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StarTool® **FDM 7.7.1**

Extended Compare Option

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Welcome to the StarTool FDM Extended Compare Option

About This Book

This document describes StarTool® FDM (File and Data Manager) Version 7.7, a product of Serena® Software, Inc. It discusses the features, functions, installation, and use of the StarTool FDM Extended Compare Option, a separately licensed feature of StarTool FDM.

StarTool FDM StarTool FDM is a multi-purpose file and data management utility for IBM® mainframe systems. It provides an ISPF-based, menu-driven, integrated interface to a variety of editors and data management tools for PDS, PDSE, VSAM, direct-access, IMS, and DB2 files. A TSO command-line interface is also supported, as well as bulk file processing in batch mode. Customizable option tables and exits make StarTool FDM highly flexible and adaptable to user needs.

Extended Compare Option The Extended Compare Option enables StarTool FDM customers to compare and find differences between two files without leaving StarTool FDM's integrated, menu-driven environment. Both fixed-format data files and free-format text files are supported. The Extended Compare Option supports the full range of capabilities offered by the standalone Serena® Comparex® utility.

Audience This document is intended for use by IBM mainframe systems engineers and software developers already familiar with the StarTool FDM base product. No knowledge of the Serena Comparex utility is assumed.

Before You Begin

New Information Change bars in the left margin (shown at left) identify substantive changes to this publication since StarTool FDM Version 7.6.3.

Corrections and Technical Support The Readme file on the product media contains updates and corrections to this manual issued after the publication date. It also provides contact information for Serena Customer Support.

Conventions

Terminology Throughout this document:

- z/OS refers to the z/OS™ and OS/390® IBM® operating systems.

- StarTool FDM may also be referenced as StarTool or FDM.

Typographic Conventions The following textual conventions are used throughout this document to highlight special information:

Convention	Meaning
Bold	Panel title or field name.
Italics	Introduces new terms, sets off important information, or marks document titles.
UPPERCASE	Indicates keys or key combinations; for example, the ENTER key.
Bright blue	Clickable cross-reference or active hyperlink.
`Monospaced`	JCL, source code, or message text. Also used for member names, file names, and commands if these are not clear from context.
`MONOSPACED UPPERCASE`	Required value or literal in code or JCL parameter.
`monospaced lowercase`	Pattern for a field value or parameter you specify. Number of characters is significant. Upper-case characters are literals. Lower-case characters are placeholders that indicate data type, where: y = year m = month d = day a = alphanumeric n = numeric x = other or mixed ? = one-character wild card * = *n*-character wild card Punctuation other than wild cards must be reproduced in the position shown.
Examples: ■ `yyyy/mm/dd` ■ `C'aa'` ■ `B'nn'` ■ `D'nn'` ■ `X'nn'`	*Examples:* ■ International calendar date with four-character year, two-character month, and two-character day separated by required slashes, such as `2010/01/01`. ■ Alphanumeric character string in user-readable form, two characters long, such as `C'K9'` ■ Binary number, two digits long, where n = 0 to 1, such as `B'10'` ■ Decimal number, two digits long, where n = 0 to 9, such as `D'10'` ■ Hexadecimal number, two digits long, where n = 0 to F, such as `X'C1'`

Convention	Meaning
monospaced italics	Descriptive placeholder for value or parameter you specify, but not a pattern; for example, *filename*.
Square braces [ ]	Optional parameter or choice of values. May be nested.
Vertical bar |	Inside braces, a vertical bar separates mutually exclusive parameter choices or values.
Ellipsis . . .	Optional repetitions of a pattern in a list.
Greater-than symbol >	Separates items in a chain of menu or command selections on a GUI client. For example, **Start > All Programs > Serena > *product_name***.

Documentation

A complete set of electronic product documentation for StarTool FDM is available on the product distribution media. You can also download the complete documentation suite from the Serena Customer Support Web site at http://www.serena.com/support/.

Printed installation guides and *Quick Reference* documents are shipped with the physical product media.

Related Publications

Available StarTool FDM publications include:

Title	Description
Serena StarTool FDM Installation Guide	System requirements, installation instructions, and configuration information for StarTool FDM.
Serena SER10TY User's Guide	Installation information for SER10TY licensing software and instructions on how to apply license key SERtificates.
Serena StarTool FDM Quick Reference	Overview of StarTool FDM commands, with syntax details for frequently used functions. Includes PEDIT and StarBat subcommands.
Serena StarTool FDM User's Guide	StarTool FDM concepts and facilities, with instructions for using the ISPF-based menu-driven interface.
Serena StarTool FDM Command Reference	TSO command-line syntax and parameter reference, organized alphabetically. Interactive subcommands included for major functions.
Serena StarTool FDM System Services	Advanced reference to operating system calls used by StarTool FDM.
Serena StarTool FDM StarTool FDM StarBat Option	Batch-mode interface for bulk changes to data sets. StarTool FDM functions invoked by JCL procedures.
Serena StarTool FDM DB2 Option	StarTool FDM data management functions for DB2 relational database tables, columns, and rows, with SQL processing support.

Title	Description
Serena StarTool FDM IMS Option	StarTool FDM data management functions for IMS hierarchical database files and structures.
Serena StarTool FDM Extended Compare Option	Integrated file comparison utility based on Serena Comparex. Data file versus text file comparison logic.
Serena StarTool FDM Messages	Consolidated message reference for base product and all licensed product options, with error recovery recommendations.

Accessing the Electronic Documentation

Electronic documentation is stored two different locations on the product distribution media. The Readme file, the Master License and Services Agreement (MLSA), and the *StarTool FDM Installation Guide* are located in the Documentation folder in the root directory. They can be accessed without installing the product.

The PC client installer unloads the full document set from the binary product files to the location you designate on your client PC during installation. The Readme file is an HTML document that displays in your Web browser. All other documentation is provided in Adobe's Portable Document Format (PDF).

Using the PDF Documentation

To view PDF files, use Adobe® Reader®, which is freely available from Adobe on the World Wide Web at *http://www.adobe.com*. Reader Version 7.0.5 or higher is recommended.

> **TIP** Be sure to download the *full version* of Reader. The more basic version does not include the cross-document search feature.

This section highlights some of the main Reader features. For more detailed information, see the Adobe Reader online help system.

The PDF manuals include the following features:

- **Bookmarks.** All of the online manuals contain predefined bookmarks that make it easy for you to quickly jump to a specific topic. By default, the bookmarks appear to the left of each online manual.

- **Links.** Cross-reference links within an online manual enable you to jump to other sections within the manual and to other manuals with a single mouse click. These links appear in blue.

- **Printing.** While viewing a manual, you can print the current page, a range of pages, or the entire manual.

- **Advanced search.** Starting with Version 6, Adobe Reader includes an advanced search feature that enables you to search across multiple PDF files in a specified directory. (This is in addition to using any search index created by Adobe Catalog—see step 3 below.)

To search across multiple PDF documents at once, perform the following steps (requires Adobe Reader Version 6 or higher):

1   In Adobe Reader, select Edit > Search (or press CTRL+F).

2   In the text box, enter the word or phrase for which you want to search.

3   Select the **All PDF Documents in** option, and browse to select the folder in which you want to search. (If you have a document open that has an Adobe Catalog index attached, you can leave the **In the index named...** option selected to search across all the manuals in the index.)

4   Optionally, select one or more of the additional search options, such as **Whole words only** and **Case-Sensitive**.

5   Click the **Search** button.

> **NOTE** Optionally, you can click the **Use Advanced Search Options** link near the lower right corner of the application window to enable additional, more powerful search options. (If this link says **Use Basic Search Options** instead, the advanced options are already enabled.) For details, see Adobe Reader's online help.

Chapter 1
Installing the Extended Compare Option

Applying the License Key

The underlying code for the Extended Compare Option is shipped with the base product for StarTool FDM. However, the actual installation of this feature requires an additional license. Contact your sales representative or Serena Customer Support to obtain a license key.

Optional license keys may be applied to an existing installation without reinstalling code. You apply license keys with Serena's licensing software, SER10TY. For instructions, refer to the *Serena SER10TY User's Guide*, which is included on the distribution media with StarTool FDM.

Enabling the Software

Once your site is licensed to use the StarTool FDM Extended Compare Option, do the following to enable execution:

1   In the options configuration module PDS#OPT4, set the @COMPARE parameter of the #INITIAL macro to the value COMPAREZ. This may be done at any time after product installation. (See the StarTool FDM Installation Guide for information about tailoring your installation using PDS#OPT4.)

2   Run the IEBUPDATE SEPARATE command against member COMPAREZ in library somnode.PDSEvrm.ASSEMBLE to unload the Extended Compare Option panels. These panels reside insomnode.PDSEvrm.PANELS and are proveded in IEBUPDATE format.

Chapter 2

Comparing Data Sets

Comparison Types

The Extended Compare Option provides the powerful functionality of the Serena Comparex file comparison utility without leaving the menu-driven data management environment of StarTool FDM. It allows you to do simple compares of two files using either a DATA type or TEXT type compare.

- Use the DATA type compare for specialized compares, such as CSECT to CSECT compares in load modules. The ability to perform DATA type compares is the main advantage of the Extended Compare Option (some other compare utilities only perform TEXT type compares).

- Use the TEXT type compare for files that do not have fields in fixed positions.

The DATA and TEXT comparisons use different comparison logic because the method of synchronization differs.

DATA Comparison

StarTool FDM defines DATA as any file that contains a known inter-record relationship. These files have bytes and fields in fixed positions on each record.

StarTool FDM compares these files record to record, using key synchronization for VSAM-KSDS or ISAM files, and physical-record to physical-record synchronization for other file types.

Typical DATA files are:

- Master files

- Intermediate files

- Transaction files

- Databases

- Load modules

TEXT Comparison

StarTool FDM defines TEXT as any file that does not contain inter-record relationships. TEXT files do not have bytes and fields in fixed positions. Rather than pairing records for comparison, TEXT synchronization uses buffers and look-ahead logic to pair blocks and isolate differences.

Typical TEXT files are:

- Program source code

- JCL

- Reports

- Documentation

DATA Comparison Logic

Under DATA comparison logic, the StarTool FDM input processing routines attempt to match records (one record from each input file) to send to the compare routines. The two types of matching are:

- Key synchronization.

- Physical-record-number to physical-record-number (no synchronization).

Key Synchronization

Extended Compare automatically uses key synchronization for VSAM-KSDS and ISAM files when performing a DATA type compare. The defined key in the file is used to pair records to send to the compare routines.

Physical-Record-Number Synchronization

If the SYSUT1 file organization is not VSAM-KSDS or ISAM, StarTool FDM uses same-physical-record-number synchronization to pair records to send to the compare routines.

This means that Comparex compares each SYSUT1 record with the same numbered record on SYSUT2. Record number 1 on SYSUT1 is compared to record number 1 on SYSUT2, and record number 1001 on SYSUT1 is compared to record number 1001 on SYSUT2.

If one file is longer than the other, the extra records are sent to the compare routines alone. Under same-physical-record-number synchronization, StarTool FDM sends pairs of records to the compare routines unless one file is at end of file. Messages CPX51I and CPX52I show the actual input sequence record number, not the sequence number of records sent to the compare routines.

Which to Use: DATA or TEXT?

Run a DATA comparison for the following situations:

- VSAM-KSDS or ISAM files (to get key synchronization)

- Databases

- Load modules (to get CSECT to CSECT compares)

- Object code files

If none of these situations apply, then use TEXT. TEXT allows you to maximize the buffering area required for look-ahead logic and minimize the number of records that must match exactly.

> **NOTE** StarTool FDM uses DATA comparison logic when TEXT is not specified, or when it has been nullified because of inconsistencies. When StarTool FDM performs DATA comparison logic, it cannot simultaneously perform TEXT comparison logic in the same run; the two comparison logic routines are incompatible.

Processing Conditions

DATA Compares

The following conditions apply only for DATA compares using key synchronization.

File Out of Sequence

While reading records from either SYSUT1 or SYSUT2, if Extended Compare finds that a key is out of sequence, then the system issues message CPX36A once followed by the offending record. For example, if a file contains records with keys 1, 5, 10, 3, and 20 (ascending order assumed); the record with key 3 is flagged as being out-of-synch and is printed with message CPX36A. Any subsequent out-of-synch records are ignored; only the first violation is flagged.

Duplicate Key on the Same File

If the compare routines find that a set of keys on a record is equal to the set of keys on the previous record from that file, StarTool FDM attempts to match this record to a record from the other file. Equal keys, then, cause no problems with synchronization. If only one record for that key exists on the other file, it is paired for comparison to the first record with the duplicate key. The second record with the duplicate key is identified as a key synchronization mismatch. It displays on the difference report after message CPX61I for the records from the SYSUT1 file, or after message CPX62I for the records from the SYSUT2 file.

End of Data on SYSUT1

If file SYSUT1 has come to end of file and file SYSUT2 has not, StarTool FDM sends all extra records from file SYSUT2 to the difference report, showing them as extra records with message CPX62I.

End of Data on SYSUT2

If file SYSUT2 has come to end of file and file SYSUT1 has not, StarTool FDM sends all extra records from file SYSUT1 to the difference report, showing them as extra records with message CPX61I.

Records Matched on Key

If the compare routines find that a set of keys on a record from file SYSUT1 is equal to a set of keys on a record from file SYSUT2 (the pair was sent to the compare routines synchronized by key), StarTool FDM compares the data values in the records.

Records Are Equal

If all bytes in the two records compare equal, StarTool FDM bypasses the records. The utility does not send the records to the difference report.

Records Compare Unequal

If the records do not compare equal, or if one record is longer than the other record, StarTool FDM sends both records to the difference report, showing the SYSUT1 record with message CPX51I and the SYSUT2 record with message CPX52I.

No Match on Key for SYSUT1

If the key is an ascending key and the compare routines find a set of keys on a record from file SYSUT1 that is lower than the next set of keys on a record from file SYSUT2, StarTool FDM sends the SYSUT1 record to the difference report, showing it as a key synchronization mismatch with message CPX61I.

If the key is a descending key and the compare routines find a set of keys on a record from file SYSUT1 that is higher than the next set of keys on a record from file SYSUT2, StarTool FDM sends the SYSUT1 record to the difference report, showing it as a key synchronization mismatch with message CPX61I.

No Match on Key for SYSUT2

If the key is an ascending key and the compare routines find a set of keys on a record from file SYSUT2 that is lower than the next set of keys on a record from file SYSUT1, StarTool FDM sends the SYSUT2 record to the difference report, showing it as a key synchronization mismatch with message CPX62I.

If the key is a descending key and the compare routines find a set of keys on a record from file SYSUT2 that is higher than the next set of keys on a record from file SYSUT1, StarTool FDM sends the SYSUT2 record to the difference report, showing it as a key synchronization mismatch with message CPX62I.

DATA and TEXT Compares

The following conditions apply for both DATA and TEXT type compares.

End of Data on SYSUT1

If file SYSUT1 has come to end of file and file SYSUT2 has not, StarTool FDM sends all extra records from file SYSUT2 to the difference report, showing them as extra records with message CPX62I.

End of Data on SYSUT2

If file SYSUT2 has come to end of file and file SYSUT1 has not, StarTool FDM sends all extra records from file SYSUT1 to the difference report, showing them as extra records with message CPX61I.

Records Are Equal

If all bytes in the two records compare equal, StarTool FDM bypasses the records. The utility does not send the records to the difference report.

Records Compare Unequal

If the records do not compare equal, or if one record is longer than the other record, StarTool FDM sends both records to the difference report, showing the SYSUT1 record with message CPX51I and the SYSUT2 record with message CPX52I.

Using the Extended Compare Option

To invoke the Extended Compare Option, type COMPARE on the OPTION line of the **StarTool FDM Primary Options** menu. The **Compare Member** panel displays:

```
----------------------- COMPARE: Compare Members --------------------------
 OPTION  ===>

- DSN=USER07.LIB.PDSE,VOL=SER=TST002  MEM= --------------------------------
 Base data set or member    ==>
   on volume                ==>           (enter if data set is not cataloged)
 Compare data set or member ==>
   on volume                ==>           (enter if data set is not cataloged)
 Comparison type            ==> TEXT    (DATA or TEXT)
```

The current data set name displays in the DSN field; in this example, USER07.LIB.PDSE. Type the names of the two data sets you want to compare in the Base Data Set and Compare Data Set fields. If they are members in the current data set, it is only necessary to type the member name. Type DATA or TEXT in the Comparison Type field.

In the following example, two assembler source members are compared using a TEXT type compare:

```
---------------------- COMPARE: Compare Members -------------------------
  OPTION  ===>

  - DSN=USER07.LIB.PDSE,VOL=SER=TST002  MEM=  --------------------------------
   Base data set or member     ==> LIB.PDSE(@SERVICE)
     on volume                 ==>          (enter if data set is not cataloged)
   Compare data set or member ==> LIB.PDSE750(@SERVICE)
     on volume                 ==>          (enter if data set is not cataloged)
   Comparison type             ==> TEXT     (DATA or TEXT)
```

After pressing ENTER, the system runs the comparison and displays a report with the results:

```
SYSUT1=USER01.LIB.PDSE(@SERVICE),SYSUT2=USER01.LIB.PDSEVRM(@SERVICE)

++++++++<+++.++++1++++.++++2++++.++++3++++.++++4++++.++++5++++.++++6++++.++++7+>++.++++8++++++++++++++++++++
 D            CLI   UCBVOLI-UCBOB(R1),C' '    *20 Blank volume name?         81140144    DIF O N E   8139  +
 D            BE    EXCPOP19                  *20 Yes, branch                81140244    DIF O N E   8140  +
 D            CLI   UCBTYP-ucbob+2(R1),X'20'  *20 DASD DEVICE?               81140344    DIF O N E   8141  +
 D            BNE   EXCPOP19                  *20 No, branch                 81141044    DIF O N E   8142  +
 D    **20    TM    FLAGSXX,FCOPYUCB          TESTUCB TO COPY THE UCB?       81150044    DIF O N E   8143  +
 D    **20    BNO   EXCPOP19                  NO, BRANCH                     81160044    DIF O N E   8144  +
 --------³---.----1----.----2----.----3----.----4----.----5----.----6----.----7----.----8----------------------
 I            TM    FLAGSXX,FCOPYUCB          TESTUCB TO COPY THE UCB?       81150016    DIF T W O   8139  +
 I            BNO   EXCPOP19                  NO, BRANCH                     81160016    DIF T W O   8140  +

++++++++<+++.++++1++++.++++2++++.++++3++++.++++4++++.++++5++++.++++6++++.++++7+>++.++++8++++++++++++++++++++
 CPX71I - END OF TEXT ON FILE SYSUT1
 CPX72I - END OF TEXT ON FILE SYSUT2
 CPX75I - RECORDS PROCESSED: SYSUT1(8758)/SYSUT2(8754),DIFFERENCES(2,4,0)
                            EXPLANATION - 2 RECORDS DIFFER THAT SYNCHRONIZED TOGETHER
                                          4 RECORDS WERE CONSIDERED INSERTED ON SYSUT1
                                          0 RECORDS WERE CONSIDERED INSERTED ON SYSUT2
 CPX80I - TIME OF DAY AT END OF JOB: 10:59:12 - CONDITION CODE ON EXIT: 4
```

The report is this example shows:

- The two files compared:

  - SYSUT1 - USER01.LIB.PDSE

  - SYSUT2 - USER01.LIB.PDSEVRM

- Record differences. The right side of the report shows the physical record number (8139, 8140 . . .) and the statements *DIF O N E* (for SYSUT1) and *DIF T W O* (for SYSUT2).

  - The D in column 1 indicates the records on SYSUT1 that were either not on SYSUT2, or they synchronized but were different. In this example, the first four records displayed were not on SYSUT2; the fifth and sixth records synchronized but were different.

  - The I in column 1 indicates the records on SYSUT2 that synchronized with records on SYSUT1 but were different.

    This correlates with the summary EXPLANATION messages at the bottom of the report.

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