file allow you to access data in a file by using different record keys for the same file. For example, you may have records with employee number, position number, and department number. Using alternative indexes, you can define three different keys: employee number, position number, and department number. Now you can look at your file in a different order depending on which key you use.

The first key defined is the primary key. Primary keys cannot be changed while updating, although alternative indexes can be changed.

If the file is created by DFU, duplicate keys are not allowed for primary keys. If the file is created using the BLDFILE procedure, DUPKEY can be specified to allow duplicate keys. See the *S/36 System Reference Manual*, SC21-9020, for an explanation of the BLDFILE procedure.

Duplicate values are allowed for alternative indexes and for limited non-contiguous keys.

Note: When you are setting up a DFU program that uses a file with alternative indexes, be sure the delete code you specify is not within the primary key area. Also do not select the primary key as a data field.

All alternative indexes share the same data in the file. Each time a record is removed or added, all alternative indexes must be updated. Also, each time a record is updated and a key field is changed, the appropriate indexes must be changed.

Because of this, alternative indexes can affect the performance of your system. The more indexes that have to be updated after each change, the longer it takes to write a record. For more information on alternative indexes, see the manual *Concepts and Programmer's Guide*.

An alternative index can be built over any existing sequential or indexed file. However, a direct file must be delete capable to have an alternative index. Any direct file created by the DFU ENTER procedure is non-delete capable. To create a delete capable direct file, you must use the BLDFILE procedure. See the *S/36 System Reference Manual*, SC21-9020, for an explanation.

To build an alternative index on a sequential, indexed, or delete capable direct file, you must use the BLDINDEX procedure. See the *S/36 System Reference Manual*, SC21-9020, for an explanation.

Note: When processing a direct file via an alternative index, you cannot add or insert new records to the file. You can only update existing records.

Non-Contiguous Keyed Files

DFU allows you to create alternative indexes with limited non-contiguous keys. A limited non-contiguous key is made up of 2 or 3 non-consecutive record fields. Each of these non-contiguous keys may be made up of sub-fields, called split keys. The total number of fields contained in a limited non-contiguous key cannot exceed 10.

To build a non-contiguous key, you must use parameters on the BLDINDEX procedure when creating the alternative index. See the *S/36 System Reference Manual*, SC21-9020, for an explanation.

Remote Files

DDM (Distributed Data Management) is an SSP feature that allows DFU to use data files residing on a remote system. If your system has DDM, the remote files you specify are located by their entries in the Network Resource Directory (NRD). The NRD is created and maintained by the NRDEDIT utility provided with DDM.

Note: DFU cannot create non-contiguous keyed files which reside on a remote system.

For more information, refer to the *Distributed Data Management Guide*, SC21-8011.

Member Names

The names of members in a library that are created by DFU must meet these requirements:

- They cannot be one of the reserved words (ALL, DIR, SYSTEM, NEW).

- They may have a maximum of eight characters.

- They must begin with a first character that is part of the extended alphabet (A through Z, #, $, @).

- They must have as the remaining characters anything except blanks, periods, single quotes, or commas within the name.

  Other special characters, such as hyphens (-), question marks (?), and slashes (/), are allowed by DFU, but should be avoided; they can cause unpredictable results when processed within the DFU procedures.

For DFU programs, DFU source specifications and display format source members, names beginning with #DF should also be avoided. DFU generates names with these starting characters and overlays existing members with the same name.

DFU Storage Requirements

DFU requires 18 K bytes of main storage, but will take advantage of any additional main storage to improve performance.

DFU dynamically allocates sufficient disk space when running execution steps.

Modulus 10 and 11 Self-Check

On the Data Field Specification display, fields of 32 characters or less (including record-key fields) can be specified as self-check fields.

Self-checking numbers offer some amount of protection against clerical errors and fraud. Self-checking is particularly useful in applications that use account numbers.

The System/36 offers two methods of self-checking: modulus 10 and modulus 11. If a self-checking method is specified for an input field, System/36 determines a self-check digit for the field's contents, using the specified self-check method. That self-check digit is compared to the rightmost position of the input field. (Nulls and blanks are considered to be self-check digits of zero.) If the self-check digit matches the rightmost position of the input field, the contents of the input field are allowed and the operator can continue. If the numbers do not match, the contents of the input field are not allowed and a keyboard error is displayed. The operator must then enter an allowed number before continuing. For example, the number 123216 is a valid modulus 10 number. The self-check digit is 6 and must be in the rightmost position of the input field. The remaining digits, 12321, are used to determine whether the self-check is successful.

The following pages describe the methods for determining the self-check digit for the contents of an input field. After reviewing how the self-check digit is determined, you might want to write a program that generates input numbers that successfully complete a self-check. You can, for example, use the generated numbers as a basis for assigning account numbers, item numbers, or security codes.

Modulus 10

To determine the modulus 10 self-check digit, do the following:

1. Disregard the rightmost digit. This digit is not used in the remaining steps, but is used in determining whether the self-check is successful.

2. Multiply the units position (the rightmost digit of what resulted from step 1) and every alternate position of that number by 2.

3. Add the digits in the products to the digits in the numbers that were not multiplied in Step 2 (again, excluding the original rightmost digit).

4. Subtract the sum from the next higher number ending in zero (0).

The difference is the self-check digit. Compare this digit with the rightmost digit of the input field. If those digits are the same, the self-check is successful.

For example, suppose you specify modulus 10 self-checking for an input field and the operator enters 123216:

Number to be self-checked	1 2 3 2 1
New rightmost position and every alternate position	1 3 1
Multiply by 2	2 6 2
Digits not multiplied	2 2
Add	2 + 2 + 6 + 2 + 2 = 14
Next higher number ending in 0	20
Subtract	20 - 14 = 6
Self-check digit	**6**

The self-check digit matches the rightmost digit of the entered number (in this case, 6). The self-check is successful.

Note: Remember that the self-check digit is always in the rightmost position of the input field.

Modulus 11

To determine the modulus 11 self-check digit, exclude the rightmost character and perform the following calculation on the remaining digits.

1. Assign a weighting factor to each digit of the entered number. These factors are: 2, 3, 4, 5, 6, 7, 2, 3, 4, 5, 6, 7, 2, 3, and so on, starting with the new rightmost position of the number and progressing toward the high-order digit (the leftmost digit). For example, the input number 991246351 would be assigned the weighting factors as follows:

Number to be self-checked	9 9 1 2 4 6 3 5
Weighting factor	3 2 7 6 5 4 3 2

2. Multiply each digit by its weighting factor.

3. Add the products.

4. Divide this sum by 11.

5. Subtract the remainder from 11.

The difference is the self-check digit. Compare this digit with the rightmost digit of the input field. If those digits are the same, the self-check is successful.

Note: If the remainder from step 4 is 0, the self-check digit is 0. If the remainder is 1, the entered number does not have a self-check digit; you must ensure that numbers with remainders of 1 in step 4 are not used in the fields you define as self-check fields.

For example, suppose you specify modulus 11 self-checking for an input field and the operator enters 123218:

Number to be self-checked	1 2 3 2 1
Weighting factors	6 5 4 3 2
Multiply	6 10 12 6 2
Add	$6+10+12+6+2 = 36$
Divide	$36/11 = 3$ plus a remainder of 3
Subtract	$11 - 3 = 8$
Self-check digit	**8**

The self-check digit matches the rightmost digit of the input number (in this case, 8). The self-check is successful.

Note: Remember that the self-check digit is always in the rightmost position of the input field.

Ideographic Considerations For Programmers

If you have ideographic characters in the displays or data files of your DFU program, you must consider the special requirements for the usage of these characters. Ideographic usage has hardware and software requirements, as well as programming and operating considerations.

Hardware Requirements

Ideographic hardware consists of a keyboard, display station, and printer.

An ideographic keyboard can enter ideographic characters, katakana characters, and uppercase alphameric characters. An ideographic keyboard cannot enter lowercase alphameric characters.

Displaying ideographic characters requires an ideographic-capable display station. An ideographic-capable display station can display uppercase alphameric characters and lowercase alphameric characters as well as ideographic characters and katakana characters.

Printing ideographic characters requires an ideographic-capable printer. Other printers will treat ideographic characters as unprintable.

Software Requirements

When programming in DFU with ideographic characters, you must:

- Have the ideographic feature SSP on your system

- Sign on at an ideographic-capable display station

- Have ideographic sort in your library or #LIBRARY if your program sorts

- Make sure any printed output is sent to an ideographic-capable printer

- Make sure that each ideographic character string starts with an SO and ends with an SI.

- Not put alphameric and ideographic characters in the same Key or Data field at the same time.

Programming Considerations

Part of the ideographic character feature is the ability to use katakana characters. Alphameric characters and katakana characters are one position each, ideographic characters are two positions each.

Each string of ideographic characters begins with a shift out character (SO) of one position, followed by ideographic characters of two positions each, followed by a shift in character (SI) of one position. This configuration means each ideographic character string will be an even number of positions and at least 4 positions long. The following figure shows a string of three ideographic characters.

Titles, key field headings, and data field headings can be:

- alphameric characters only

- ideographic characters only

- both alphameric or ideographic characters

Key fields and data fields can be:

- alphameric characters only

- ideographic characters only

- either alphameric or ideographic characters but not both at the same time. Key fields and data fields cannot contain both alphameric and ideographic characters at the same time.

```
                       KEY FIELD SELECTION

               FIELDS THAT COMPOSE THE RECORD KEY

                  *FILE    IGCFILE    80
                  *KEY                10         11
        01        *RECORD
                            CODE       1          1
                            IGCX      10         11
                            IGCE      12         23
                            IGCF       8         31
                            CHAR      12         43
                            CHAR2     37         80


KEY FIELD    HEADING              FUNCTIONS:
                                  A=ACCUMULATE      X=IGC
                                  B=MOD 10 CHECK    E=EITHER A/N DEFAULT
                                  C=MOD 11 CHECK    F=EITHER IGC DEFAULT
                                  D=AUTO-DUP
```

```
                     DATA FIELD SELECTION              RECORD TYPE: 01
               FIELDS IN WHICH DATA IS TO BE ENTERED
        01        *RECORD
                            CODE       1          1
                            IGCX      10         11
                            IGCE      12         23
                            IGCF       8         31
                            CHAR      12         43
                            CHAR2     37         80


DATA FIELD   HEADING              FUNCTIONS:
                                  A=ACCUMULATE      X=IGC
                                  B=MOD 10 CHECK    E=EITHER A/N DEFAULT
                                  C=MOD 11 CHECK    F=EITHER IGC DEFAULT
                                  D=AUTO-DUP
```

X = IGC   This means only ideographic characters (IGC) can be entered in this field.

E = EITHER A/N DEFAULT This field is set up to accept alphameric characters but can accept ideographic characters (IGC) instead.

F = EITHER IGC DEFAULT This field is set up to accept ideographic characters (IGC) but can accept alphameric characters instead. Specify the F field option in Enter mode before Update mode. If a field is specified alphameric in Enter mode but F in Update mode, the field will not default to ideographic characters.

Select constant fields can be either alphameric or ideographic, but not both at the same time. The field is set up for alphameric characters, and alphameric apostrophes (') must surround the ideographic select constants.

In ideographic mode, DFU prompts, DFU informational messages, and output page headings will be ideographic.

Operating Considerations

After you sign on to an ideographic-capable display station, when an ideographic character is on the display, press the DSPLY OE/OF key. You will see a hexadecimal character at either end of the ideographic character string. The hexadecimal character 0E is the shift out character (SO). The hexadecimal character 0F is the shift in character (SI). Each string of ideographic characters must start with a SO character of one position, followed by ideographic characters of two positions each, followed by a SI character of one position.

The programmer tells the DFU program what type of data will be used. You cannot enter the wrong type of data, but you can enter ideographic characters so that the SO or SI are lost. Displaying the SO and SI characters may help you prevent this error from occurring.

The function keys and the command keys on the ideographic keyboard work the same as the function keys and the command keys on the alphameric keyboard.

Note: When you are in setup mode for ENTER, UPDATE, INQUIRY, or LIST and use the ROLL↑ or ROLL↓ keys, you will no longer be able to enter Ideographic data. This situation can be easily corrected by pressing the ERASE EOF key and then entering the Ideographic data.

Chapter 9. DFU Attributes

When you supply a file definition for a job, DFU builds a simplified version of the F- and I-specifications, that is used as a temporary source of information about the file. This simplified version of the F- and I-specifications is called the DFU *attributes*.

For example, assume you have the following file definition:

```
MEMBER     LISTSRC  LIBRARY    DFULIB          SEU EOJ PRINTOUT          DATE  12/03/82      TIME  14.29

                                          IBM SYSTEM/36 SOURCE ENTRY UTILITY

        FCUSTMASTU           256  8 I      2 DISK
        ICUSTMAST     01
        I                                           1    1 ARCOD
        I                                           2    9 CUSNO
        I                                          10   34 CUSNM
        I                                          35   59 CUSA1
        I                                          60   84 CUSA2
        I                                          85  109 CUSA3
        I                                         110  111 STATE
        I                                       P 112 1160ZIPCD
        I                                       P 117 1180AREAC
        I                                       P 119 1220PHONE
        I                                         123  123 CUSTP
        I                                       P 124 1270CRLIM
        I                                       P 128 1300SLSNO
        I                                       P 131 1352AMDUE
        I                                       P 136 1390DLTPM
        I                                       P 140 1442LSTAP
        I                                       P 145 1492PRBAL
        I                                       P 150 1542CHGTD
        I                                       P 155 15920VR30
        I                                       P 160 16420VR60
        I                                       P 165 16920VR90
        I                                       P 170 1742CRDTD
        I                                       P 175 1792ADJTD
        I                                       P 180 1842SLSLY
        I                                       P 185 1880DTLOR
        I                                       P 189 1920MDATE
        I                                       P 193 1960RRFST
        I                                       P 197 2000RRLST
        I                                         201  256 BUFFR
                         **** E N D   O F   S E U   P R I N T O U T ****
```

The attributes built from the specifications look like this:

```
**  DFU ATTRIBUTES  **              DATE        TIME       FILE DESC    DFU PROGRAM   DFU SPECS    DSPLY SRCE    MASTER FILE D
                                    12/03/82    14.18.56   LISTSRC      ◊DFW11                     ◊DFW11

          *FILE    CUSTMAST   256
          *KEY                  8        9
01        *RECORD
               ARCOD           1        1
               CUSNO           8        9
               CUSNM          25       34
               CUSA1          25       59
               CUSA2          25       84
               CUSA3          25      109
               STATE           2      111
               ZIPCD    P    9.0      116
               AREAC    P    3.0      118
               PHONE    P    7.0      122
               CUSTP           1      123
               CRLIM    P    7.0      127
               SLSNO    P    5.0      130
               AMDUE    P    9.2      135
               DLTPM    P    7.0      139
               LSTAP    P    9.2      144
               PRBAL    P    9.2      149
               CHGTD    P    9.2      154
               OVR30    P    9.2      159
               OVR60    P    9.2      164
               OVR90    P    9.2      169
               CRDTD    P    9.2      174
               ADJTD    P    9.2      179
               SLSLY    P    9.2      184
               DTLOR    P    7.0      188
               MDATE    P    7.0      192
               RRFST    P    7.0      196
               RRLST    P    7.0      200
               BUFFR          56      256
```

Viewing Attributes At the Top of the Display

While you are responding to job setup prompts, the attributes are shown at the top of the display. For example:

```
                    RECORD KEY DESCRIPTION

                 Description of the record key

                 FILE   CUSTMAST   256
                 KEY                  5        6
        01       RECORD
                      ARCOD           1        1
                      CUSNO           8        9
                      CUSNM          25       34
                      CUSA1          25       59
                      CUSA2          25       84
                      CUSA3          25      109


        Record key heading . . . . . . . . . . . . . . . . .  *KEY

        Is the record key numeric? . . . . . . . . . . .Y,N
```

Viewing Attributes on the Whole Display

While the DFU specifications are being displayed for updating at the end of the job (using the entire display), press the Display Attr/Spec command key (Cmd 8) to display the attributes on the entire display. For example:

```
                              UPDATE DFU SPECIFICATIONS
                             Changes to DFU specifications

                      Field1  Field2  Field3  Field4  Field5
?=Remove line                 *FILE   CUSTMAST  256
>=Add lines                   *KEY                5       6
                      01      *RECORD
Press ENTER to accept                 ARCOD           1       1
  changes                              CUSNO           8       9
                                       CUSNM          25      34
                                       CUSA1          25      59
                                       CUSA2          25      84
                                       CUSA3          25     109
                                       STATE           2     111
                                       ZIPCD   P     9.0     116
                                       AREAC   P     3.0     118
                                       PHONE   P     7.0     122
                                       CUSTP           1     123
                                       CRLIM   P     7.2     127
                                       SLSNO   P     5.0     130
                                       AMDUE   P     9.2     135
Cmd7-End program setup                 DLTPM   P     7.0     139
                                       LSTAP   P     9.2     144
```

Whether you are viewing all of the attributes or only part of the attributes, you can scan through the attributes using the roll keys. And, you can print the attributes or DFU specifications by pressing the Print command key (Cmd 6) when the specifications are being displayed for updating.

What the Attributes Mean

The DFU attributes consist of 40-character records divided into five 8-character fields. The following describes each line of the attributes built from the file definition:

```
        Field          Field       Field       Field      Field
          1              2           3           4          5

         **** DFU ATTRIBUTES  ****

  1 ─────────────*FILE    SALESORD     50
  2 ─────────────*KEY                   5          50
  3 ──01  *RECORD *SINGLE
  4 ─────────────*CODE      C       H               1
                            CODE             1       1
                            CUSTNO         5.0       6
                            ORDNO            6      12
  5 ─{                      CUSORD           5      17
                            DATE             8      25
                            SHPTO            2      27
                            SHPVIA          15      42
  3 ──02  *RECORD *GROUP
  4 ─────────────*CODE      C       D               1
                            CODE             1       1
                            CUSTNO         5.0       6
  5 ─{                      ORDNO            6      12
                            QTY            4.0      16
                            PARTNO           6      22
```

What ∎1 *Means*

∎1 describes the file to be processed.

Field 1:   Blank

Field 2:   *FILE

Field 3:   Name of the file specified to be processed

Field 4:   Length of the records in the file

Field 5:   Blank

What ∎2 *Means*

∎2 describes the record key in the file to be processed. There could be up to three of these specifications. This attribute line does not appear if you are processing a sequential or direct file.

Field 1:   Blank or *EXTK followed by a number (2 or 3 only)

Field 2:   *KEY

Field 3:   Blank

Field 4:   Length of the record key. If packed keys are used, the length follows the letter P.

Field 5:   End position of the record key in the record.

What ∎3 *Means*

Each ∎3 identifies the record type described by the DFU attributes lines that follow (the ∎4 and ∎5 lines).

Field 1:   Record identification indicator of the record type.

Field 2:   *RECORD

*GROUP: This record type is sequenced, with one or more records in the sequence.

Blank: If there have been no sequenced record types yet, this record type is also unsequenced. If there have been sequenced record types previously, this record type has the same sequence attributes (*SINGLE or *GROUP) as the previous record type. This situation occurs when two or more record types are in an OR relationship.

Field 3:   *SINGLE

Field 4:   Blank

Field 5:   Blank

What **4** *Means*

Each **4** specifies the record identification codes for the record type.

Field 1: Blank for the first or only code line; AND or OR for succeeding code lines

Field 2: *CODE

Field 3: Record identification code

Field 4: Blank

Field 5: Position of the identification code in the record

What **5** *Means*

Each **5** describes the fields in the record type.

Field 1: Blank

Field 2: Blank

Field 3: Name of the field

Field 4: Length of the field. For a numeric field, Field 4 contains the length of the field followed by a period and a digit indicating the number of decimal positions in the field. For a packed decimal field, the number in Field 4 follows the letter P.

Field 5: End position of the field in the record.

DFU Attributes When Using a Related Master File

If you are using a related master file when using list, you must also supply a file definition that describes the master file and the field in the list file that DFU uses to retrieve master file records (the key field).

DFU first builds attributes for the list file (using the file definition you supplied to describe that file). Then DFU builds attributes for the master file (using the file definition you supplied for the master file).

The master file attributes follow the list file attributes and are the same as those described earlier except:

- In **2**, Field 3 names the field in the list file that corresponds to the key field in the master file.

- **3** and **4** do not appear in the DFU attributes. DFU does not determine the record type when using a master record.
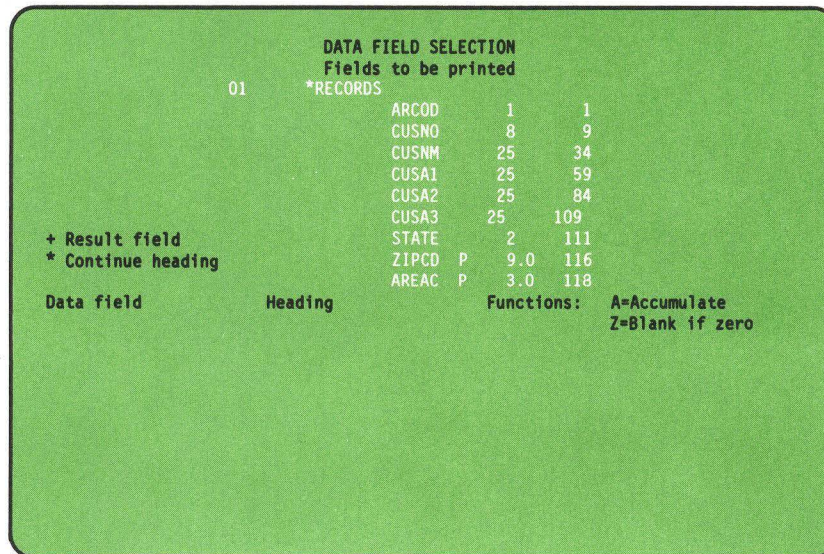
Chapter 10. DFU Specifications

As you respond to prompts during program setup, DFU uses your responses to create *DFU specifications*. The specifications describe what you want to do with your file: do you want to sort it, print records from it, or enter records into it. These specifications can be saved as a source member in the library and used as input for other DFU jobs, allowing you to skip the setup prompting sequence.

This chapter explains the contents of the DFU specifications, how the specifications can be modified, and how they can be saved and used in other setups.

Viewing Specifications at the Top of the Display

The specifications can be shown at the top of the display as you respond to program setup prompts by pressing the Display Attr/Spec command key (Cmd 8). For example:

```
                        DATA FIELD SELECTION
                        Fields to be printed
                01    *RECORDS
                          ARCOD      1       1
                          CUSNO      8       9
                          CUSNM     25      34
                          CUSA1     25      59
                          CUSA2     25      84
                          CUSA3     25     109
  + Result field          STATE      2     111
  * Continue heading       ZIPCD  P  9.0   116
                          AREAC  P  3.0   118
  Data field            Heading          Functions:   A=Accumulate
                                                       Z=Blank if zero
```

Note: The Cmd 8 key alternately displays the DFU attributes and DFU specifications for your program. Each of your responses is added to the specifications when you press the Enter (or Cmd 12) key to enter the response.

Viewing Specifications on the Whole Display

At the end of the job, DFU specifications are shown on the whole display for updating or correcting. For example:

```
                         UPDATE DFU SPECIFICATIONS
                        Changes to DFU specifications

                   Field1  Field2  Field3  Field4  Field5
   ?=Remove line            *LIST   *SUMMARY ───────────────────   1
   >=Add lines              *KEY ──────────────────────────────   2
                   1,1 132*TITLE  SUMMARY LIST/NO DETAIL ─────   3
   Press the Enter key to  01      *RECORD ───────────────────   4
      accept changes               *       CUSNM   CUSTOMER NAME
                                   *       CUSNO   CUSTOMER NUMBER    5
                                   *ADD    AMDUE   AMOUNT DUE
                   10.2    *ADD    +MOINT  TOTAL INTEREST
                   ADD             AMDUE
                   MULT            .01
                           *SORTA  CUSNO                              6
                           *TOTAL  CUSNO
                           *SELECT SMDUE   GT
                                   50.00


   Cmd7-End program setup
```

What DFU Specification Lines Mean

The following describes each line of the DFU specifications. There are several types of lines within the specifications. Each line is 40 characters long and divided into 5 fields of 8 characters.

1 The first line in the specifications is the header line. It specifies the DFU program type and special processing required when the job is run.

2 The record key line or lines follow the header line and specify special record key or record number processing required when the job is run, as well as the headings for record key or record number fields.

3 The title line follows the record key field specification. It specifies the column spacing value and job title.

4 The record line(s) specifies the record identification indicator for the record types to be processed. There is one record line for each record type processed. The record lines must be in the same order as they are in the file definition if sequenced record types are specified for entering or updating.

5 The data field specification line(s) describe the processing required on the individual fields within each record type. A data field specification line must be present for each processed field in each record type.

Note: If a heading has more than one line, continuation lines must be used to describe each additional line of a heading.

6 For record list or summary list DFU specifications, more than one field specification line may be needed to specify calculated result fields, record selection tests, and headings that contain more than one line.

Note: The sort, control level, and select specifications can be in any order, but must follow all record and field specifications. (The exception is a select specification in which a field is compared to a constant; the constant must directly follow the associated select specification.)

DFU Specification Types

The DFU specifications differ depending on the type of job being setup. The types of DFU specifications are:

- Enter/update

- Inquiry

- Record list

- Summary list.

Enter/Update Specifications

The enter/update specifications must occur in this order:

	Field 1	Field 2	Field 3	Field 4	Field 5
Header specification line	*HALT or blank	*ENT/UPD	*LIST *LISTNEW *NOLIST blank	Delete code	*COLUMN *COLUMNS *MAXIMUM blank
Record key specification line(s)	Field name or blank	*KEY	*GENKEY *NUMERIC *FIELDS *SEQ blank	Heading ⟶ Heading ⟶ Heading ⟶	
[1]Key field specification line(s) (if *FIELDS, specified in key specification)		opcode	Field name	Heading	
Title specification line	Field column spacing and printer line width	*TITLE	⟵ Title ⟶	Title	
Record specification line(s)	Record ID	*RECORD	blank *LOWCASE		
Data field specification line(s)		Opcode	Field name	Heading ⟶	
[1]Keyfield specification is optional.					

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Enter/Update Specification Explanation

Header specification line: Always present.

Field 1:	*HALT	Halt when characters in data cannot be printed.
	Blank	Do not halt when data to be printed contains these characters.
Field 2:	*ENT/UPD	Identifies these specifications as enter/update program specifications.
Field 3:	*LIST	Print records as created, plus updated and deleted records.
	*LISTNEW	Print only new records.
	*NOLIST	Don't print any records.
	Blank	Print only updated or deleted records.
Field 4:	Delete code	Delete code, position (for example X, 1).
Field 5:	*COLUMN	The display is in single-column format.
	*COLUMNS	The display is in multiple-column format.
	*MAXIMUM	The display is in maximum data format.
	Blank	Defaults to *COLUMNS.

Record key specification line(s): Always present.

Field 1:	Field name	Name of the field to contain the record number when processing sequential or direct files.
	Blank	Only for sequential or direct files; the record number is not placed in a created/changed record.
Field 2:	*KEY	Identifies line as record key specification.
Field 3:	*GENKEY	DFU generated a five-digit numeric key for indexed files, or sequential record numbers for sequential or direct files.
	*NUMERIC	The operator supplies a numeric key when processing indexed files.

	*SEQ	The file is to be processed sequentially. Record numbers are not prompted for in enter mode. However, in update mode the record numbers are prompted for.
	*FIELDS	The record key is composed of field(s) in the record (the following specifications describe the record key fields). This is only used when processing indexed files.
	Blank	The operator supplies an alphameric key when processing indexed files, or DFU is not generating record numbers for sequential or direct files.
Fields 4 and 5:	Heading	Heading for key field.

Key field specification line(s) (optional): Present only if *FIELDS specified in the key specification.

Field 1:	Blank	Unused.
Field 2:	Op code	A description of the valid enter/update operation codes is listed later in this chapter.
Field 3:	Field name	Name of the field you selected as key field.
Fields 4 and 5:	Heading	Heading you specified for the key field.

Title specification line(s): Always present.

Field 1:	F XXX	F = Number of spaces between fields on printer output (0 through 9). XXX = Printer line width (60 through 19 value must be right-justified.
Field 2:	*TITLE	Identifies line as title specification.
Fields 3, 4 and 5:	Title	Title of your job that will appear on printout (you specified on General Information display).

Record specification line(s): At least one must be present.

| **Field 1:** | Record ID | |

Field 2:	*RECORD	Identifies line as a record specification.
Field 3:	Blank	Operator can key only uppercase data for this record type.
	*LOWCASE	Operator can key uppercase and lowercase data for this record type.
Field 4:	Blank	Unused.
Field 5:	Blank	Unused.

Data field specification line(s): At least one must be present.

Field 1:	Blank	Unused.
Field 2:	Op code	A description of the enter/update operation codes is listed later in this chapter.
Field 3:	Field name	Name of field you selected.
Fields 4 and 5:	Heading	Heading you specified for this field.

Note: After the title specification, the record and associated data field specifications alternate until all record types have been defined.

Inquiry Specifications

The inquiry specifications must occur in this order:

	Field 1	Field 2	Field 3	Field 4	Field 5
Header specification line	*HALT or blank	*INQUIRY	*EDIT or blank		*COLUMN *COLUMNS *MAXIMUM blank
Record key specification line(s)	Field name or blank	*KEY	*NUMERIC *FIELDS blank	Heading ──────→ Heading ──────→	
[1]Key field specification line(s) (if *FIELDS, specified in record key specification)		Opcode	Field name	Heading ──────→	
Title specification line	Field column spacing and printer line width	*TITLE	Title ──────────────────────────→		
Record specification line(s)	Record ID	*RECORD	blank *LOWCASE		
Data field specification line(s)		Opcode	Field name	Heading ──────→	
[1]Keyfield specification is optional.					

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Inquiry Specifications Explanation

Header specification line: Always present.

Field 1:	*HALT	Halt when data to be printed contains characters that cannot be printed.
	Blank	Do not halt when data to be printed contains these characters.
Field 2:	*INQUIRY	Identifies these specifications as Inquiry specifications.
Field 3:	*EDIT	Indicates that numeric data is edited. DFU blanks any leading zeros, left-justifies the numeric characters, inserts decimal points, and displays the sign if it is negative (-).
	Blank	Indicates no editing of numeric data.
Field 4:	Blank	Unused.
Field 5:	*COLUMN	The display is in single-column format.
	*COLUMNS	The display is in multiple column format.
	*MAXIMUM	The display is in the maximum data format.
	Blank	Defaults to *COLUMNS.

Record key specification line(s): Always present.

Field 1:	Field name	Name of the field in the record that contains the record number when processing sequential or direct files.
	Blank	Used when processing direct or sequential files; assumes a field length of 7 for the record number prompt.
Field 2:	*KEY	Identifies line as record key specification.
Field 3:	*NUMERIC	The operator supplies a numeric key.
	*FIELDS	The record key is composed of field(s) in the record (the following specifications describe the record key fields).
	Blank	The operator supplies an alphameric key when processing indexed files, when processing sequential or direct files, this field must be blank.

Fields 4 and 5:	Heading	Heading for key field.

Key field specification line(s) (optional): Present only if *FIELDS specified in the record key specification.

Field 1:	Blank	Unused.
Field 2:	Op code	A description of the valid inquiry operatio: codes is listed later in this chapter.
Field 3:	Field name	Name of the field you selected as key field
Fields 4 and 5:	Heading	Heading you specified for key field.

Title specification line: Always present.

Field 1:	F XXX	F = Number of spaces between fields on printer output (0 through 9).
		XXX = Printer line width (60 through 19! value must be right-justified.
Field 2:	*TITLE	Identifies line as title specification.
Field 3, 4 and 5:	Title	Job title you specified on the General Information display.

Record specification line(s): At least one must be present.

Field 1:	Record ID	
Field 2:	*RECORD	Identifies line as record specification.
Field 3:	Blank	Operator can key only uppercase data for this record type.
	*LOWCASE	Operator can key uppercase and lowercase data for this record type.
Field 4:	Blank	Unused.
Field 5:	Blank	Unused.

Data field specification line(s): At least one must be present.

Field 1:	Blank	Unused.
Field 2:	Op code	A description of the valid inquiry operation codes is listed later in this chapter.

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Field 3:	Field name	Name of the field you selected.
Fields 4 and 5:	Heading	Heading you specified for this field.

Note: After the title specification, the record and associated data field specifications alternate until all record types have been defined.

Record List Specifications

The following table describes the first set of specifications for a record type list. The first set of specifications must occur in this order:

	Field 1	Field 2	Field 3	Field 4	Field 5
Header specification line	*HALT or blank	*LIST	*RECORD		
Record Key specification line(s)		*KEY	*RECNUM *PRINT *NUMERIC blank	Heading ——————▶ Heading ——————▶ Heading ——————▶	
Title specification line	Field column spacing and printer line width values	*TITLE	Title ———		———————————▶
Record specification line(s)	Record ID	*RECORD			
Data field specification line(s)		Opcode	Field name	Heading ——————▶	
	Length• decimal positions	Opcode	*RESULT	Heading ——————▶	
	Length• decimal positions	Opcode	+Field name	Heading ——————▶	
Continuation specification line(s)	*	*HDNG	Blank	Heading or blank ——————▶	
Result field specification line(s) (if preceding data field specification indicates a result field)	ADD SUB MULT DIV		Factor ————————————————▶ (Factor Factor ———————————▶) (Factor ——————————▶)		

Record List Specifications Explanation

Header specification line: Always present.

Field 1:	*Halt	Halt when the data to be printed contains characters that cannot be printed.
	Blank	Do not halt when the data to be printed contains unprintable characters.
Field 2:	*LIST	Identifies these as list program specifications.
Field 3:	*RECORD	Identifies this as record list.
Field 4:	Blank	Unused.
Field 5:	Blank	Unused.

Record key specification line(s): Always present.

Field 1:	Blank	Unused.
Field 2:	*KEY	Identifies line as key field specification.
Field 3:	*RECNUM	Print the relative record number as the first field. This is only used for sequential or direct files.
	*PRINT	Print an alphameric record key as the first field when processing an indexed file. When processing a sequential or direct file, generate and print a record number for each consecutive record.
	*NUMERIC	Print a numeric record key as the first field. This is only used for indexed files.
	Blank	Don't print a record key or record numb the first field.
Fields 4 and 5:	Heading	Heading for key field.

Title specification line(s): Always present.

Field 1:	F,L XXX	F = Number of spaces between field; on printer output (0 through 9).
		L = Detail line spacing on printer output (1, 2, 3).

		XXX = Printer line width (60 through 198); value must be right-justified.
Field 2:	*TITLE	Identifies line as title specification.
Fields 3, 4 and 5:	Title	Job title you specified on the General Information display. It will appear on your printouts.

Record specification line(s): At least one must be present.

Field 1:	Record ID	
Field 2:	*RECORD	Identifies line as a record specification.
Fields 3, 4 and 5:	Blank	Unused.

Data field specification line(s): At least one must be present.

Field 1:	Length, decimal positions	Specifies the length and decimal positions for the result field (length, decimal position).
Field 2:	Op code	A description of the valid list function operation codes is listed later in this chapter.
Field 3:	Field name:	This field is printed as is.
	*RESULT	This field is printed after combining factors froɪ one or more input fields and/or constants via arithmetic operations. These factors are described in the following result field specifications.
	+ Field name	Same as *RESULT. The result of the calculation can be used as a factor in succeeding result fields on the print line.
Fields 4 and 5:	Heading	Heading you specified for this field.

Continuation specification line(s): Optional.

Field 1:	*	Indicates this is a continuation specificati(
Field 2:	*HDNG	Indicates this is a heading continuation.
Field 3:	Blank	Field 3 must be blank for heading continuations.
Fields 4 and 5:	Heading	Continuation of heading for data field or blank.

Result field specification line(s): Present if the previous data field specification is *RESULT or + Field name.

Field 1:	ADD	Add this factor to the result.
	SUB	Subtract this factor from the result.
	MULT	Multiply this factor times the result.
	DIV	Divide the result by this factor.
Fields 2:	Blank	Unused.
Fields 3, 4 and 5:		These fields hold the factor to be incorporated into the result:
	Factor	A single factor.
	(Factor	The first factor in an expression within parenthesis.
	Factor)	The last factor in an expression within parenthesis.
	(Factor)	The only factor in an expression within parenthesis.

Notes:

1. *The factor can be a numeric constant, a field from the list or master file, or the name of a previous result field.*
2. *If the factor is a previously named result field, do not type in the + sign preceding the result name.*

As in enter/update and inquiry, record and associated data field specifications alternate until all record types to be listed are defined.

	Field 1	Field 2	Field 3	Field 4	Field 5
Sort field specification line(s)	Control type	*SORTA *SORTD	Field name		
Control field specification line(s)	blank *SKIP	*TOTAL	Field name		
Record select field specification line(s) (compare field to another field)	blank (1st) AND/OR	*SELECT	Field name	Relation	Field name or keyword
Record select field specification line(s) (compare field to a constant)	blank (1st) AND/OR	*SELECT	Field name Constant	Relation	blank

Sort field specification line(s): Optional; if specified, they must be in a major to minor order.

Field 1:	Control type	
Field 2:	*SORTA	Sort this field in ascending sequence.
	*SORTD	Sort this field in descending sequence.
Field 3:	Field name	Name of field you selected to sort.
Field 4:	Blank	Unused.
Field 5:	Blank	Unused.

Control field specification line(s): Optional; if specified, they must be in a major to minor order.

Field 1:	Blank	Do not skip to a new page after a control break on this field.
	*SKIP	Skip to a new page after a control break on this field.
Field 2:	*TOTAL	Identifies field as a control field which causes a total to be printed.

| **Field 3:** | Field name | Name of field you selected as a control field. |
| | | |

| **Field 4:** | Blank | Unused. |
| | | |

| **Field 5:** | Blank | Unused. |

Record select field specification line(s): Optional.

Comparing a field to a field:

Field 1:	Blank	First select field specification.
	AND	This condition must be satisfied in additio to the previous select criterion.
	OR	The start of a new set of select conditions.
Field 2:	*SELECT	Identifies line as a record select specification.
Field 3:	Field name or keyword	Name of field you selected to compare to another field or constant.
Field 4:	Relation	EQ, NE, GT, LT, GE, or LE.
Field 5:	Field name or keyword	Compare select field to this field.
	UMONTH	Compare select field to current month.
	UDAY	Compare select field to current day.
	UYEAR	Compare select field to current year.
	UDAY	Compare select field to current date.

Comparing a field to a constant (requires two specifications):

1. First specification: Same as above, except field 5 is blank.

2. Second specification: Field 3 through 5 hold the constant to be compared against.

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Summary List Specifications

The following table describes the first set of specifications for a summary list. The first set of specifications must occur in the specified order.

	Field 1	Field 2	Field 3	Field 4	Field 5
Header specification line	*HALT or blank	*LIST	*SUMMARY	blank *DETAIL	
Record key specification line(s)		*KEY	*PRINT *NUMERIC blank *RECNUM	Heading ————→ Heading ————→ Heading ————→	
Title specification line	Field column spacing and printer line width values	*TITLE	Title ——————————————————→		
Record specification line(s)	Record ID	*RECORD			
Data field specification line(s)		Opcode	Field name	Heading ————→	
	Length• decimal position	Opcode	*RESULT	Heading ————→	
	Length• decimal position	Opcode	+Field	Heading ————→	
Continuation specification line(s)	*	*HDNG	Blank	Heading or blank ————→	
Result field specification line(s) (if preceding data field specification indicated a result field)	ADD SUB MULT DIV		Factor —————————————→ (Factor —————————————→ Factor —————————→) (Factor —————————→)		

Summary List Specifications Explanation

Header specification line: Always present.

Field 1:	*Halt	Halt when the data to be printed contains characters that cannot be printed.
	Blank	Do not halt when the data to be printed c characters that cannot be printed.
Field 2:	*LIST	Identifies these as list program specificatio
Field 3:	*SUMMARY	Identifies this as summary list.
Field 4:	Blank	Print only control fields and accumulator fields on control breaks.
	*DETAIL	Print all detail records selected for process
Field 5:	Blank	Unused.

Record key specification line(s): Always present.

Field 1:	Blank	Unused.
Field 2:	*KEY	Identifies line as record key specification.
Field 3:	*PRINT	Print an alphameric record key as the first field when processing an indexed file. Wh processing a sequential or direct file, generate and print a record number for ea consecutive record.
	*NUMERIC	Print a numeric record key as the first fiel This is only used for indexed files.
	Blank	Don't print a record key or record numbeɪ as the first field.
	*RECNUM	Print the relative record number as the first field. This is only used for sequential or direct files.
Fields 4 and 5:	Heading	Heading for key field.

Title specification line(s): Always present.

Field 1:	F,L XXX	F	= Number of spaces between fields on printer output (0 through 9).
		L	= Detail line spacing on printer output (1, 2, 3).
		XXX	= Printer line width (60 through 198); values must be right-justified.
Field 2:	*TITLE		Identifies line as a record specification.
Fields 3:	Title		Job title you specified on the General Information display. It will
4 and 5:			

Record specification line(s): Optional; if absent, all record types containing at least one list field will be printed.

Field 1:	Record ID	
Field 2:	*RECORD	Identifies line as a record specification.
Fields 3, 4 and 5:	Blank	Unused.

Data field specification line(s): At least one must be present.

Field 1:	Length, decimal position	Required for result fields. This is the length and decimal positions used for the result field (length decimal positions).
Field 2:	Op code	A description of the valid list function operation codes is listed later in this chapter.
Field 3:	Field name:	This field is printed as is.
	*RESULT	This field is printed after combining factors from one or more input fields and/or constants via arithmetic operations. These factors are described in the following result field specifications.
	+ Field name	This field is the same as *RESULT above. In addition, the calculation result can be used as a factor in succeeding result fields on the print line.
Fields 4 and 5:	Heading	Heading you specified for this field.

Continuation specification line(s): Optional.

Field 1:	*	Indicates this is a continuation specificati⟨
Field 2:	*HDNG	Indicates this is a heading continuation.
Field 3:	Blank	Field 3 must be blank for heading continuations.
Fields 4 and 5:	Heading	Continuation of heading you specified data field or blank.

Result field specification line(s): Present if the preceding specification is *RESULT or + Field name.

Field 1:	ADD	Add this factor to the result.
	SUB	Subtract this factor from the result.
	MULT	Multiply this factor times the result.
	DIV	Divide the result by this factor.
Field 2:	Blank	Unused.
Fields 3, 4 and 5:		These fields hold the factor to be incorpo⟨ into the result.
	Factor	A single factor.
	(Factor	The first factor in an expression within parenthesis.
	Factor)	The last factor in an expression within parenthesis.
	(Factor)	The only factor in an expression within parenthesis.

Notes:

1. *The factor can be a numeric constant, a field from the list or master file, or the name of a previous result field.*
2. *If the factor is a previously named result field, do not type in the + sign before the result name.*

Unlike enter/update, inquiry, and record list, all summary-list record specifications appear before any summary-list data field specifications; if there are no record specifications, all record types containing a field to be listed will be included in the list.

The sort, control level, and select specifications, if present, follow all data field specifications. They can be in any order. (The only exception is a select specification in which a field is compared to a constant; the constant must directly follow the associated select specification.)

	Field 1	Field 2	Field 3	Field 4	Field 5
Sort field specification line(s)	Control field type	*SORTA *SORTD	Field name		
Control field specification line(s)	*SKIP or blank	*TOTAL	Field name		
Record select field specification line(s) (compare this field to field)	blank (1st) AND/OR	*SELECT	Field name	Relation	Field name or keyword
Record select field specification line(s) (compare field to constant)	blank (1st) AND/OR	*SELECT	Field name Constant ──────	Relation	blank ───────►

Sort field specification line(s): Optional; if specified, they must be in a major to minor order.

Field 1:	Control type	
Field 2:	*SORTA	Ascending sequence sort.
	*SORTD	Descending sequence sort.
Field 3:	Field name	Name of field you selected to sort.
Fields 4 and 5:	Blank	Unused.

Control field specification line(s): Optional; if specified, they must be in a major to minor order.

Field 1:	*SKIP	Skip to a new page after a control break o this field.
	Blank	Do not skip to a new page after a control on this field.
Field 2:	*TOTAL	Identifies field as a control field which causes a total to be printed.
Field 3:	Field name	Name of field you selected as a control field.
Field 4:	Blank	Unused.
Field 5:	Blank	Unused.

Record select field specification line(s): Optional.

Comparing a field to a field:

Field 1:	Blank	First select field specification.
	AND	This condition must be satisfied in addition t(the previous select criterion.
	OR	The start of a new set of select conditions.
Field 2:	*SELECT	Identifies line as a record select specification.
Field 3:	Field name	Name of field you selected to compare to another field or constant.
Field 4:	Relation	EQ, NE, GT, LT, GE, or LE.
Field 5:	Field name or date keyword	Field name: Compare select field to this field.

UMONTH – Compare select field to current 1

UDAY – Compare select field to current day.

UYEAR – Compare select field to current yea

UDAY – Compare select field to current date

Comparing a field to a constant (requires two specifications):

1. First specification: Same as above, except field 5 is blank.

2. Second specification: Fields 3 through 5 hold the constant to be compared against.

Operation Codes for DFU Specifications

Field 3 of the Data Field specifications identifies which operation code has been specified (if any) for a particular data field. Operation codes (also called op codes) identify the function used in the data field. Each function or combination of functions is identified by a code. For example, if you specify Modulus 10 checking for a field (on the Data Field Specification display); *C is entered in Field 3 of the Data Field Specification. If you specify Modulus 10 checking and accumulate for the same field; *ADDC is entered (*ADD alone identifies the field as accumulate only).

This table lists the op codes used to identify the function used in data fields.

Op Code Used	For This Function	When You Are Using		
		ENTER/ UPDATE	INQUIRY	LIST
*C	Modulus 10 checking	X		
*K	Modulus 11 checking	X		
*Z	Blank fill			X
*D	Automatic duplication	X		
*ADD	Accumulate	X		X
*ADDZ	Accumulate and blank fill			X
*CD	Modulus 10 checking and automatic duplication	X		
*KD	Modulus 11 checking and automatic duplication	X		
*ADDC	Accumulate and Modulus 10 checking	X		
*ADDK	Accumulate and Modulus 11 checking	X		
*ADDD	Accumulate and automatic duplication	X		
*ADDCD	Accumulate and Modulus 10 checking and automatic duplication	X		
*ADDKD	Accumulate and Modulus 11 checking and automatic duplication	X		
*HDNG	Heading continuation			X

If Field 3 of the Data Field specifications is left blank, no functions are used.

Reusing DFU Specifications

It is possible to save and name the DFU specifications built during setup as a source member in a library. They can be used as input for the setup of a similar DFU job, modified as necessary, then used in building the program for that job.

The program can be named and saved in the library, or the default name can be used, causing the program to be removed from the library at the end of the job. If a new program is to be created with the same name as the existing program, the existing program name must first be removed from the library using the REMOVE command. The program is stored both as a subroutine member and as a corresponding display program load member for enter, update, and inquiry. Both must be removed.

It is also possible to create DFU specifications without DFU and store them as a source member in the library. These DFU specifications can be used as input to the job setup in place of operator-entered prompt responses or DFU specifications saved from a previous job setup.

The ability to save the DFU specifications allows you to use them again and change them to describe a different job without going through the prompting sequences to create the specifications.

Any saved DFU specifications used must be requested the first time on the procedure command or on the DFU parameter prompt display. A file definition source member for the file(s) to be processed must also be available. The DFU attributes are created from information in the file definition source member, and then the DFU specifications are used from the source member. Control is then passed to the specification update routine, bypassing the prompting cycle, allowing the operator to modify the DFU specifications.

How to Save DFU Specifications

You indicate at the end of job setup whether you want to save the DFU specifications. Refer to the "DFU Program Source Save Display" in Chapters 4, 5, or 6 for more information.

Updating DFU Specifications

During the program setup, any part of the DFU attributes or specifications can be displayed by pressing the Display Attr/Spec command function key, or the Roll Up and Roll Down function keys. Beginning at line 5, DFU attributes or specifications are displayed one per line, up to and including the next to last line of the display; any DFU specifications displayed can be changed. Change a specification by moving the cursor to the character you want changed, typing in the changes, and pressing the Enter key. You can also delete or add specifications as explained in the following paragraphs. A printout of the DFU attributes and specifications can be obtained from the system list device by pressing the Print Rec command key (Cmd 6).

If the Enter key is pressed and no specifications have been changed, a roll up (Roll ↑) function occurs to display the next set of specifications. A roll up function performed at the end of the specifications will roll the specifications back to the beginning of those specifications.

Deleting

A DFU specification(s) can be deleted by typing a question mark (?) in the first position of the line(s) to be deleted and pressing the Enter key.

Adding

DFU specifications can be added by placing the greater than sign (>) in the first position of the line in which you want the inserted lines to follow, and pressing the Enter key. An Add Specification display is then displayed to allow the addition of DFU specifications beginning at line 5; they can be added one per line up to and including the next to last line on the display. Pressing the Enter key without typing data on a line ends the Add Specification display; any data typed on previous lines is saved. Filling add lines causes the Add Specification display to be repeated.

Correcting DFU Specifications

When you have finished updating the DFU specifications, press the End-of-Job command (Cmd 7) key. This indicates the end of the setup and causes the DFU specifications to be checked for errors. If no errors are found, the DFU specifications are converted to a program and you cannot update the DFU specifications any further in this setup step. Changes are allowed by DFU only if an error is detected.

When errors are detected, a DFU specification is highlighted. The cursor is moved to the highlighted specification and the message code is displayed with the error message on the last line of the display. In the case of a syntax error, the highlighted specification contains the error and must be corrected or deleted to continue with the job. When a required specification is missing, the specification in its place is highlighted. For some errors, several specifications can be involved in causing and/or correcting the error. One of the specifications is displayed. Use the message code to find an explanation of the error; in the *Utilities Messages*. You can either correct the error by reentering the proper data or press Cmd 12 to accept with error. If you make a correction to the DFU specifications and press the EOJ command (Cmd 7) key, the corrected specifications are diagnosed.

Creating the DFU Program

Once the DFU specifications are error-free, DFU converts them into the program that is saved as a subroutine member in the library by combining the information from the DFU attributes and specifications. If you are using List, the printout begins.

Display source are built for enter, update and inquiry DFU jobs before they are run.

Changing Stored Display Source

When you gave the DFU display source a name on the Procedure display, DFU stored the display source statements (or specifications) as a source member. Changing display specifications requires some programming considerations and should only be done by an experienced user. It is recommended that you read *Creating Displays: Screen Design Aid and System Support Program* before attempting to update these specifications.

In order to change the display formats in a DFU program, the following steps are involved:

1. Change the DFU generated display format source specifications using SDA or SEU.

    When changing the specifications you can change the way the display looks - for example, you can highlight fields, make a field blink, or show a field in reverse image. In other words :

    -   You can add output constants.

    -   You must not change the order of fields on the display.

    -   You must not change the length and data of output constants.

    -   You must not add or remove any displays, or change the name of any displays.

    -   You must not change the order of the specifications.

    -   You must not change the length on any input fields, or add any input fields.

    -   You must not change any input field data types.

    Changing indicators can have unexpected results. You should be extremely careful when making any changes to indicators.

2. Compile the display format source specifications (see the FORMAT procedure in the *System/36 System Support Reference* manual).

3. You must replace the existing load member which forms part of the DFU program with the load member generated in step 2. Please note that the name given to the load member must be the same as that given to the DFU program. If you assign a different name to the load module, you will have created another load member which DFU will not know about.

Glossary

#LIBRARY. The library, provided with the system, that contains the System Support Program Product. See *system library*.

access method. The way that records in files are referred to by the system. The reference can be consecutive (records are referred to one after another in the order in which they appear in the file), or it can be random (the individual records can be referred to in any order).

accumulate. To collect. For example, to accumulate the values in a field.

accumulating. The process of totaling the values in a particular field as records are being processed.

align. To bring into or be in line with another or with others. For example, to align numbers on the decimal point.

allocate. To assign a resource, such as a disk file or a diskette file, to perform a specific task.

alphabetic character. Any one of the letters A through Z (uppercase and lowercase). Some program products extend the alphabet to include the special characters #, $, and @.

alphameric. Consisting of letters, numbers, and often other symbols, such as punctuation marks and mathematical symbols.

alphanumeric. See *alphameric*.

alternative index. An index that is built after a file is created and that provides a different order for reading or writing records in the file. Contrast with *primary index*.

AND relationship. In RPG, the specifying of indicators so that an operation is performed only when all conditions are met.

arithmetic expression. A statement containing any combination of data items joined together by one or more arithmetic operators in such a way that the statement can be evaluated as a single numeric value.

arithmetic operator. A symbol used to represent a mathematical operation, such as + or -, used to indicate addition or subtraction.

array. A named set of data items, all of which are the same type, arranged in a pattern (for example, columns and rows).

ascending key sequence. The arrangement of data in order from the lowest value of the key field to the highest value of the key field. Contrast with *descending key sequence*.

assembler. A program that converts assembler language statements to machine instructions.

attribute. A characteristic. For example, the attribute for a displayed field could be blinking.

automatic duplication. An option of DFU that allows information from a previous record to be duplicated in the current record.

automatic duplication indicator. In DFU, an indicator that tells whether automatic duplication is on or off.

automatic key generation. A DFU option that allows DFU to assign 5-digit record keys to the records of a file.

autoskip option. An option of SEU that allows the cursor to automatically skip fields.

base number. The part of a self-check field from which the check digit is calculated.

BASIC (beginner's all-purpose symbolic instruction code). A programming language designed for interactive systems and originally developed at Dartmouth College to encourage people to use computers for simple problem-solving operations.

binary. (1) Pertaining to a system of numbers to the base two; the binary digits are 0 and 1. (2) Involving a choice of two conditions, such as on-off or yes-no.

byte. The amount of storage required to represent one character; a byte is 8 bits.

call. To activate a program or procedure at its entry point. Compare with *load.*

cancel. To end a task before it is completed.

character. A letter, digit, or other symbol.

character key. A keyboard key that allows the user to enter the character shown on the key. Compare with *command keys* and *function key.*

character string. A sequence of consecutive characters.

check. (1) An error condition. (2) To look for a condition.

check digit. The rightmost digit of a self-check field used to check the accuracy of the field.

code. (1) Instructions for the computer. (2) To write instructions for the computer. Same as *program.* (3) A representation of a condition, such as an error code.

collating sequence. The sequence in which characters are ordered within the computer for sorting, combining, or comparing.

command. A request to perform an operation or a procedure.

command keys. The 12 keys on the top row of the display station keyboard that are used with the Cmd key (and optionally the Shift key) to request up to 24 different actions defined for program products and user programs. Compare with *character key* and *function key.*

compile. To translate a program written in a high-level programming language into a machine language program.

configure. To describe (to the system) the devices, optional features, and program products installed on a system.

constant. A data item with a value that does not change. Contrast with *variable.*

constant field. A field that is defined by a display format to contain a value that does not change.

control break. In RPG, a change in the contents of a control field.

control field. A field that identifies a record's relationship to other records (such as a part number in an inventory record). In RPG, control fields are compared from record to record to determine when certain operations are to be performed. In sort, control fields determine the order of records in the sorted file.

current library. The first library searched for any required members. The current library can be specified during sign-on or while running programs and procedures.

cursor. A movable symbol (such as an underline) on a display, usually used to indicate to the operator where to type the next character.

cylinder. All disk or diskette tracks that can be read or written without moving the disk drive or diskette drive read/write mechanism.

data file utility (DFU). The part of the Utilities Program Products that is used to create, maintain, display, and print disk files.

data type. A category that identifies the mathematical qualities and internal representation of data.

DDM. See *distributed data management.*

decimal. Pertaining to a system of numbers to the base ten; decimal digits range from 0 through 9.

default value. A value stored in the system that is used when no other value is specified.

delete. To remove. For example, to delete a file.

delete character. A character that identifies a record to be removed from a file.

delete-capable file. A file from which records can be logically removed without compressing the file.

descending key sequence. The arrangement of data in order from the highest value of the key field to the lowest value of the key field. Contrast with *ascending key sequence.*

DFU. See *data file utility.*

direct file. A disk file in which records are referenced by the relative record number. Contrast with *indexed file* and *sequential file.*

disk. A storage device made of one or more flat, circular plates with magnetic surfaces on which information can be stored.

display. (1) A visual presentation of information on a display screen. (2) To show information on the display screen.

display format. Data that defines (or describes) a display.

distributed data management (DDM). A part of the System Support Program Product that allows DFU programs to use files that are on a remote system (remote files).

edit. (1) To modify the form or format of data; for example, to insert or remove characters such as for dates or decimal points. (2) To check the accuracy of information that has been entered, and to indicate if an error is found.

enter. To type in information on a keyboard and press the Enter key in order to send the information to the computer.

feature. A programming or hardware option, usually available at an extra cost.

field. One or more characters of related information (such as a name or an amount).

file label. The name of the file on the disk.

file name. The name of the file specified on DFU procedure displays.

format. (1) A defined arrangement of such things as characters, fields, and lines, usually used for displays, printouts, or files. (2) To arrange such things as characters, fields, and lines. (3)Previous term for a DFU program.

function key. A keyboard key that requests an action but does not display or print a character. The cursor movement and Help keys are examples of function keys. Compare with *command keys* and *character key*.

header record. A record that contains information, such as customer name and customer address, that is common to following detail records. Contrast with *detail record*.

hex. See *hexadecimal*.

hexadecimal. Pertaining to a system of numbers to the base sixteen; hexadecimal digits range from 0 (zero) through 9 (nine) and A (ten) through F (fifteen).

ideographic character. A two position symbol, pictogram, or graphic character used to represent ideas.

ideographic feature. A version of SSP that manages ideographic data, display stations, printers, and programs.

indexed file. A file in which the key and the position of each record is recorded in a separate portion of the file called an index. Contrast with *direct file* and *sequential file*.

initialize. To prepare for use. For example, to initialize a diskette.

input. Data to be processed.

job. (1) A unit of work to be done by a system. (2) One or more related procedures or programs grouped into a procedure.

job queue. A list, on disk, of jobs waiting to be processed by the system.

katakana. A one-position symbol, pictogram, or graphic character used to represent phonetic sounds.

key. One or more characters used to identify the record and establish the record's order within an indexed file.

keyword. A symbol that identifies a parameter.

left-adjust. To place or move an entry in a field so that the leftmost character of the field is in the leftmost position. Contrast with *right-adjust*.

library. (1) A named area on disk that can contain programs and related information (not files). A library consists of different sections, called library members. (2) The set of publications for a system.

library member. A named collection of records or statements in a library. The types of library members are *load member, procedure member, source member*, and *subroutine member*.

load member. A library member that contains information in a form that the system can use directly, such as a display format. Contrast with *source member*.

master file. A file that is used in a job and that is relatively permanent, even though its contents may change.

member. See *library member*.

menu. A displayed list of items from which an operator can make a selection.

message. Information sent to an operator or programmer from a program. A message can be either displayed or printed.

message identification code (MIC). A four-digit number that identifies a record in a message member. This number can be part of the message identification.

MIC. See *message identification code.*

mode. A method of operation. For an example, see *enter/update mode.*

modulus 10/modulus 11 checking. Formulas used to calculate the check digit for a self-check field.

multiple. More than one.

non-contiguous key. A key that is made up of 2 or 3 non-consecutive record fields.

null character. The character hex 00, used to represent the absence of a printed or displayed character.

numeric. Pertaining to any of the digits 0 through 9.

OCL. See *operation control language.*

operand. A quantity of data that is operated on, or the address in a computer instruction of data to be operated on.

output. The result of processing data.

overlay. (1) To write over (and therefore destroy) an existing file. (2) A program segment that is loaded into main storage and replaces all or part of a previously loaded program segment.

parameter. A value supplied to a procedure or program that either is used as input or controls the actions of the procedure or program.

primary index. The index that is built when an indexed file is created. Contrast with *alternative index.*

printout. Information from the computer that is produced by a printer.

procedure. A set of related operation control language statements (and, possibly, utility control statements and procedure control expressions) that cause a specific program or set of programs to be performed.

procedure member. A library member that contains the statements (such as operation control language statements) necessary to perform a program or set of programs.

program. (1) A sequence of instructions for a computer. See *source program.* (2) To write a sequence of instructions for a computer. Same as *code.*

prompt. A displayed request for information or operator action.

protected field. A displayed field in which operators cannot enter data.

queue. A line or list formed by items waiting to be processed.

record. A collection of fields that is treated as a unit.

remote file. A file that resides on a system connected to the user's own system via a communication facility.

right-adjust. To place or move an entry in a field so that the rightmost character of the field is in the rightmost position. Contrast with *left-adjust.*

RPG. A programming language specifically designed for writing application programs that meet common business data processing requirements.

scratch file. A file, usually used as a work file, that exists until the program that uses it ends.

screen design aid (SDA). The part of the Utilities Program Product that helps the user design, create, and maintain displays and menus. Additionally, SDA can generate specifications for RPG and WSU work station programs.

SDA. See *screen design aid.*

self-check field. A field, such as an account number, consisting of a base number and a check digit.

sequential file. A file in which records occur in the order in which they were entered. Contrast with *direct file* and *indexed file.*

SEU. See *source entry utility.*

shift in (SI). A one position hexadecimal character (OF) that signifies the end of an ideographic character string.

shift out (SO). A one position hexadecimal character (OE) that signifies the start of an ideographic character string.

SI. See *shift in.*

SO. See *shift out.*

sign on. (Verb) To begin a session at a display station.

source entry utility (SEU). The part of the Utilities Program Product used by the operator to enter and update source and procedure members.

source member. A library member that contains information in the form in which it was entered, such as RPG specifications. Contrast with *load member*.

source program. A set of instructions that are written in a programming language and that must be translated to machine language before the program can be run.

special character. A character other than an alphabetic or numeric character. For example; *, +, and % are special characters.

specification sheets. Forms on which a program is coded and described.

SSP. See *System Support Program Product*.

statement. An instruction in a program or procedure.

status. The condition. For example, the status of a printer.

subroutine. A group of instructions that can be called by another program or subroutine.

subroutine member. A library member that contains information that must be combined with one or more members before being run by the system.

syntax. The rules for the construction of a statement.

system. The computer and its associated devices and programs.

system library. The library, provided with the system, that contains the System Support Program Product and is named #LIBRARY.

System Support Program Product (SSP). A group of licensed programs that manage the running of other programs and the operation of associated devices, such as the display station and printer. The SSP also contains utility programs that perform common tasks, such as copying information from diskette to disk.

transaction. An item of business. The handling of customer orders and customer billing are examples of transactions.

truncate. To shorten a field or statement to a specified length.

Utilities Program Product. A program product that contains the data file utility (DFU), the source entry utility (SEU), the work station utility (WSU), and the screen design aid (SDA).

utility program. A System Support Program Product program that allows you to perform a common task, such as copying information from diskette to disk.

variable. A name used to represent a data item whose value can change while the program is running. Contrast with *constant*.

work station. A device that lets people transmit information to or receive information from a computer; for example, a display station or printer.

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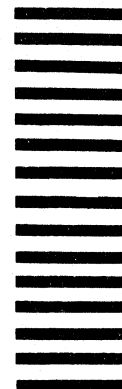
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Remove the following pages:	Replace with the following pages:
ix, x	ix, x
8-13, 8-14	8-12.1, 8-12.2
	8-13, 8-14
X-7, X-8	X-7, X-8

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