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Spreadsheet Converter Guide

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Introduction

This document provides details of the conversion performed by the Uniplex Spreadsheet Converter. This is a one way converter for Uniplex ucalc worksheets to Lotus 123 .WK3 or .WK4 format. The details of command line options are given elsewhere (in the Technical Guide).
Conversion Principles

The objective of the converter is to minimise the effort required to migrate Uniplex worksheets to other spreadsheet packages. The bulk of the effort in converting a worksheet is to related to conversion of the data, formulae and formatting. Global settings like cursor position or window layout are one off jobs and require very much less effort. Accordingly less emphasis is placed on converting these kind of features.

Particular care is taken when converting formulae to preserve mathematical integrity. For example the @if function may be modified during conversion in order to preserve the correct logical test results. Where Uniplex specific functions cannot be converted a warning message is logged and @ERR result appears in the converted worksheet.

Some features do not map well from Uniplex to Lotus 123, for example graphs or printing details. In these cases no conversion is done. Since the user would almost certainly need to modify the resulting worksheet it makes little difference if they start from default settings or inappropriately converted settings.

There are many advanced features in Lotus 123 and other PC spreadsheets that cannot be converted to Uniplex worksheets. Only simple worksheets can be imported successfully and Uniplex already supplies a converter to do this job. This converter does not convert from Lotus 123 to Uniplex ucalc.
File Formats

The conversion is one way, from Uniplex spreadsheet save format to Lotus 123 worksheet format.

Supported Formats

Input formats: Uniplex V7, V8 binary save format and PSF.
Output formats: Lotus 123 .WK3 or .WK4.

Notes:

1. Some clients have successfully converted Uniplex V6 binary save format but this has not been fully tested and is not officially supported.

2. There is an assumption for binary save format that native C int is 32 bits - byte ordering and structure alignments are handled automatically. Early Uniplex DOS versions have 16 bit integers - these files will not convert and generate a corrupt input file error code.

3. The .WK3 format is supported by most popular PC spreadsheet packages and provides a conversion path from Uniplex to Excel, Quatro Pro or SuperCalc.

Input Format Recognition

The input format is automatically recognised and conversion set for binary or PSF format.

Changes in Source or Target Formats

The conversion of binary save format relies on exact details of the binary file layout. Any modification to the binary save format, except the introduction of new functions, will require a modification to the converter.

Addition of new functions requires modification to the converter if they are to be converted correctly. Without modification the function is logged as unsupported and converts to @unknown producing in an ERR result requiring a manual correction.
PSF format is more adaptable - the addition of completely new record types is not a problem, they are simply ignored by the converter. Modification of existing record formats will require changes to the converter, however since this would render PSF non backward compatible it should not occur.

Lotus 123 .WK3 and .WK4 formats are industry standard and will not be changed. Should Lotus 123 be upgraded and a .WK5 format produced it is certain that the new product would be able to load .WK3 or .WK4 worksheets. In this case there would be little point in upgrading the converter.
What Gets Converted

This section details what information gets successfully converted. During conversion a log file is produced containing any errors and warnings about unconverted information.

Worksheet Extent

The extent of cells in the worksheet is converted as part of the header information. Uniplex can support more columns or rows than are permitted in a Lotus 123 worksheet. In this case an error is generated and the worksheet will not convert until it has been modified to fit into 256 columns.

Since Uniplex worksheets are only a single sheet all information is placed in sheet A of the .WK3 or .WK4 file.

Column Widths

Default and individual column widths are converted. The Uniplex spreadsheet has an inter column spacing of two characters, this is not present in Lotus 123. To compensate the column widths are increased by 2 during conversion.

Zero width columns are converted to hidden columns and have the default column width when revealed.

Named Ranges

Uniplex refers to cell range naming as range lables. These are converted to Lotus 123 named ranges. Some information is lost in the conversion: named ranges have a maximum length of 16 characters and so longer labels are truncated and a warning is logged. Uniplex allows labels to refer to absolute or relative addresses, in Lotus 123 a named range is always relative and may be designated absolute when used. After conversion all ranges are relative.

Uniplex uses labels for input and display only. The actual range reference is stored in a formula and converted to a label for display. Lotus 123 stores the named range reference in the formula, not the range it refers to. During
Spreadsheet Converter Functional Specification

formula conversion named ranges are substituted to explicit ranges where appropriate.

**Row/Col Titles**

Uniplex spreadsheet supports an off sheet set of row and column titles. These are awkward to use and many worksheets do not contain any. However if they are present it is useful to convert them since there could be a lot of work involved in re-entering them afterwards.

Optionally row and column titles can be converted into text in column A and row 1 respectively. This causes a displacement of the whole worksheet by one row and one column. During conversion all ranges and range references are adjusted to allow for this displacement.

By default this conversion does not occur since in many cases it would not be considered good practice to modify the cell locations and would cause problems for linked worksheets.

**Protection**

Uniplex refers to cell protection as locking. By default cells are created unlocked and the global protection flag is set false. In Lotus 123 cells are created locked and the global protection flag is false.

By default the conversion process protects all cells, as a consequence explicitly unprotected cells get protected. There is an option to preserve protection exactly as defined in the source worksheet.

**Formats**

Global and cell formats including blank, or empty formatted cells, are converted. However this conversion is not perfect and is done following the rules given here.

**Decimal places**: both Uniplex and Lotus 123 permit decimal format of 0-15 decimal places. Explicit setting of decimal places is converted without problems. In addition Uniplex displays unspecified decimal format as up to 6 decimal places with trailing zeros stripped - Lotus 123 shows these as...
whole numbers. So if the value is not a whole number then a format 2 decimal places is specified.

**Scientific:** Both Uniplex and Lotus 123 support scientific or exponential format and conversion is done without problems.

**Comma:** The use of a comma in numbers - for example 1,000.00 - is supported by both Uniplex and Lotus 123. This converts without problems. Details of numeric display are configured in Lotus 123 by use of the Windows International settings.

**Alignment:** Lotus 123 does not support left, right or centre justification via formats. Text cells only may have alignments are this is specified by the prefix character ‘*’ or ‘ˆ’. During conversion text cells have the appropriate alignment prefix added. Any alignment of numeric cells is lost.

**Currency:** Uniplex uses both hard coded format flags and user defined formats for currency symbols. By contrast Lotus 123 has a single currency format which is determined by setup information. By default the Pound format bit or user format 6 (Sterling) is converted to the Lotus 123 currency format. The currency symbol displayed by Lotus 123 is configured by Windows International settings.

This can be changed by a run time option to select Dollars or other user defined currency formats. Any other Uniplex currency formats are not converted.

**Dates:** Uniplex date formats are configurable, the conversion assumes default definitions are in use and converts as follows:

<table>
<thead>
<tr>
<th>datefmt</th>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>day-month-year</td>
</tr>
<tr>
<td>9</td>
<td>day-month</td>
</tr>
<tr>
<td>10</td>
<td>month-year</td>
</tr>
<tr>
<td>11</td>
<td>International long</td>
</tr>
<tr>
<td>12</td>
<td>International short</td>
</tr>
<tr>
<td>other</td>
<td>International long</td>
</tr>
</tbody>
</table>
**Effects:** Uniplex spreadsheet allows a restricted range of Uniplex effects to be assigned to cells - by default these are AHCDEI converted as follows:

- **A** bold
- **H** large & bold
- **C** underline
- **D** underline
- **E** underline & bold
- **I** italic

Notes: this information is not stored in the .WK3 but in a .FM3 file which is also produced during conversion. When loading a worksheet the .FM3 file must be in the same directory as the .WK3 - otherwise the effects information will be lost.

**Percent:** Both Uniplex and 123 support a percentage format and conversion is done without problems.

**User formats:** Uniplex has user definable formats which are mostly used for currency definitions. In practice these are very rarely changed, and if they are changed then it is probably to something that cannot be converted. The conversion assumes the default specification and converts 3 to highlight negative numbers and 5 to hidden cells.

**Values**

Lotus 123 uses floating point numbers with a range greater than or equal to 64 bit double precision C floating point numbers. So there are no range problems during conversion.

All numeric values are converted unmodified except when formatted as a date. Lotus 123 date values are 1 greater than Uniplex. For example:

- Uniplex 1-Aug-95 is 34911
- Lotus 123 1-Aug-95 is 34912

The difference results from Uniplex using 28 days for February 1900, whilst Lotus uses 29 days.
To compensate for this difference any constant value - that is not the result of a calculation - that has a date format is incremented by 1 during conversion.

Text

Text strings are converted from Uniplex to Lotus 123 without problems. Uniplex has a maximum string length of 256 characters which can be supported by Lotus 123.

Uniplex uses the ISO 8859/1 extended character set. Lotus uses its own internal encoding system LMBCS. During conversion 8 bit characters are converted between the two character sets and all ISO 8859/1 characters are supported.

Uniplex worksheets may contain embedded Uniplex effects in strings. These effects, except for graphics, are stripped during conversion.

Line draw and graphics characters are formed in Uniplex by using a special effect '['. During conversion line draw characters are converted as - | and + characters because standard Windows fonts do not have line draw characters.
Formulae

Conversion of formulae is the main work of the converter.

Mathematical Operators

All maths operators (+ - * / ) are converted except for %. Natural operator precedence and use of brackets is preserved.

Uniplex has a special % operator which is not present in Lotus 123. The percent operator is converted into division by 100 for example:

\[ B44 + B45\% \rightarrow B44 + B45 / 100 \]

Logical Operators

All logical operators (== <> > < >= <=) are converted. In addition Uniplex logical functions NOT(), AND() & OR() are converted to Lotus 123 logical operators #NOT#, #AND# and #OR# respectively.

Stats Functions

Uniplex statistical functions sum(), avg(), min(), max(), count() and stdev() are all converted to Lotus 123 equivalents.

If Function

Uniplex supports 2 and 3 result if functions as follows:

\[
\begin{align*}
@if ( \text{expression}, \text{result if expression > 0}, \text{result if expression <= 0} ) \\
@if ( \text{expression}, \text{result if expression > 0}, \text{result if expression = 0}, \text{result if expression < 0} )
\end{align*}
\]

Lotus 123 has a 2 result if function as follows:

\[
@if ( \text{expression}, \text{result if expression <> 0}, \text{result if expression = 0} )
\]
So conversion to maintain the correct logic is a little tricky as follows:

\[@\text{if} (A1 > B1, 1, 2)\] converts as expected to \[@\text{IF} (A1 > B1, 1, 2)\]

However if the expression is not a logical operation then the conversion adds in the comparison implicit in Uniplex:

\[@\text{if} (A1, 1, 2)\] converts to \[@\text{IF} (A1 > 0, 1, 2)\]

Three result if statements are converted as follows:

\[@\text{if} (A1, 1, 2, 3)\] converts to \[@\text{IF} (A1 > 0, 1, @\text{if} (A1 = 0, 2, 3))\]

**Financial Functions**

Where possible Uniplex financial functions are converted to Lotus 123 equivalents - in some cases it is necessary to substitute the equivalent formulae since no equivalent function exists:

\[@\text{rate} (A, B, C)\] converts to \[@\text{RATE} (B, A, C)\] - note args A & B swapped

\[@\text{fv} (A, B, C)\] converts to \[@\text{FV}(A, B, C)\]
\[@\text{pv} (A, B, C)\] converts to \[@\text{PV}(A, B, C)\]
\[@\text{npv} (A, \text{range})\] converts to \[@\text{NPV}(A, \text{range})\]
\[@\text{irr} (A, \text{range})\] converts to \[@\text{IRR}(A, \text{range})\]
\[@\text{pmt} (A, B, C)\] converts to \[@\text{PMT}(A, B, C)\]
\[@\text{spv} (A, B, C)\] converts to \(A / (1 + B)^C\)
\[@\text{sfv} (A, B, C)\] converts to \(A * (1 + B)^C\)
\[@\text{sink} (A, B, C)\] converts to \(A * B / ((1 + B)^C - 1)\)
\[@\text{period} (A, B, C)\] converts to \(\log_{10}(B / A) / \log_{10}(1 + C)\)

Optional multiple arg forms of @npv and @irr cannot be converted:

\[@\text{npv} (A, B, C, D, \ldots)\] warning \[@\text{npv}(A, B, C, D, \ldots)\] - result ERR ...
\[@\text{irr} (A, B, C, D, \ldots)\] warning \[@\text{irr}(A, B, C, D, \ldots)\] - result ERR ...

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Error Handling Functions

Error handling functions @err, @na, @iserr() and @isna() convert to Lotus 123 equivalents @ERR, @NA, @ISERR() and @ISNA() respectively.

Mathematical Functions

All the simple maths functions convert except for @div which is replaced by an equivalent formula. The following list summaries the mathematical function conversions:

<table>
<thead>
<tr>
<th>Function</th>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>@int (A)</td>
<td></td>
</tr>
<tr>
<td>@abs (A)</td>
<td></td>
</tr>
<tr>
<td>@div (A, B)</td>
<td></td>
</tr>
<tr>
<td>@mod (A, B)</td>
<td></td>
</tr>
<tr>
<td>@root (A)</td>
<td></td>
</tr>
<tr>
<td>@exp (A)</td>
<td></td>
</tr>
<tr>
<td>@log (A)</td>
<td></td>
</tr>
<tr>
<td>@log10 (A)</td>
<td></td>
</tr>
</tbody>
</table>

Trignometrical Functions

Lotus 123 does not support all Uniplex trigonometrical functions so some are replaced by equivalent formula:

<table>
<thead>
<tr>
<th>Function</th>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>@PI</td>
<td>@PI</td>
</tr>
<tr>
<td>@deg (A)</td>
<td>A * 180 / @PI</td>
</tr>
<tr>
<td>@rad (A)</td>
<td>A * @PI / 180</td>
</tr>
<tr>
<td>@sin (A)</td>
<td>@SIN (A)</td>
</tr>
<tr>
<td>@cos (A)</td>
<td>@COS (A)</td>
</tr>
<tr>
<td>@tan (A)</td>
<td>@TAN (A)</td>
</tr>
<tr>
<td>@asin (A)</td>
<td>@ASIN (A)</td>
</tr>
<tr>
<td>@acos (A)</td>
<td>@ACOS (A)</td>
</tr>
<tr>
<td>@atan (A)</td>
<td>@ATAN (A)</td>
</tr>
<tr>
<td>@atan2 (A, B)</td>
<td>@ATAN2 (A, B)</td>
</tr>
</tbody>
</table>
String Functions

All Uniplex string functions can be converted although the Lotus 123 equivalents do not usually share the same function name:

- `@fix ( A , B )` converts to `@STRING ( A , B )`
- `@str ( A )` converts to `@STRING ( A , 2 )`
- `@cmp ( A , B )` converts to `@EXACT ( A , B )`
- `@rpt ( A , B )` converts to `@REPEAT ( A , @SUM ( B ) )`
- `@lit ( A )` converts to `@CELL ( "address", A )`
- `@len ( A )` converts to `@LENGTH ( A )`
- `@mid ( A , B , C )` converts to `@MID ( A , B - 1 , C )`
- `@val ( A )` converts to `@VALUE ( A )`

Date Functions

All simple date functions `@TODAY`, `@day`, `@month`, `@year` and `@date` convert to Lotus 123 functions of the same name but `@day_mon` and `@date_math` have no equivalent functions - see unsupported functions.

Logical Functions

Except for the simplest logical functions `@TRUE` and `@FALSE` which convert unchanged, all other logical functions are more complex to convert. Uniplex `@AND` `@OR` and `@NOT` functions are converted to operators in Lotus 123 as shown below:

- `@AND ( A , B )` converts to `A #AND# B`
- `@OR ( A , B )` converts to `A #OR# B`
- `@NOT ( A )` converts to `#NOT# A`
- `@empty ( A )` converts to `@CELL ( "type", A ) = "b"
- `@defcell ( A )` converts to `@CELL ( "type", A ) = "v"
- `@datacell ( A )` converts to `@ISNUMBER ( A )`
- `@textcell ( A )` converts to `@ISSTRING ( A )`
Reference Functions

Reference functions @choose and @index convert but there is no general support for @lookup in Lotus 123. Some @lookup functions will convert to @HLOOKUP or @VLOOKUP but it depends on the ranges used for the lookup.

@ROW converts @CELL ("row", FC) to
@COL converts @CELL ("col", FC) to
@choose (A, B, C, ...) converts @CHOOSE (A, B, C, ...) to
@index (A, B, C) converts @INDEX (A..IV8912, C, B) to
@lookup (A, R1, R2) converts @HLOOKUP (A, R, O) to
or @lookup (A, R1, R2) converts @VLOOKUP (A, R, O) to

To convert ranges R1 and R2 must have specific properties. For conversion to @VLOOKUP Uniplex @lookup R1 must be within a single column and R2 must be a matching range in a column to the right. So for example:

@lookup("Yes", A5..A24, H5..H24) converts to @VLOOKUP("Yes", A5..H24, 7)
but @lookup("Yes", H5..H24, A5..A24) will not convert since range2 is left of range1
and @lookup("Yes", A3..A10, F7..F14) will not convert since range2 is lower than range1

For conversion to @HLOOKUP ranges R1 and R2 must be in matching rows of cells where R1 is above R2.

Often @lookup can be made to convert by rearranging the rows and columns used in the lookup tables.
External Functions

Some simple off sheet links will convert but in general it will be necessary to replace links that retrieve ranges of cells with Lotus 123 macros that perform equivalent functions. Other external functions and other links, such as database access, are not converted.

An off sheet reference to a single cell will convert, but a range will not since Uniplex and Lotus 123 use of off sheet ranges is completely different.

@link ("get A1 from other.ss") converts to <<other.WK3>>A:A1..A:A1
@link ("get r1c1 from other.ss") converts to <<other.WK3>>A:A1..A:A1
@link ("get name from other.ss") converts to <<other.WK3>>A:B7..A:B7
where name is a label for cell B7

Unsupported Functions

These are covered in the next section on "What doesn't get converted".
What Doesn’t Get Converted

This section lists the functions and features that do not get converted and explains why they are not converted. Also see the first section on “conversion principles” which explains the assumptions behind what is and what is not worthwhile converting. Sometimes it is better to do no conversion at all than to convert in an unreliable manner, especially when it may effect the calculations in the resulting worksheet.

Unsupported Functions

Some functions have no equivalent on Lotus 123. When there are encountered during a conversion they are converted to display the original function but generate an ERR value. A warning is placed in the conversion log file. The following functions will not convert:

- @pipe ("SQL statement")
- @link ("paste db SQL statement")
- @link ("get range from external.ss")
- @sh ("command")
- @rsh ("command")
- @irr (A, B, C, D, ...)
- @npv (A, B, C, D, ...)

Note: an alternative form of these functions @irr (A, range) and @npv (A, range) convert OK.

- @lookup (A, R1, R2)
- @where (range, X)
- @eval (X)
What Doesn’t Get Converted

@day_mon (A)  no equivalent function
@date_math (A)  no equivalent function

Headers

Uniplex supports two lines of worksheet header - there is no equivalent of this in Lotus 123 and these are ignored during conversion.

Links

As explained earlier only links to a single cell will convert. Off sheet range references have semantically different meaning and cannot be translated. This is because Lotus 123 treats an off sheet reference range as if it is a range reference. For example @SUM(<other.wk3>>A:A1..A:A4) returns the sum of A1..A4 in other.wk3. Whereas Uniplex @link("get A1..A4 from other.ss") retrieves range of cells from other.ss and places the values into an equivalent range in the current worksheet.

Database

Uniplex database interface uses SQL to retrieve information from Uniplex DataLink databases. Lotus 123 uses DataLens and ODBC technology to access data. There is no simple way to convert between the two methods and it is likely that a worksheet will need to be redesigned to some extent to handle the Windows database access methods.

Graphs

Uniplex graphic facilities are very limited and do not operate in the same manner as Lotus 123. There is no simple way to translate between the two and graphs need to be redrawn manually in Lotus 123. Fortunately Uniplex graphics are rarely used.

Printing

Uniplex print setup is limited and operates in a different manner to Lotus 123. Also Unix and Windows printing is very different. Beta testing conversion of print setup resulted in inappropriate settings that had to be manually
reset. As a result any attempt to convert print setup was removed since it was easier to manually set print information from default values than to correct inappropriate translations.

**Macros**

Uniplex macro language is not used extensively. Conversion is very complex and unlikely to be 100% reliable. Even detecting which cells contain macros is difficult since a macro is just text in a cell. No attempt is made to translate macros since the translation would cause as many problems as it solved.