

ooRexx

Documentation 5.1.0

Open Object Rexx

RxMath Math Functions Reference



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RxMath Math Functions Reference

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Preface

This book describes the Open Object Rexx Math Function Library.

This book is intended for people who plan to develop applications using Rexx. Its users range from the novice, who might have experience in some programming language but no Rexx experience, to the experienced application developer, who might have had some experience with Object Rexx.

This book is a reference rather than a tutorial. It assumes you are already familiar with object-oriented programming concepts.

Descriptions include the use and syntax of the language and explain how the language processor "interprets" the language as a program is running.

1. Document Conventions

This manual uses several conventions to highlight certain words and phrases and draw attention to specific pieces of information.

1.1. Typographic Conventions

Typographic conventions are used to call attention to specific words and phrases. These conventions, and the circumstances they apply to, are as follows.

Mono-spaced Bold is used to highlight literal strings, class names, or inline code examples. For example:

The **Class** class comparison methods return **.true** or **.false**, the result of performing the comparison operation.

This method is exactly equivalent to **subWord(*n*, 1)**.

Mono-spaced Normal denotes method names or source code in program listings set off as separate examples.

This method has no effect on the action of any `hasEntry`, `hasIndex`, `items`, `remove`, or `supplier` message sent to the collection.

```
-- reverse an array
a = .Array~of("one", "two", "three", "four", "five")

-- five, four, three, two, one
aReverse = .CircularQueue~new(a~size)~appendAll(a)~makeArray("lifo")
```

Proportional Italic is used for method and function variables and arguments.

A supplier loop specifies one or two control variables, *index*, and *item*, which receive a different value on each repetition of the loop.

Returns a string of length *length* with *string* centered in it and with *pad* characters added as necessary to make up length.

1.2. Notes and Warnings

Finally, we use three visual styles to draw attention to information that might otherwise be overlooked.

**Note**

Notes are tips, shortcuts or alternative approaches to the task at hand. Ignoring a note should have no negative consequences, but you might miss out on a trick that makes your life easier.

**Important**

Important boxes detail things that are easily missed, like mandatory initialization. Ignoring a box labeled 'Important' will not cause data loss but may cause irritation and frustration.


**Warning**

Warnings should not be ignored. Ignoring warnings will most likely cause data loss.


2. How to Read the Syntax Diagrams

Throughout this book, syntax is described using the structure defined below.

- Read the syntax diagrams from left to right, from top to bottom, following the path of the line.

The  symbol indicates the beginning of a statement.

The  symbol indicates that the statement syntax is continued on the next line.

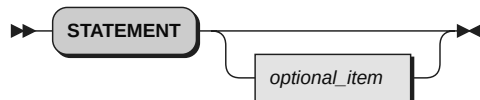
The  symbol indicates that a statement is continued from the previous line.

The  symbol indicates the end of a statement.

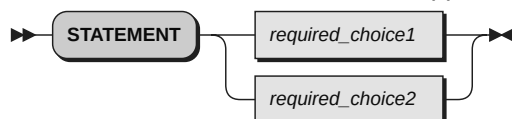
- Required items appear on the horizontal line (the main path).



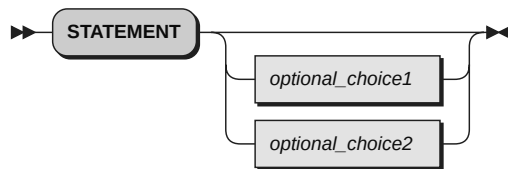
- Optional items appear below the main path.



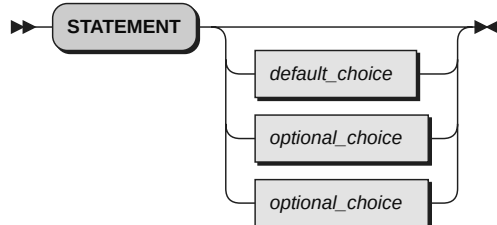
- If you can choose from two or more items, they appear vertically, in a stack. If you must choose one of the items, one item of the stack appears on the main path.



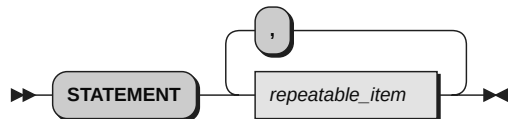
- If choosing one of the items is optional, the entire stack appears below the main path.



- If one of the items is the default, it is usually the topmost item of the stack of items below the main path.



- A path returning to the left above the main line indicates an item that can be repeated.



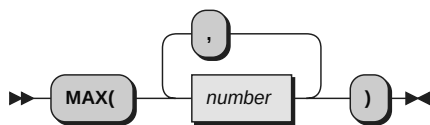
A repeat path above a stack indicates that you can repeat the items in the stack.

- A pointed rectangle around an item indicates that the item is a fragment, a part of the syntax diagram that appears in greater detail below the main diagram.



- Keywords appear in uppercase (for example, **SIGNAL**). They must be spelled exactly as shown but you can type them in upper, lower, or mixed case. Variables appear in all lowercase letters (for example, *index*). They represent user-supplied names or values.
- If punctuation marks, parentheses, arithmetic operators, or such symbols are shown, you must enter them as part of the syntax.

The following example shows how the syntax is described:



3. Getting Help and Submitting Feedback

The Open Object Rexx Project has a number of methods to obtain help and submit feedback for ooRexx and the extension packages that are part of ooRexx. These methods, in no particular order of preference, are listed below.

3.1. The Open Object Rexx SourceForge Site

Open Object Rexx utilizes SourceForge to house its source repositories, mailing lists and other project features at <https://sourceforge.net/projects/ooRexx>. ooRexx uses the Developer and User mailing lists at <https://sourceforge.net/p/ooRexx/mailman> for discussions concerning ooRexx. The ooRexx user is most likely to get timely replies from one of these mailing lists.

Here is a list of some of the most useful facilities provided by SourceForge.

The Developer Mailing List

Subscribe to the oorexx-devel mailing list at <https://sourceforge.net/projects/oorexx/lists/oorexx-devel> to discuss ooRexx project development activities and future interpreter enhancements. You can find its archive of past messages at <https://sourceforge.net/p/oorexx/mailman/oorexx-devel>.

The Users Mailing List

Subscribe to the oorexx-users mailing list at <https://sourceforge.net/projects/oorexx/lists/oorexx-users> to discuss how to use ooRexx. It also supports a historical archive of past messages.

The Announcements Mailing List

Subscribe to the oorexx-announce mailing list at <https://sourceforge.net/projects/oorexx/lists/oorexx-announce> to receive announcements of significant ooRexx project events.

The Bug Mailing List

Subscribe to the oorexx-bugs mailing list at <https://sourceforge.net/projects/oorexx/lists/oorexx-bugs> to monitor changes in the ooRexx bug tracking system.

Bug Reports

You can view ooRexx bug reports at <https://sourceforge.net/p/oorexx/bugs>. To be able to create new bug reports, you will need to first register for a SourceForge userid at <https://sourceforge.net/user/registration>. When reporting a bug, please try to provide as much information as possible to help developers determine the cause of the issue. Sample program code that can reproduce your problem will make it easier to debug reported problems.

Documentation Feedback

You can submit feedback for, or report errors in, the documentation at <https://sourceforge.net/p/oorexx/documentation>. Please try to provide as much information in a documentation report as possible. In addition to listing the document and section the report concerns, direct quotes of the text will help the developers locate the text in the source code for the document. (Section numbers are generated when the document is produced and are not available in the source code itself.) Suggestions as to how to reword or fix the existing text should also be included.

Request For Enhancement

You can suggest new ooRexx features or enhancements at <https://sourceforge.net/p/oorexx/feature-requests>.

Patch Reports

If you create an enhancement patch for ooRexx please post the patch at <https://sourceforge.net/p/oorexx/patches>. Please provide as much information in the patch report as possible so that the developers can evaluate the enhancement as quickly as possible.

Please do not post bug fix patches here, instead you should open a bug report at <https://sourceforge.net/p/oorexx/bugs> and attach the patch to it.

The ooRexx Forums

The ooRexx project maintains a set of forums that anyone may contribute to or monitor. They are located at <https://sourceforge.net/p/oorexx/discussion>. There are currently three forums available: Help, Developers and Open Discussion. In addition, you can monitor the forums via email.

3.2. The Rexx Language Association Mailing List

The Rexx Language Association maintains a forum at <https://groups.io/g/rexxla-members/topics>.

4. Related Information

See also: *Open Object Rexx: Reference*

Introduction

RxMath is a Rexx utility package that enables you to use enhanced mathematical functions.

The function names in the Rexx Mathematical Functions package are similar to the names of their corresponding mathematical functions.

The precision of calculation depends on:

- The value specified when the command is issued
- The numeric digits settings of the calling Rexx activity



Note

Precision is limited to 16 digits. If a precision larger than 16 digits is specified, the resulting precision will be 16 digits.

1.1. Using the RxMath package

The Rexx Mathematical Functions package is contained in the library *rxmath*, with the appropriate file name for the operating system. This library must be loadable by the operating system using the normal procedure for the system. For instance, on Windows the file must be placed in a directory listed in your PATH. When installing ooRexx from any of the installation packages, the details of where the file is placed are handled automatically.

Beginning with ooRexx 4.0.0, a more robust process is used to load external functions. To get access to the functions in the Rexx Mathematical Functions package, use a `::requires` directive. For example:

```
say 'The square root of 3 is:' RxCalcSqrt(3)

::requires 'rxmath' LIBRARY
```

Existing code that used the previous process to load external functions:

```
call rxfuncadd "MathLoadFuncs", "rxmath", "MathLoadFuncs"
```

does not need to be changed. However, both **MathLoadFuncs()** and **MathDropFuncs()** are nops in ooRexx 4.0.0 and later.

1.2. Error Handling and Function Returns

Error 40 (Incorrect call to routine) is raised if either the wrong number of arguments or incorrect data is passed to a function.

If a mathematical function fails, the function will return *nan*, *+infinity*, and *-infinity* as appropriate. These returns are consistent on all operating systems.

1.3. Package Limitations

The RxMath package internally uses the corresponding C library math functions to perform the actual calculations. These C functions are limited to values of the C numeric type of **double**. All numeric

arguments passed to the RxMath package functions are truncated (if needed) in order to convert them to the C **double** type.

Functions

Most function names in the Rexx Mathematical Functions package are similar to the names of their corresponding mathematical functions. Note that in ooRexx 4.0.0 and later, the **MathLoadFuncs()** and **MathDropFuncs()** are nops.

- MathLoadFuncs()
- MathDropFuncs()
- RxCalcSqrt()
- RxCalcExp()
- RxCalcLog()
- RxCalcLog10()
- RxCalcSinH()
- RxCalcCosH()
- RxCalcTanH()
- RxCalcPower()
- RxCalcSin()
- RxCalcCos()
- RxCalcTan()
- RxCalcCotan()
- RxCalcPi()
- RxCalcArcSin()
- RxCalcArcCos()
- RxCalcArcTan()

2.1. MathLoadFuncs()



Beginning with ooRexx 4.0.0 this function is basically a nop. Use:

```
::requires 'rxmath' LIBRARY
```

to gain access to the functions in the package.

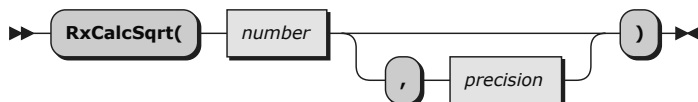
However, if this function is called with a single, string, parameter, the copyright information is printed.

2.2. MathDropFuncs()



This function is a nop in ooRexx 4.0.0 and later. It does nothing.

2.3. RxCalcSqrt()



Returns the absolute value of the square root of number.

Parameters:

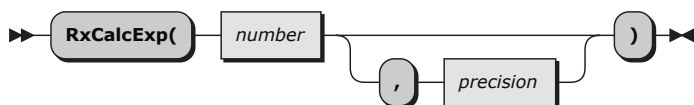
number

The number whose square root you wish to calculate.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.4. RxCalcExp()



Returns the exponential function of number.

Parameters:

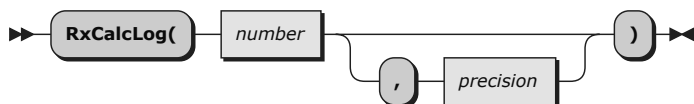
number

The number for which you wish to calculate the exponential function.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.5. RxCalcLog()



Returns the natural logarithm (base e) of number.

Parameters:

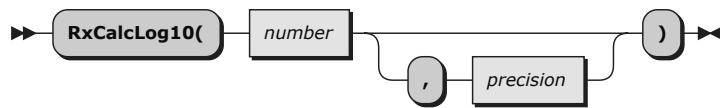
number

The number for which you wish to calculate the natural logarithm.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.6. RxCalcLog10()



Returns the base 10 logarithm of *number*.

Parameters:

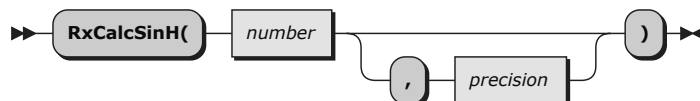
number

The number for which you wish to calculate the base 10 logarithm.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.7. RxCalcSinH()



Returns the hyperbolic sine of *number*.

Parameters:

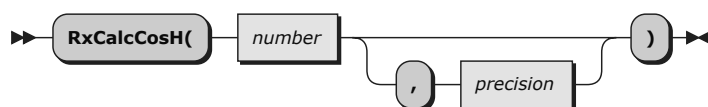
number

The number for which you wish to calculate the hyperbolic sine.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.8. RxCalcCosH()



Returns the hyperbolic cosine of *number*.

Parameters:

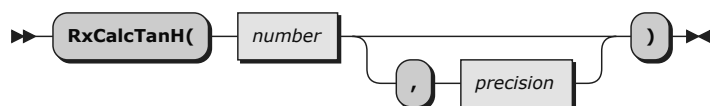
number

The number for which you wish to calculate the hyperbolic cosine.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.9. RxCalcTanH()



Returns the hyperbolic tangent of *number*.

Parameters:

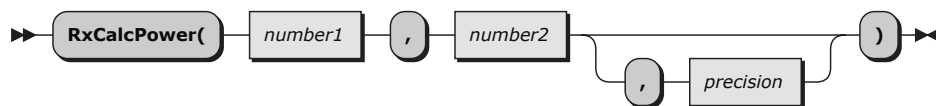
number

The number for which you wish to calculate the hyperbolic tangent.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.10. RxCalcPower()



Returns the value of mathematical expression *number1* raised to the power of exponent *number2*.

Parameters:

number1

The mathematical expression to be raised to the power of exponent *number2*.

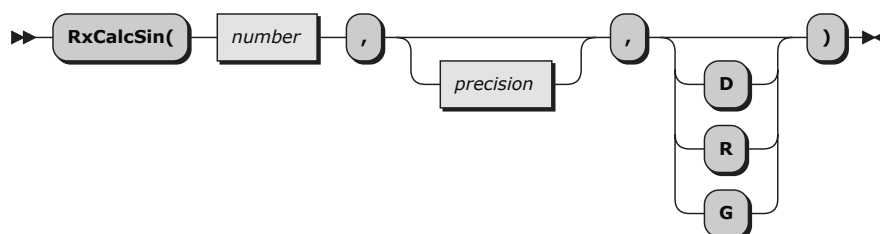
number2

The exponent to which *number1* is to be raised.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.11. RxCalcSin()



Returns the sine value for *number*, where *number* is the angle size, expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The angle size, expressed in degree [D], radian [R], or grade [G] units.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the angle size is expressed in degrees. This is the default.

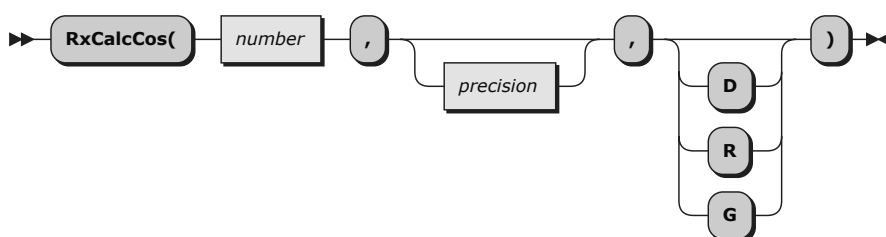
R

Indicates that the angle size is expressed in radians.

G

Indicates that the angle size is expressed in grades.

2.12. RxCalcCos()



Returns the cosine value for number, where number is the angle size, expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The angle size, expressed in degree [D], radian [R], or grade [G] units.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the angle size is expressed in degrees. This is the default.

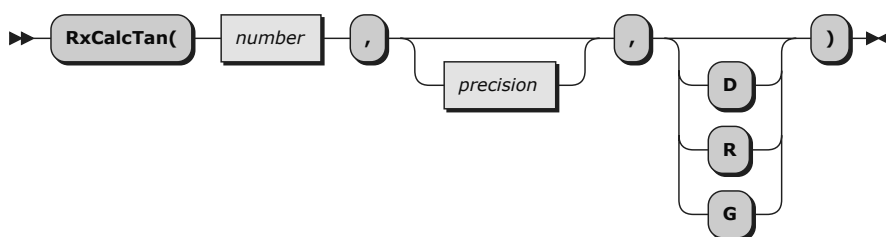
R

Indicates that the angle size is expressed in radians.

G

Indicates that the angle size is expressed in grades.

2.13. RxCalcTan()



Returns the tangent value for number, where number is the angle size, expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The angle size, expressed in degree [D], radian [R], or grade [G] units.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the angle size is expressed in degrees. This is the default.

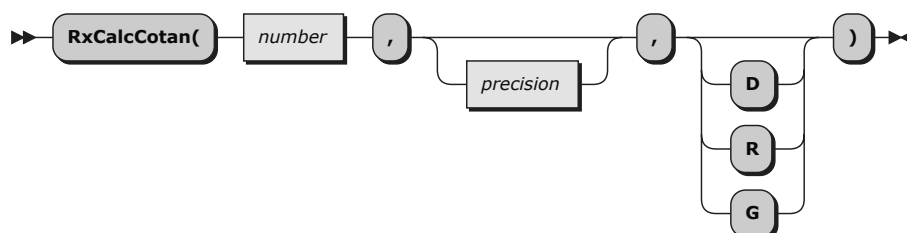
R

Indicates that the angle size is expressed in radians.

G

Indicates that the angle size is expressed in grades.

2.14. RxCalcCotan()



Returns the cotangent value for number, where number is the angle size, expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The angle size, expressed in degree [D], radian [R], or grade [G] units.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the angle size is expressed in degrees. This is the default.

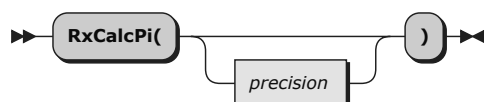
R

Indicates that the angle size is expressed in radians.

G

Indicates that the angle size is expressed in grades.

2.15. RxCalcPi()



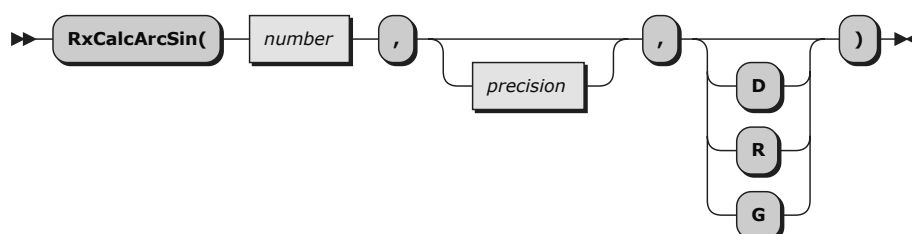
Returns the value of pi.

Parameters:

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.16. RxCalcArcSin()



Returns the arcsine of number, where the result can be expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The number for which the arcsine is to be calculated.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the result is expressed in degrees. This is the default.

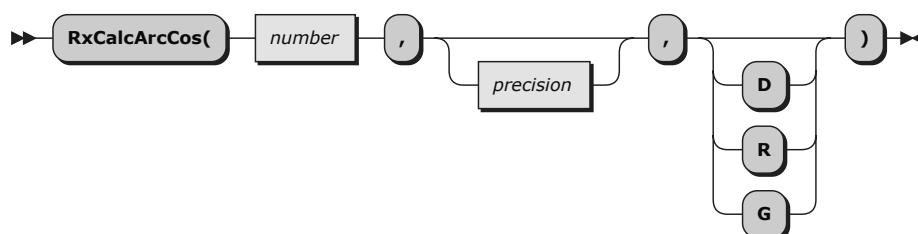
R

Indicates that the result is expressed in radians.

G

Indicates that the result is expressed in grades.

2.17. RxCalcArcCos()



Returns the arccosine of number, where the result can be expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The number for which the arccosine is to be calculated.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the result is expressed in degrees. This is the default.

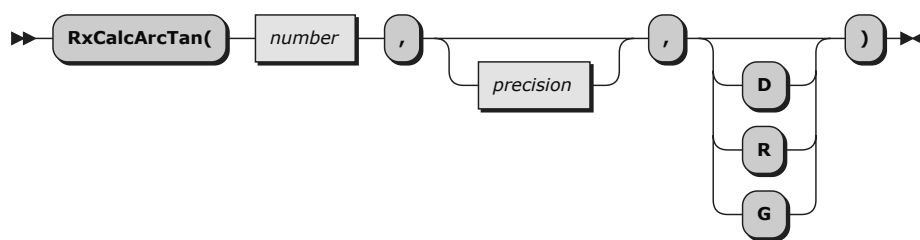
R

Indicates that the result is expressed in radians.

G

Indicates that the result is expressed in grades.

2.18. RxCalcArcTan()



Returns the arctangent of number, where the result can be expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The number for which the arctangent is to be calculated.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the result is expressed in degrees. This is the default.

R

Indicates that the result is expressed in radians.

G

Indicates that the result is expressed in grades.

Appendix A. Notices

Any reference to a non-open source product, program, or service is not intended to state or imply that only non-open source product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Rexx Language Association (RexxLA) intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-open source product, program, or service.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurement may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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The railroad diagrams were generated with the help of "Railroad Diagram Generator" located at <https://github.com/GuntherRademacher/rr>. Special thanks to Gunther Rademacher for creating and maintaining this tool.



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Version 1.0

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Revision 0-0 Aug 2016

Initial creation for 5.0

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