

ooRexx

Documentation 5.2.0

Open Object Rexx

RxSock TCP/IP Socket Functions Reference



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Author	W. David Ashley
Author	Josep Maria Blasco
Author	Rony G. Flatscher
Author	Mark Hessling
Author	Rick McGuire
Author	Per Olov Jonsson
Author	Lee Peedin
Author	Oliver Sims
Author	Erich Steinböck
Author	Jon Wolfers

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Preface

This book describes the Open Object Rexx™ TCP/IP Sockets Function Library and Classes.

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

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.

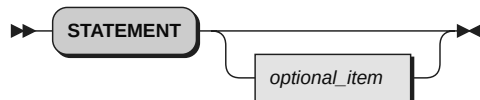
The  symbol indicates that a statement is continued from the previous line.

The  symbol indicates the end of a statement.

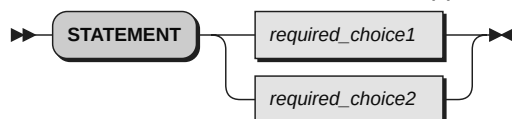
- Required items appear on the horizontal line (the main path).



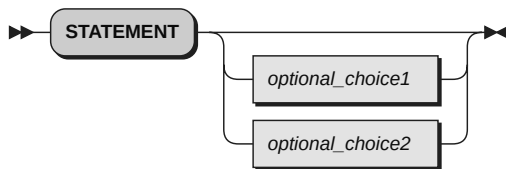
- Optional items appear below the main path.



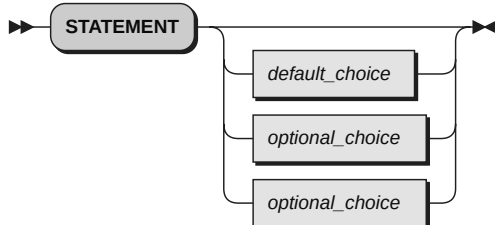
- If you can choose from two or more items, they appear vertically, in a stack. If you must choose one of the items, one item of the stack appears on the main path.



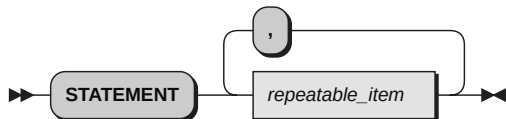
- If choosing one of the items is optional, the entire stack appears below the main path.



- 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.



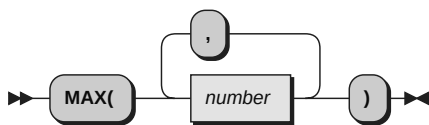
A repeat path above a stack indicates that you can repeat the items in the stack.

- 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: Programmer Guide*

What is RxSock?

RxSock is a Rexx function package providing access to the TCP/IP socket APIs available to the C programming environment. Most of the functions described in this reference are similar to the corresponding C functions available in the TCP/IP socket library.

In addition, there are several classes supplied that encapsulate and extend the functionality of the function package. These classes can reduce the amount of programming necessary to incorporate TCP/IP protocols in your projects.

It is assumed that you are familiar with the basic socket APIs and can reference those specific to the system. For more information, refer to the book *Internetworking with TCP/IP, Volume I: Principles, Protocols and Architecture* by Douglas Comer (Prentice Hall PTR).

The RxSock package requires TCP/IP support to be active on your system.

Installation and Removal

The RxSock package is contained in the file rxsock.dll. This file must be placed in a directory listed in your LIBPATH. To get access to the functions in the RxSock package, execute the following Rexx code:

```
If RxFuncQuery("SockDropFuncs") then
do
  rc = RxFuncAdd("SockLoadFuncs", "rxsock", "SockLoadFuncs")
  rc = SockLoadFuncs()
end
```

To unload the DLL, call the SockDropFuncs() function and then exit all CMD.EXE shells. After exiting all command shells, the DLL is dropped by the system and can be deleted or replaced.

Parameters and Return Values

Unless otherwise stated, the return values are the same as for the corresponding C functions. The following standard parameter types are referred to throughout this reference:

socket

is a socket value, which is an integral number.

domain

is a domain value. Currently, only the domain AF_INET is supported.

address

is the stem of a stem variable with the following values:

address.family

must always be AF_INET.

address.port

is a port number.

address.addr

is a dotted decimal address or INADDR_ANY, where appropriate.

When this parameter is needed, set it the name of a stem variable for the function to set (or that the function will read from). For example, if you pass the string xxx.! as a parameter, the following variables are set or queried by the function:

"xxx.!family"

"xxx.!port"

"xxx.!addr"

A null address is an address with the family field being AF_INET, the port field being 0, and the addr field being 0.0.0.0.

dotAddress

is the standard dotted decimal address. For example, the string 9.23.19.63 is a valid address.

host

is the stem of a stem variable with the following values:

host.name

is the standard name of the host.

host.alias.0

is the number of aliases for this host.

host.alias.1

is the first alias for this host.

host.alias.n

is the nth alias for this host.

host.addrtype

must always be AF_INET.

host.addr

is a dotted decimal address (default address).

`host.addr.0`
is the number of addresses for this host.

`host.addr.1`
is the first address for this host.

`host.addr.n`
is the *n*th address for this host.

When this parameter is needed, set it the name of a stem variable for the function to set (or that the function will read from). For example, if you pass the string `xxx.!` as a parameter, the following variables are set or queried by the function:

```
"xxx.!name"
"xxx.!alias.0", "xxx.!alias.1" ... "xxx.!alias.n"
"xxx.!addrtype"
"xxx.!addr"
"xxx.!addr.0", "xxx.!addr.1" ... "xxx.!addr.n"
```

3.1. Stem Variables

The address and host type of a parameter are stems of a stem variable. Normally, when you pass a string like `addr.` as a parameter, you expect the variables `addr.family`, `addr.port`, and `addr.addr` to be set by the function. In the previous examples, however, the stem contained an exclamation mark. This exclamation mark helps prevent the value that follows from getting misused as a normal variable. Example:

```
port = 923
sNew = SocketAccept(sOld, "addr.")
say addr.port
```

In this example, you might expect the `say` statement to write the port number of the accepted socket. Instead, it writes the value of the variable, namely `addr.923`, because the `port` variable is set to this value.

Because exclamation marks are rarely used in variables, it is unlikely that the variable `!port` is used in your program.



Note

Do not use the characters `_`, `0`, and `1` to prefix tail values. `0` and `1` are difficult to distinguish from `O`, `I`, and `I`.

Special Variables

The following variables are maintained by the system: `errno` and `h_errno`.

Variable *errno*

The variable `errno` is set after each `RxSock` call. It can have one of the following values or any other numeric value:

- `EWOULDBLOCK`
- `EINPROGRESS`
- `EALREADY`
- `ENOTSOCK`
- `EDESTADDRREQ`
- `EMSGSIZE`
- `EPROTOTYPE`
- `ENOPROTOOPT`
- `EPROTONOSUPPORT`
- `ESOCKTNOSUPPORT`
- `EOPNOTSUPP`
- `EPFNOSUPPORT`
- `EAFNOSUPPORT`
- `EADDRINUSE`
- `EADDRNOTAVAIL`
- `ENETDOWN`
- `ENETUNREACH`
- `ENETRESET`
- `ECONNABORTED`
- `ECONNRESET`
- `ENOBUFS`
- `EISCONN`
- `ENOTCONN`
- `ESHUTDOWN`
- `ETOOMANYREFS`
- `ETIMEDOUT`

-
- ECONNREFUSED
 - ELOOP
 - ENAMETOOLONG
 - EHOSTDOWN
 - EHOSTUNREACH
 - ENOTEMPTY



Note

The value is set even if the function called does not set the variable, in which case the value has no meaning. A value of 0 indicates that no error occurred.

Variable *h_errno*

This variable is now obsolete. It is set to zero (0) after each RxSock call.

Function Reference

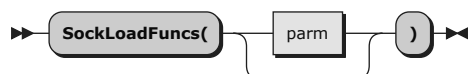
The following sections describe how the individual functions contained in RxSock are invoked from the Rexx programming environment:

- [Section 5.1, "SockLoadFuncs"](#)
- [Section 5.2, "SockDropFuncs"](#)
- [Section 5.3, "SockVersion"](#)
- [Section 5.4, "SockAccept"](#)
- [Section 5.5, "SockBind"](#)
- [Section 5.6, "SockClose"](#)
- [Section 5.7, "SockConnect"](#)
- [Section 5.8, "SockGetHostByAddr"](#)
- [Section 5.9, "SockGetHostByName"](#)
- [Section 5.10, "SockGetHostId"](#)
- [Section 5.11, "SockGetPeerName"](#)
- [Section 5.12, "SockGetSockName"](#)
- [Section 5.13, "SockGetSockOpt"](#)
- [Section 5.14, "SockInit"](#)
- [Section 5.15, "SockIoctl"](#)
- [Section 5.16, "SockListen"](#)
- [Section 5.17, "SockPSock_Errno"](#)
- [Section 5.18, "SockRecv"](#)
- [Section 5.19, "SockRecvFrom"](#)
- [Section 5.20, "SockSelect"](#)
- [Section 5.21, "SockSend"](#)
- [Section 5.22, "SockSendTo"](#)
- [Section 5.23, "SockSetSockOpt"](#)
- [Section 5.24, "SockShutDown"](#)
- [Section 5.25, "SockSock_Errno"](#)
- [Section 5.26, "SockSocket"](#)
- [Section 5.27, "SockSoClose"](#)

5.1. SockLoadFuncs

The SockLoadFuncs() call loads all RxSock functions.

Syntax:



All parameters that you supply are only used to bypass copyright information.

5.2. SockDropFuncs

The SockDropFuncs call drops all RxSock functions.

Syntax:

```
SockDropFuncs( )
```

To unload the dynamic load library (DLL), first call SockDropFuncs() and then exit all CMD.EXE shells. After exiting all command shells, the DLL is dropped by the system and can be deleted or replaced.

5.3. SockVersion

The SockVersion() call provides the version of RxSock.

Syntax:



Return Values:

The returned value is in the form version.subversion, for example 2.1.

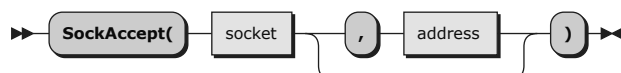
Prior to Version 1.2, this function did not exist. To check if a former version of Rxsock is installed, use the following code after loading the function package with SockLoadFuncs():

```
/* oldVersion is 1 if a version of RxSock < 1.2 is loaded */
oldVersion = (1 = RxFuncQuery("SockVersion"))
```

5.4. SockAccept

The SockAccept() call accepts a connection request from a remote host.

Syntax:



where:

socket

is the socket descriptor created with the SockSocket() call. It is bound to an address using the SockBind() call and must be enabled to accept connections using the SockListen() call.

address

is a stem variable that contains the socket address of the connection client when the SockAccept() call returns. This parameter is optional.

SocketAccept() is used by a server in a connection-oriented mode to accept a connection request from a client. The call accepts the first connection on its queue of pending connection requests. It creates a new socket descriptor with the same properties as socket and returns it to the caller. This new socket descriptor cannot be used to accept new connections. Only the original socket can accept more connection requests.

If the queue has no pending connection requests, SocketAccept() blocks the caller unless the socket is in nonblocking mode. If no connection requests are queued and the socket is in nonblocking mode, SocketAccept() returns a value of -1 and sets the return code to the value EWOULDBLOCK.

You cannot get information on requesters without calling SocketAccept(). The application cannot tell the system from which requesters it will accept connections. The caller can close a connection immediately after identifying the requester.

The SocketSelect() call can be used to check the socket for incoming connection requests.

Return Values:

A positive value indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code by calling SocketErrno() or SocketPSock_Errno(). Possible values:

ENOTSOCK

socket is not a valid socket descriptor.

EINTR

Interrupted system call.

EINVAL

SocketListen() was not called for socket.

EOPNOTSUPP

socket is not connection-oriented.

EWOULDBLOCK

socket is in nonblocking mode, and there are no connection requests queued.

ECONNABORTED

The software caused a connection close.



Note

SocketAccept() interfaces with the C function accept().

5.5. SocketBind

The SocketBind() call binds a local name to the socket.

Syntax:

```

>> SocketBind( socket , address )
  
```

where:

socket

is the socket descriptor returned by a previous call to SocketSocket().

address

is a stem variable containing the address that is to be bound to socket.

SockBind() binds the unique local name address to the socket with descriptor socket. After calling SockSocket(), a descriptor does not have a name. However, it belongs to a particular address family that you specified when calling SockSocket().

Because socket was created in the AF_INET domain, the fields of the stem address are as follows:

The family field must be set to AF_INET. The port field is set to the port to which the application must bind. If port is set to 0, the caller allows the system to assign an available port. The application can call SockGetSockName() to discover the port number assigned. The addr field is set to the Internet address. On hosts with more than one network interface (called multihomed hosts), a caller can select the interface with which it is to bind.

Only UDP packets and TCP connection requests from this interface that match the bound name are routed to the application. This is important when a server offers a service to several networks. If addr is set to INADDR_ANY, the caller requests socket be bound to all network interfaces on the host. If you do not specify an address, the server can accept all UDP packets and TCP connection requests made to its port, regardless of the network interface on which the requests arrived.

Return values:

The value 0 indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code by calling SockSock_Errno() or SockPSock_Errno(). Possible values:

EADDRINUSE

address is already in use. See the SO_REUSEADDR option described under SockGetSockOpt() and the SO_REUSEADDR option described under SockSetSockOpt().

EADDRNOTAVAIL

The address specified is not valid on this host. For example, the Internet address does not specify a valid network interface.

EAFNOSUPPORT

The address family is not supported.

ENOTSOCK

socket is not a valid socket descriptor.

EINVAL

socket is already bound to an address.

ENOBUFS

No buffer space available.

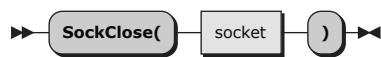


Note

SockBind() interfaces with the C function bind().

5.6. SockClose

The SockClose() call shuts down a socket and frees resources allocated to the socket.

Syntax

where:

socket

is the descriptor of the socket to be closed.

If the `SO_LINGER` option of `SockSetSockOpt()` is enabled, any queued data is sent. If this option is disabled, any queued data is flushed.

Return values:

The value 0 indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code by calling `SockSock_Errno()` or `SockPSock_Errno()`. Possible values are:

ENOTSOCK

socket is not a valid socket descriptor.

EALREADY

The socket is in nonblocking mode. A previous connection attempt has not completed.

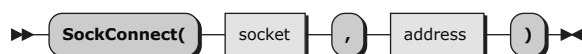
`SockClose()` is exactly the same as `SockSoClose()`.

**Note**

`SockClose()` interfaces with the C function `soclose()` or, in the Windows environments, with `closesocket()`.

5.7. SockConnect

The `SockConnect()` socket call requests a connection to a remote host.

Syntax:

where:

socket

is the socket descriptor used to issue the connection request.

address

is a stem variable containing the address of the socket to which a connection is to be established.

The `SockConnect()` call performs the following tasks when called for a stream socket:

1. It completes the binding for a socket, if necessary.
2. It attempts to create a connection between two sockets.

This call is used by the client side of socket-based applications to establish a connection with a server. The remote server must have a passive open pending, which means it must successfully call `SockBind()` and `SockListen()`. Otherwise, `SockConnect()` returns the value -1 and the error value is set to `ECONNREFUSED`.

In the Internet communication domain, a timeout occurs if a connection to the remote host is not established within 75 seconds.

If the socket is in blocking mode, the SockConnect() call blocks the caller until the connection is established or an error is received. If the socket is in nonblocking mode, SockConnect() returns the value -1 and sets the error value to EINPROGRESS if the connection was successfully initiated. The caller can test the completion of the connection by calling:

- SockSelect(), to test for the ability to write to the socket
- SockGetsockopt(), with option SO_ERROR, to test if the connection was established

Stream sockets can call SockConnect() only once.

Datagram or raw sockets normally transfer data without being connected to the sender or receiver. However, an application can connect to such a socket by calling SockConnect(). SockConnect() specifies and stores the destination peer address for the socket. The system then knows to which address to send data and the destination peer address does not have to be specified for each datagram sent. The address is kept until the next SockConnect() call. This permits the use of the SockRecv() and SockSend() calls, which are usually reserved for connection-oriented sockets. However, data is still not necessarily delivered, which means the normal features of sockets using connectionless data transfer are maintained. The application can therefore still use the SockSendTo() and SockRecvFrom() calls.

Datagram and raw sockets can call SockConnect() several times. The application can change their destination address by specifying a new address on the SockConnect() call. In addition, the socket can be returned to a connectionless mode by calling SockConnect() with a null destination address. The null address is created by setting the stem variable address as follows: the family field to AF_INET, the port field to 0, and the addr field to 0.0.0.0.

The call to SockConnect returns the value -1, indicating that the connection to the null address cannot be established. Calling SockSock_Errno() returns the value EADDRNOTAVAIL.

Return values:

The value 0 indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code by calling SockSock_Errno() or SockPSock_Errno(). Possible values are:

EADDRNOTAVAIL

The calling host cannot reach the specified destination.

EAFNOSUPPORT

The address family is not supported.

EALREADY

The socket is in nonblocking mode. A previous connection attempt has not completed.

ENOTSOCK

The socket is not a valid socket descriptor.

ECONNREFUSED

The destination host rejected the connection request.

EINPROGRESS

socket is in nonblocking mode, and the connection cannot be completed immediately.
EINPROGRESS does not indicate an error.

EINTR

Interrupted system call.

EISCONN

socket is already connected.

ENETUNREACH

The network cannot be reached from this host.

ETIMEDOUT

Establishing the connection timed out.

ENOBUFS

There is no buffer space available.

EOPNOTSUPP

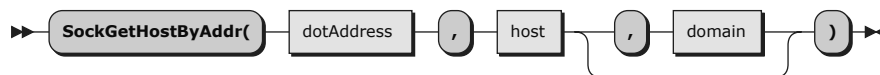
The operation is not supported on socket.

**Note**

SockConnect interfaces with the C function connect().

5.8. SockGetHostByAddr

The SockGetHostByAddr() call retrieves information about a specific host using its address.

Syntax:

where:

dotAddress

is the standard dotted decimal address of the host.

host

is a stem variable that is to receive the information on the host.

domain

is the domain AF_INET. This parameter is optional.

Return values:

The value 1 indicates successful execution of the call. The value 0 indicates an error.

**Note**

SockGetHostByAdress() interfaces with the C function gethostbyaddr().

5.9. SockGetHostByName

The SockGetHostByName() call retrieves host information on a specific host using its name or any alias.

Syntax:



where:

nameAddress

is the name of a host, for example www.ibm.com.

host

is the name of a stem variable to receive the information on the host.

Return values:

The value 1 indicates successful execution of the call. The value 0 indicates an error.



Note

SockGetHostByName() interfaces with the C function gethostbyname().

5.10. SockGetHostId

The SockGetHostId() call retrieves the dotAddress of the local host.

Syntax:



The return value is the dotAddress of the local host.



Note

SockGetHostId() interfaces with the C functions gethostname() and gethostbyname() for Windows platforms and with the C function getifaddrs() for non-Windows platforms (Unix, Linux, macOS). For non-Windows platforms lacking getifaddrs() there is a fallback to using gethostname() and gethostbyname().

5.11. SockGetPeerName

The SockGetPeerName() call gets the name of the peer connected to a socket.

Syntax:



where:

socket
is the socket descriptor.

address
is a stem variable that will contain the address of the peer connected to socket.

Return values:

The value 0 indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code by calling SockSock_Errno() or SockPSock_Errno(). Possible values are:

ENOTSOCK
socket is not a valid socket descriptor.

ENOTCONN
socket is not connected.

ENOBUFS
There is no buffer space available.



Note

SockGetPeerName() interfaces with the C function getpeername().

5.12. SockGetSockName

The SockGetSockName() call gets the local socket name.

Syntax:

```

  SockGetSockName( socket , address )

```

where:

socket
is the socket descriptor.

address
is a stem variable that is to receive the address of the socket returned.

SockGetSockName() returns the address for socket in the stem variable address. If the socket is not bound to an address, the call returns a null address.

The returned null address is a stem variable with the family field set to AF_INET, the port field set to 0, and the addr field set to 0.0.0.0.

All sockets are explicitly assigned an address after a successful call to SockBind(). Stream sockets are implicitly assigned an address after a successful call to SockConnect() or SockAccept() if SockBind() was not called.

The SockGetSockName() call is often used to identify the port assigned to a socket after the socket has been implicitly bound to a port. For example, an application can call SockConnect() without previously calling SockBind(). In this case, the SockConnect() call completes the binding necessary by assigning a port to the socket.

Return values:

The value 0 indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code by calling `SockSock_Errno()` or `SockPSock_Errno()`. Possible values are:

ENOTSOCK

socket is not a valid socket descriptor.

ENOBUFS

There is no buffer space available.

**Note**

`SockGetSockName()` interfaces with the C function `getsockname()`.

5.13. SockGetSockOpt

The `SockGetSockOpt()` call gets the socket options associated with a socket.

Syntax:

where:

socket

is the socket descriptor.

level

specifies which option level is queried for the specified optname. The only supported level is `SOL_SOCKET`.

optname

is the name of the specified socket option. Only one option can be specified with a call.

optval

is the variable to receive the option values requested. For socket options that are Boolean the option is enabled if `optval` is nonzero and disabled if `optval` is 0.

`SockGetSockOpt()` returns the value of a socket option at the socket level. It can be requested for sockets of all domain types. Some options are supported only for specific socket types.

The following options are recognized for `SOL_SOCKET`:

SO_BROADCAST

returns the information whether datagram sockets are able to broadcast messages. If this option is enabled, the application can send broadcast messages using datagram socket, if the interface specified in the destination supports broadcasting of packets.

SO_DEBUG

returns the information whether debug information can be recorded for a socket.

SO_DONTROUTE

returns the information whether the socket is able to bypass the routing of outgoing messages. If this option is enabled, outgoing messages are directed to the network interface specified in the network portion of the destination address. When enabled, packets can only be sent to directly connected networks.

SO_ERROR

returns any error pending at the socket and clears the error status. It can be used to check for asynchronous errors at connected datagram sockets or for asynchronous errors that are not explicitly returned by one of the socket calls.

SO_KEEPALIVE

returns the information whether stream sockets are able to send keepalive packets. TCP uses a timer called the keepalive timer. This timer monitors idle connections that might have been disconnected because of a peer crash or timeout. If this option is enabled, a keepalive packet is periodically sent to the peer.

This option is mainly used to enable servers to close connections that are no longer active as a result of clients ending connections without properly closing them.

SO_LINGER

returns the information whether stream sockets are able to linger on close if data is present. If this option is enabled and there is data still to be sent when `SockSoClose()` is called, the calling application is blocked during the `SockSoClose()` call until the data is transmitted or the connection has timed out. If this option is disabled, the `SockSoClose()` call returns without blocking the caller while TCP is trying to send the data. Although the data transfer is usually successful, it cannot be guaranteed because TCP tries to send the data only for a specific amount of time.

SO_OOBINLINE

returns the information whether stream sockets are able to receive out-of-band data. If this option is enabled, out-of-band data is placed in the normal data input queue as it is received. It is then made available to `SockRecv()` and `SockRecvFrom()` without the `MSG_OOB` flag being specified in those calls. If this option is disabled, out-of-band data is placed in the priority data input queue as it is received. It can then only be made available to `SockRecv()` and `SockRecvFrom()` by specifying the `MSG_OOB` flag in those calls.

SO_RCVBUF

returns the buffer size for input.

SO_RCVLOWAT

returns the receive low-water mark.

SO_RCVTIMEO

returns the timeout value for a receive operation.

SO_REUSEADDR

returns the information whether stream and datagram sockets are able to reuse local addresses. If this option is enabled, the local addresses that are already in use can then be bound. This alters the normal algorithm used in the `SockBind()` call. At connection time, the system checks whether the local addresses and ports differ from foreign addresses and ports. If not, the error value `EADDRINUSE` is returned.

SO_SNDBUF

returns the size of the send buffer.

SO_SNDLOWAT

returns the send low-water mark. This mark is ignored for nonblocking calls and not used in the Internet domain.

SO_SNDTIMEO

returns the timeout value for a send operation.

SO_TYPE

returns the socket type. The integer pointed to by optval is then set to one of the following: STREAM, DGRAM, RAW, or UNKNOWN.

SO_USELOOPBACK

bypasses hardware where possible.

All option values are integral except for SO_LINGER, which contains the following blank-delimited integers:

- The l_onoff value. It is set to 0 if the SO_LINGER option is disabled.
- The l_linger value. It specifies the amount of time, in seconds, to be lingered on close. A value of 0 causes SocketSoClose() to wait until disconnection completes.

Return values:

The value 0 indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code by calling SocketSock_Errno() or SocketPSock_Errno(). Possible values are:

EADDRINUSE

The address is already in use.

ENOTSOCK

socket is not a valid socket descriptor.

ENOPROTOOPT

optname or level is not recognized.



Note

SocketGetSockOpt() interfaces with the C function getsockopt().

5.14. SocketInit

The SocketInit() call initializes the socket data structures and checks whether the TCP/IP network is active.

Syntax:

» **SocketInit()** «

SocketInit() can be called at the beginning of each program that uses SocketSocket(). However, it is not obligatory because each RxSocket function is automatically initialized. For this reason, explicit initialization is not available in all system environments.

Return values:

The value 0 indicates successful execution of the call. The value 1 indicates an error.



Note

SockInit() interfaces with the C function `sock_init()`.

5.15. SockIoctl

The SockIoctl() call performs special operations on the socket.

Syntax:



where:

`socket`

is the socket descriptor.

`ioctlCmd`

is the ioctl command to be performed.

`ioctlData`

is a variable containing data associated with the particular command. Its format depends on the command requested. Valid commands are:

FIONBIO

sets or clears nonblocking input or output for a socket. This command is an integer. If the integer is 0, nonblocking input or output on the socket is cleared. If the integer is a number other than 0, input or output calls do not block until the call is completed.

FIONREAD

gets the number of immediately readable bytes for the socket. This command is an integer.

Return values:

The value 0 indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code `SockSock_Errno()` or `SockPSock_Errno()`. Possible values are:

ENOTSOCK

socket is not a valid socket descriptor.

EINVAL

The request is not valid or not supported.

EOPNOTSUPP

The operation is not supported on the socket.



Note

SockIoctl() interfaces with the C function ioctl() or, in the Windows environments, with ioctlsocket().

5.16. SockListen

The SockListen() call completes the binding necessary for a socket to accept connections and creates a connection request queue for incoming requests.

Syntax:



where:

socket
is the socket descriptor.

backlog
controls the maximum queue length for pending connections.

SockListen() performs the following tasks:

1. It completes the binding necessary for socket, if SockBind() has not been called for the socket.
2. It creates a connection request queue with a length of backlog to queue incoming connection requests.

When the queue is full, additional connection requests are ignored.

SockListen() can only be called for connection-oriented sockets.

SockListen() is called after allocating a socket with SockSocket() and after binding a name to socket with SockBind(). It must be called before SockAccept().

SockListen() indicates when it is ready to accept client connection requests. It transforms an active socket to a passive socket. After it is called, socket cannot be used as an active socket to initiate connection requests.

If backlog is smaller than 0, SockListen() interprets the backlog to be 0. If it is greater than the maximum value defined by the network system, SockListen() interprets the backlog to be this maximum value.

Return values:

The value 0 indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code SockSock_Errno() or SockPSock_Errno(). Possible values are:

ENOTSOCK

socket is not a valid socket descriptor.

EOPNOTSUPP

socket is not a socket descriptor that supports the SockListen() call.



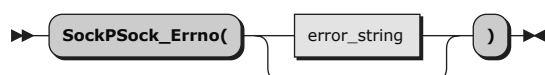
Note

SockListen() interfaces with the C function listen().

5.17. SockPSock_Errno

The SockPSock_Errno() call writes a short error message to the standard error device. It describes the last error encountered during a call to a socket library function.

Syntax:



where:

error_string

is the error string written to the standard error device describing the last error encountered. The string printed is followed by a colon, a space, and then the message. If it is omitted or empty, only the message is printed. The string is optional.

The error code is acquired by calling SockSock_Errno(). It is set when errors occur. Subsequent socket calls do not clear the error code.



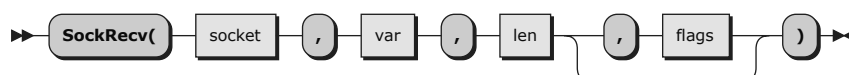
Note

SockPSock_Errno() interfaces with the C function psock_errno().

5.18. SockRecv

The SockRecv() call receives data on a connected socket.

Syntax:



where:

socket

is the socket descriptor.

var

is the name of a Rexx variable to receive the data.

len

is the maximum amount of data to be read.

flags

is a blank-delimited list of options:

MSG_OOB

reads any out-of-band data on the socket.

MSG_PEEK

peeks at the data on the socket. The data is returned but not removed, so the subsequent receive operation sees the same data.

SockRecv() receives data on a socket with descriptor socket and stores it in the Rexx variable var. It applies only to connected sockets. For information on how to use SockRecv() with datagram and raw sockets, see Datagram or raw sockets.

SockRecv() returns the length of the incoming data. If a datagram is too long to fit the buffer, the excessive data is discarded. No data is discarded for stream sockets. If data is not available at socket, the SockRecv() call waits for a message and blocks the caller unless the socket is in nonblocking mode. See SockIoctl() for a description of how to set the nonblocking mode.

SockRecv() may return fewer bytes than requested. This is due to the underlying TCP/IP subsystem and is not controllable by the RxSock programmer. When you receive fewer bytes than you request you should follow immediately with another request for the balance of the requested bytes. You may have to call SockRecv() repeatedly to obtain all the bytes. Each subsequent call should request the difference between the previous request number of bytes and the number of bytes actually received.

Return values:

If successful, the length of the data in bytes is returned. The value 0 indicates that the connection is closed. The value -1 indicates an error. You can get the specific error code SockSock_Errno() or SockPSock_Errno(). Possible values are:

ENOTSOCK

socket is not a valid socket descriptor.

EINTR

Interrupted system call.

EINVAL

Invalid argument.

EWouldBlock

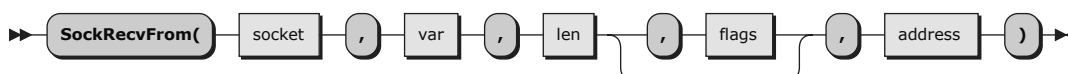
socket is in nonblocking mode and no data is available, or the SO_RCVTIMEO option has been set for socket and the timeout expired before any data arrived.

**Note**

SockRecv() interfaces to the C function recv().

5.19. SockRecvFrom

The SockRecvFrom() call receives data on a socket.

Syntax:

where:

socket

is the socket descriptor.

var

is the name of a Rexx variable to receive the data.

len

is the maximum amount of data to be read.

flags

is a blank delimited list of options:

MSG_OOB

reads any out-of-band data on the socket.

MSG_PEEK

peeks at the data present on the socket. The data is returned but not consumed. The subsequent receive operation thus sees the same data.

address

is a stem variable specifying the address of the sender from which the data is received, unless it is a null address.

SockRecvFrom() receives data on a socket with descriptor socket and stores it in a Rexx variable named var. It applies to any socket type, whether connected or not.

SockRecvFrom() returns the length of the incoming message or data. If a datagram is too long to fit the supplied buffer, the excessive data is discarded. No data is discarded for stream sockets. If data is not available at socket, the SockRecvFrom() call waits for a message to arrive and blocks the caller, unless the socket is in nonblocking mode. See SockIoctl() for a description of how to set the nonblocking mode.

Return values:

If successful, the length of the data in bytes is returned. The value -1 indicates an error. You can get the specific error code SockSock_Errno() or SockPSock_Errno(). Possible values are:

ENOTSOCK

socket is not a valid socket descriptor.

EINVAL

Invalid argument.

EWOULDBLOCK

socket is in nonblocking mode, no data is available, or the SO_RCVTIMEO option has been set for socket and the timeout expired before data arrived.



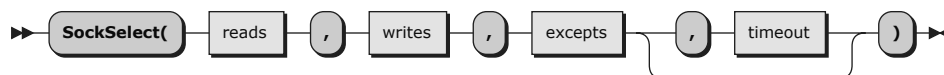
Note

SockRecvFrom() interfaces with the C function recvfrom().

5.20. SockSelect

The SockSelect() call monitors the activity on a socket with regard to readability, readiness for writing, and pending exceptional conditions.

Syntax:



where:

reads

is the number of sockets to be checked for readability.

writes

is the number of sockets to be checked for readiness for writing.

excepts

is the number of sockets to be checked for pending exceptional conditions. For Network Services sockets, the only pending exceptional condition is out-of-band data in the receive buffer.

timeout

is the maximum number of seconds the system waits for the selection to complete. Set the timeout parameter to 0 for a blocking operation. If the socket is ready, the return will be immediate.

Each parameter specifying a number of sockets is qualified by a stem variable which is queried and set by this function. The stem variable has the following format: stem.0 contains the number of sockets, stem.1 the first socket, and so on. Upon return, the stem variables are reset to the sockets that are ready. If any of the stem variables are empty (), or no parameter is passed, no sockets for that type are checked.

The timeout value must be integral (no fractional values). Nonnumeric and negative numbers are considered to be 0. If no timeout value is passed, an empty string () is assumed.

If the timeout value is 0, SockSelect() does not wait before returning. If the timeout value is an empty string (), SockSelect() does not time out, but returns when a socket becomes ready. If the timeout value is in seconds, SockSelect() waits for the specified interval before returning. It checks all indicated sockets at the same time and returns as soon as one of them is ready.

Return values:

The number of ready sockets is returned. The value 0 indicates an expired time limit. In this case, the stem variables are not modified. The value -1 indicates an error. You can get the specific error code SockSock_Errno() or SockPSock_Errno(). Possible values are:

ENOTSOCK

socket is not a valid socket descriptor.

EFAULT

The address is not valid.

EINVAL

Invalid argument.

EINTR

Interrupted system call.

Example 5.1. SockSelect

```

r.0 = 2                /* specify 2 sockets for read in stem r. */
r.1 = 101
r.2 = 102

                        /* specify 1 socket for write in stem w. */
w.0 = 1
w.1 = 103

                        /* no sockets for exceptions in stem e. */
e.0 = 0
rc = SockSelect("r.", "w.", "e.")
do i = 1 to r.0        /* display sockets ready for read */
    say "socket" r.i "is ready for reading."
end

```

That SockSelect() call can be invoked as:

```
rc = SockSelect("r.", "w.", "")
```

or

```
rc = SockSelect("r.", "w.", )
```

The function call SockSelect(, , , x) results in the program pausing for x seconds.



Note

SockSelect() interfaces with the C function select().

5.21. SockSend

The SockSend() call sends data to a connected socket.

Syntax:



where:

socket

is the socket descriptor.

data

is the name of a Rexx variable containing the data to be transmitted.

flags

is a blank delimited list of options:

MSG_OOB

sends out-of-band data to sockets that support SOCK_STREAM communication.

MSG_DONTROUTE

turns on the SO_DONTROUTE option for the duration of the send operation. This option is usually only used by diagnostic or routing programs.

SockSend() sends data to a connected socket with descriptor socket. For information on how to use SockSend() with datagram and raw sockets, see Datagram or raw sockets.

If the socket does not have enough buffer space to hold the data to be sent, the SockSend() call blocks unless the socket is placed in nonblocking mode. See SockIoctl() for a description of how to set the nonblocking mode. Use the SockSelect() call to determine when it is possible to send more data.

Return values:

If successful, the number of bytes of the socket with descriptor socket that is added to the send buffer is returned. Successful completion does not imply that the data has already been delivered to the receiver.

The return value -1 indicates that an error was detected on the sending side of the connection. You can get the specific error code SockSock_Erno() or SockPSock_Erno(). Possible values are:

ENOTSOCK

socket is not a valid socket descriptor.

EINTR

Interrupted system call.

EINVAL

Invalid argument.

ENOBUFS

There is no buffer space available to send the message.

EWouldBlock

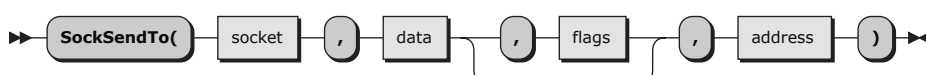
socket is in nonblocking mode, the data cannot be sent without blocking, or the SO_SNDTIMEO option has been set for socket and the timeout expired before any data was sent.

**Note**

SockSend() interfaces with the C function send().

5.22. SockSendTo

The SockSendTo() call sends data to a connected or unconnected socket.

Syntax:

where:

socket

is the socket descriptor.

data

is a string of data to be transmitted.

flags

is a blank delimited list of options:

MSG_OOB

sends out-of-band data to sockets that support SOCK_STREAM communication.

MSG_DONTROUTE

turns on the SO_DONTROUTE option for the duration of the send operation. This option is usually only used by diagnostic or routing programs.

address

is a stem variable containing the destination address.

SockSendTo() sends data to a connected or unconnected socket with descriptor socket. For unconnected datagram and raw sockets, it sends data to the specified destination address. For stream sockets, the destination address is ignored.

Datagram sockets are connected by calling SockConnect(). This call identifies the peer to send or receive the datagram. After a datagram socket is connected to a peer, you can still use the SockSendTo() call but you cannot include a destination address.

To change the peer address when using connected datagram sockets, issue SockConnect() with a null address. Specifying a null address removes the peer address specification. You can then issue either a SockSendTo() call and specify a different destination address or a SockConnect() call to connect to a different peer. For more information on connecting datagram sockets and specifying null addresses, see Datagram or raw sockets.

Return values:

If successful, the number of bytes sent is returned. Successful completion does not guarantee that the data is delivered to the receiver. The return value -1 indicates that an error was detected on the sending side. You can get the specific error code SockSock_Errno() or SockPSock_Errno(). Possible values are:

ENOTSOCK

socket is not a valid socket descriptor.

EMSGSIZE

The message data was too big to be sent as a single datagram.

ENOBUFS

There is no buffer space available to send the message.

EWOULDBLOCK

socket is in nonblocking mode, the data cannot be sent without blocking, or the SO_SNDTIMEO option has been set for socket and the timeout expired before any data was sent.

ENOTCONN

The socket is not connected.

EDESTADDRREQ

Destination address required.



Note

SockSendTo() interfaces with the C function sendto().

5.23. SockSetSockOpt

The SockSetSockOpt() call sets options associated with a socket.

Syntax:



where:

socket

is the socket descriptor.

level

specifies which option level is set. The only supported level is SOL_SOCKET.

optname

is the name of a specified socket option.

optval

is the variable containing the data needed by the set command. It is optional.

SockSetSockOpt() sets options associated with a socket with descriptor socket such as enabling debugging at the socket or protocol level, controlling timeouts, or permitting socket data broadcasting. Options can exist at the socket or the protocol level. They are always present at the highest socket level. When setting socket options, the option level and name must be specified.

For socket options that are toggles, the option is enabled if optval is nonzero and disabled if optval is 0.

The following options are recognized for SOL_SOCKET:

SO_BROADCAST

enables datagram sockets to broadcast messages. The application can then send broadcast messages using datagram socket, if the interface specified in the destination supports broadcasting of packets.

SO_DEBUG

enables debug information to be recorded for a socket.

SO_DONTROUTE

enables the socket to bypass the routing of outgoing messages. Outgoing messages are then directed to the network interface specified in the network portion of the destination address. When enabled, packets can only be sent to directly connected networks.

SO_KEEPALIVE

enables stream sockets to send keepalive packets, which keep the connection alive. TCP uses a timer called the keepalive timer. This timer monitors idle connections that might have been

disconnected because of a peer crash or timeout. If this option is enabled, a keepalive packet is periodically sent to the peer.

This option is mainly used to enable servers to close connections that are no longer active as a result of clients ending connections without properly closing them.

SO_LINGER

enables stream sockets to linger on close if data is present. If this option is enabled and there is data still to be sent when `SocketSoClose()` is called, the calling application is blocked during the `SocketSoClose()` call until the data is transmitted or the connection has timed out. If this option is disabled, the `SocketSoClose()` call returns without blocking the caller while TCP is trying to send the data. Although the data transfer is usually successful, it cannot be guaranteed because TCP tries to send the data only for a specific amount of time.

SO_OOBINLINE

enables stream sockets to receive out-of-band data, which is a logically separate data path using the same connection as the normal data path. If this option is enabled, out-of-band data is placed in the normal data input queue as it is received. It is then made available to `SocketRecv()` and `SocketRecvFrom()` without the `MSG_OOB` flag being specified in those calls. If this option is disabled, out-of-band data is placed in the priority data input queue as it is received. It can then only be made available to `SocketRecv()` and `SocketRecvFrom()` by specifying the `MSG_OOB` flag in those calls.

SO_RCVBUF

sets the buffer size for input. This option sets the size of the receive buffer to the value contained in the buffer pointed to by `optval`. In this way, the buffer size can be tailored for specific application needs, such as increasing the buffer size for high-volume connections.

SO_RCVLOWAT

sets the receive low-water mark.

SO_RCVTIMEO

sets the timeout value for a receive operation.

SO_REUSEADDR

enables stream and datagram sockets to reuse local addresses. Local addresses that are already in use can then be bound. This alters the normal algorithm used in the `SocketBind()` call. At connection time, the system checks whether the local addresses and ports differ from foreign addresses and ports. If not, the error value `EADDRINUSE` is returned.

SO_SNDBUF

Sets the buffer size for output. This option sets the size of the send buffer to the value contained in the buffer pointed to by `optval`. In this way, the send buffer size can be tailored for specific application needs, such as increasing the buffer size for high-volume connections.

SO_SNDLOWAT

sets the send low-water mark. This mark is ignored for nonblocking calls and not used in the Internet domain.

SO_SNDTIMEO

sets the timeout value for a send operation.

SO_USELOOPBACK

bypasses hardware where possible.

Except for `SO_LINGER`, all values are integral. `SO_LINGER` expects two blank delimited integers:

1. The `l_onoff` value. It is set to 0 if the `SO_LINGER` option is disabled.
2. the `l_linger` value. The `l_linger` field specifies the amount of time, in seconds, to be lingered on close. A value of 0 causes `SocketSoClose()` to wait until disconnection completes.

Return values:

The value 0 indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code `SocketSock_Errno()` or `SocketPSock_Errno()`. Possible values are:

`EADDRINUSE`

The address is already in use.

`ENOTSOCK`

socket is not a valid socket descriptor.

`ENOPROTOOPT`

optname is not recognized.

`EINVAL`

Invalid argument.

`ENOBUFS`

There is no buffer space available.



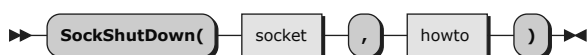
Note

`SocketSetSockOpt()` interfaces with the C function `setsockopt()`.

5.24. SocketShutdown

The `SocketShutdown()` call shuts down all, or part, of a full duplex connection. This call is optional.

Syntax:



>where:

socket

is the socket descriptor.

howto

is the condition of the shutdown of socket.

Because data flows in different directions are independent of each other, `SocketShutdown()` allows you to independently stop data flows in one direction, or all data flows, with one API call. For example, you can enable yourself to send data but disable other senders to send data to you.

The `howto` parameter sets the condition for shutting down the connection to socket socket. It can be set to one of the following:

0

No more data can be received on socket.

- 1
No more output is allowed on socket.
- 2
No more data can be sent or received on socket.

Return values:

The value 0 indicates successful execution of the call. The value -1 indicates an error. You can get the specific error code `Socket_Sock_Errno()` or `SocketPSock_Errno()`. Possible values are:

ENOTSOCK
socket is not a valid socket descriptor.

EINVAL
howto was not set to a valid value.



Note

`SocketShutdown()` interfaces with the C function `shutdown()`.

5.25. Socket_Sock_Errno

The `Socket_Sock_Errno()` call returns the last error code set by a socket call. Subsequent socket API calls do not reset this error code.

Syntax:

» `Socket_Sock_Errno()` «



Note

`Socket_Sock_Errno()` interfaces with the C function `sock_errno()`.

5.26. SocketSocket

The `SocketSocket()` call creates an end point for communication and returns a socket descriptor representing the end point. Each socket type provides a different communication service.

Syntax:

» `SocketSocket( domain , type , protocol )` «

where:

domain

is the communication domain requested. It specifies the protocol family to be used. Currently, only the domain `AF_INET` is supported, which uses addresses in the Internet address format.

type

is the type of socket created. The following types are supported:

SOCK_STREAM

provides sequenced, two-way byte streams that are reliable and connection-oriented. It supports a mechanism for out-of-band data. Stream sockets are supported by the Internet (AF_INET) communication domain.

SOCK_DGRAM

provides datagrams, which are connectionless messages of a fixed length whose reliability is not guaranteed. Datagrams can be received out of order, lost, or delivered several times. Datagram sockets are supported by the Internet (AF_INET) communication domain.

SOCK_RAW

provides the interface to internal protocols, such as IP and ICMP. Raw sockets are supported by the Internet (AF_INET) communication domain.

protocol

is the protocol to be used with the socket. It can be IPPROTO_UDP, IPPROTO_TCP, or 0. If it is set to 0, which is the default, the system selects the default protocol number for the domain and socket type requested.

Sockets are deallocated with the SockClose() call.

Return values:

A non-negative socket descriptor return value indicates successful execution of the call. The return value -1 indicates an error. You can get the specific error code SockSock_Erno() or SockPSock_Erno(). Possible values are:

EMFILE

The maximum number of sockets are currently in use.

EPROTONOSUPPORT

The protocol is not supported in the specified domain or the protocol is not supported for the specified socket type.

EPFNOSUPPORT

The protocol family is not supported.

ESOCKTNOSUPPORT

The socket type is not supported.

**Note**

SockSocket() interfaces with the C function socket().

5.27. SockSoClose

The SockSoClose() call shuts down a socket and frees resources allocated to the socket.

Syntax:

where:

socket

is the socket descriptor of the socket to be closed.

This function is identical to SockClose().

Socket Class Reference

The following sections describe the socket class supplied with ooRexx. This class encapsulates the rxsock external functions into several classes that improve the functionality of the external function library by extending the error checking and reducing the amount of code needed in an average rxsock program.

6.1. Installation

The Socket class package is contained in the file socket.cls. This file must be placed in a directory listed in your PATH. To get access to the class and methods in the Socket class, include the following statement in your Rexx program:

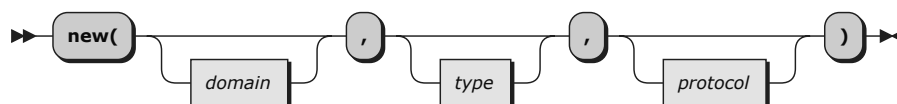
```
::requires 'socket.cls'
```

6.2. Socket Class

Table 6.1. Socket Class

Object		
Socket		
<i>new (Inherited Class Method)</i> <i>getHostByAddr (Class Method)</i> <i>getHostByName (Class Method)</i> <i>getHostId (Class Method)</i> <i>getHostName (Class Method)</i>		
<i>accept</i> <i>bind</i> <i>close</i> <i>connect</i> <i>errno</i> <i>getOption</i>	<i>getPeerName</i> <i>getSockName</i> <i>ioctl</i> <i>listen</i> <i>recv</i> <i>recvFrom</i>	<i>select</i> <i>Send</i> <i>setOption</i> <i>string</i>

6.2.1. new (Inherited Class Method)



This method returns a new instance of the [Socket](#) class.

domain

If specified, this argument must be AF_INET.

type

If specified, this argument must be SOCK_STREAM, SOCK_DGRAM or SOCK_RAW. SOCK_STREAM is the default.

protocol

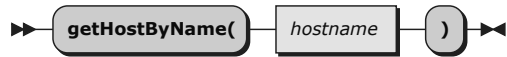
If specified, this argument must be 0, IPPROTO_UDP or IPPROTO_TCP. 0 is the default.

6.2.2. getHostByAddr (Class Method)



This is a class method. It returns an instance of the [HostInfo](#) class.

6.2.3. getHostByName (Class Method)



This is a class method. It returns an instance of the [HostInfo](#) class.

6.2.4. getHostId (Class Method)



This is a class method. It returns the dotted decimal host id of the local machine.

6.2.5. getHostName (Class Method)



This is a class method. Returns the name of the local host.



Note

getHostName() interfaces with the C function gethostname().

6.2.6. accept



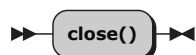
This method returns a new socket class instance that is connected to a remote host that has requested a connection from a server socket.

6.2.7. bind



This method binds a socket to a particular local IP address specified by an instance of the [InetAddress](#) class contained in the *address* argument.

6.2.8. close



This method closes this socket instance.

6.2.9. connect



This method connect the socket to a remote address specified by an instance of the [InetAddress](#) class contained in the *address* argument.

6.2.10. errno



Returns a string describing the last error occurred.

6.2.11. getOption



This method returns the value of the options specified by the *option* argument.

The *option* argument must be one of the following:

SO_BROADCAST
 SO_DEBUG
 SO_DONTROUTE
 SO_ERROR
 SO_KEEPALIVE
 SO_LINGER
 SO_OOBINLINE
 SO_RCVBUF
 SO_RCVLOWAT
 SO_RCVTIMEO
 SO_REUSEADDR
 SO_SNDBUF
 SO_SNDLOWAT
 SO_SNDTIMEO
 SO_TYPE
 SO_USELOOPBACK

6.2.12. getPeerName



This method returns the peer name of the remote connection.

6.2.13. getSockName



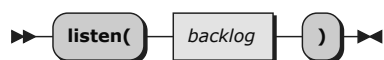
This method returns an instance of the [InetAddress](#) class that is the name information of the remote machine.

6.2.14. ioctl



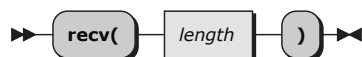
This method sends a special command to the socket. The *cmd* and the *data* are not checked for valid values.

6.2.15. listen



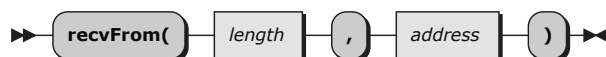
This method turns the socket into a server listening socket. The *backlog* is the number of connection requests the socket should cache.

6.2.16. recv



This method receives data on a socket connection. The *length* is the maximum number of bytes the socket should receive. This method returns the data received, which could be less than the maximum length specified.

6.2.17. recvFrom



This method receives data on a socket connection from the specified *address*. The *address* must be an instance of the [InetAddress](#) class. The *length* is the maximum number of bytes the socket should receive. This method returns the data received, which could be less than the maximum length specified.

6.2.18. select



This method monitors activity on a set of sockets. It returns the number of sockets ready for activity. Upon return the input argument arrays will be reset to only the sockets that are ready.

reads

An array of socket instances to monitor for read activity.

writes

An array of socket instances to monitor for write activity.

excepts

An array of socket instances to monitor for exception activity.

timeout

The timeout in seconds. This must be a whole number (no fractions allowed).

6.2.19. Send



This method sends the *data* on the socket. It returns the number of bytes sent, which could be less than the length of *data*.

6.2.20. setOption



This method sets the option given by *name* with the data in *value*. See the method [getOption](#) for the list of valid *names*.

6.2.21. string



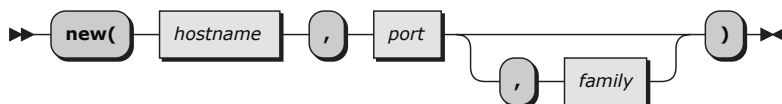
This method returns the string representing the socket.

6.3. InetAddress Class

Table 6.2. InetAddress Class

Object		
InetAddress		
<i>new (Inherited Class Method)</i>		
<i>address</i> <i>address=</i> <i>family</i>	<i>family=</i> <i>makeStem</i> <i>port</i>	<i>port=</i>

6.3.1. new (Inherited Class Method)



This method creates a new instance of the InetAddress class.

hostname

The IP address or host name of the host machine.

port

The port number of the connection.

family

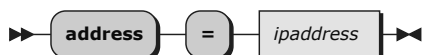
The address family. The only valid value is AF_INET.

6.3.2. address



This method returns the IP address of the original hostname.

6.3.3. address=



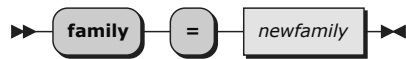
Sets the IP address of the original hostname.

6.3.4. family



This method returns the IP address family of the original hostname.

6.3.5. family=



This method sets the IP address family of the original hostname.

6.3.6. makeStem



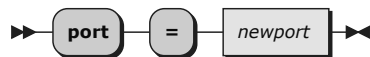
This method returns a stem variable set to the current values of the instance. This method has limited usefulness to the programmer.

6.3.7. port



This method returns port number of the original hostname.

6.3.8. port=



This method sets the port number of the original hostname.

6.4. HostInfo Class

Table 6.3. HostInfo Class

Object		
HostInfo		
<i>new (Inherited Class Method)</i>		
<i>addr</i> <i>address</i>	<i>alias</i> <i>makeStem</i>	<i>name</i>

6.4.1. new (Inherited Class Method)



This method create an instance of the HostInfo class and sets all the attribute methods of the instance. The *hostname* can be either a valid DNS host name or an IP address.

6.4.2. addr



This method returns an array of IP addresses of the host.

6.4.3. address



This method returns the main IP address of the host.

6.4.4. alias



This method returns an array of alias host name of the host.

6.4.5. makeStem



This method returns a stem variable set to the current values of the instance. This method has limited usefulness to the programmer.

6.4.6. name



This method returns the main host name of the host.

6.5. Socket Class Example

Example 6.1. Socket Class

```

host = '127.0.0.1'
port = 8080
srvr = .server~new(host, port)
call sys$sleep(1) -- just to let the server get started
call client host, port, 'This is test 1'
call client host, port, 'This is test 2'
call client host, port, 'stop'
return

::requires 'socket.cls'

::routine client
use strict arg host, port, message
-- get a new socket
s = .socket~new()
-- set the server address/port to connection information
addr = .inetaddress~new(host, port)
-- connect to the server
retc = s~connect(addr)
if retc <> 0 then do
    say 'Error' s~errno() 'connecting to server socket.'
    return
end
-- send the command
retc = s~send(message)
-- receive the command back
say s~recv(4096)
-- close the socket
s~close()
return

::class server
::method init
use strict arg host, port

```

```
-- get a new socket
s = .socket~new()
if s = -1 then do
  say 'Error' s~errno() 'creating server socket'
  return
end
-- set the socket to reuse the addresses assigned to it
retc = s~setoption('SO_REUSEADDR', 1)
if retc = -1 then do
  say 'Error' s~errno() 'setting socket option'
  return
end
-- bind the socket to an address/port
addr = .inetaddress~new(host, port)
retc = s~bind(addr)
if retc = -1 then do
  say 'Error' s~errno() 'binding socket'
  return
end
-- mark it as a listening socket
retc = s~listen(3)
if retc = -1 then do
  say 'Error' s~errno() 'making the socket a listening socket'
  return
end
say 'Server starting'
reply
stop = .false
do while \stop
  -- accept a client connection socket
  cs = s~accept()
  if cs = .nil then do
    say 'Error accepting new socket'
    iterate
  end
  -- receive the command from the client
  cmd = cs~recv(4096)
  -- echo the command back to the client
  cs~send(cmd)
  -- close the client connection socket
  cs~close()
  -- if the command was stop then stop the server
  if cmd~upper() = 'STOP' then do
    stop = .true
  end
end
-- close the socket
s~close()
return
```

StreamSocket Class Reference

The following sections describe the **StreamSocket** class supplied with ooRexx. This class encapsulates the rxsock external functions into a class that treats the socket as a standard ooRexx input/output stream. It improves error checking and reduces the amount of code needed in an average rxsock program.

7.1. Installation

The StreamSocket class package is contained in the file streamsocket.cls. This file must be placed in a directory listed in your PATH. To get access to the class and methods in the StreamSocket class, include the following statement in your Rexx program:

```
::requires 'streamsocket.cls'
```

7.2. The StreamSocket Class

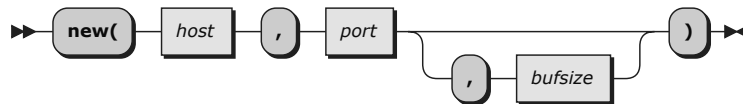
A **StreamSocket** object allows external communication from Rexx to a socket.

The **StreamSocket** class is a subclass of the **InputOutputStream** class.

Table 7.1. StreamSocket Class

Object		
+ OutputStream (Mixin Class)		
Methods inherited from the OutputStream class		
arrayOut	close	open
charIn	lineIn	position
charOut	lineOut	
chars	lines	
+ InputStream (Mixin Class)		
Methods inherited from the InputStream class		
arrayIn	close	open
charIn	lineIn	position
charOut	lineOut	
chars	lines	
+ InputOutputStream (Mixin Class)		
Methods inherited from the InputOutputStream class (no class or instance methods)		
StreamSocket		
<i>new (Inherited Class Method)</i>		
<i>arrayIn</i>	<i>close</i>	<i>open</i>
<i>arrayOut</i>	<i>description</i>	<i>position</i>
<i>charIn</i>	<i>lineIn</i>	<i>say</i>
<i>charOut</i>	<i>lineOut</i>	<i>state</i>
<i>chars</i>	<i>lines</i>	<i>string</i>

7.2.1. new (Inherited Class Method)



Initializes a stream object for the *host* and *port*, but does not open the stream. Returns the new stream object.

host

The host name or TCP/IP address of an Internet host.

port

The port number of the host.

bufsize

(optional) The buffersize to use for read operations. The default size is 4096.

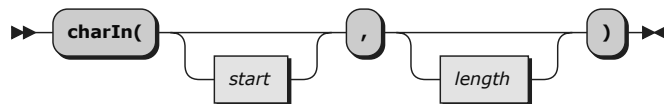
7.2.2. arrayIn

This method is invalid for this class and will raise an error if invoked.

7.2.3. arrayOut

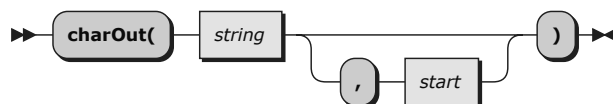
This method is invalid for this class and will raise an error if invoked.

7.2.4. charIn



Returns a string of up to *length* characters from the input stream. If you omit *length*, it defaults to **1**. If you specify *start*, it will be ignored since sockets are considered not to be persistent streams. If the stream is not already open, the stream attempts to open for reading and writing. If that fails, the stream opens for input only.

7.2.5. charOut



Returns the count of characters remaining after trying to write *string* to the output stream.

The *string* can be the null string. In this case, `charOut` writes no characters to the stream and returns **0**. If you omit *string*, `charOut` writes no characters to the stream and returns **0**.

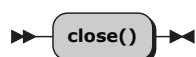
If you specify *start* it will be ignored since socket streams are not considered persistent.

7.2.6. chars



Returns **1** if the stream is open. Otherwise returns **0**.

7.2.7. close



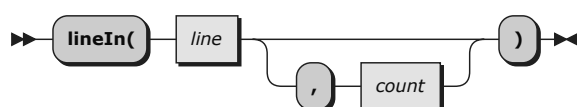
Closes the stream. `close` returns **READY**: if closing the stream is successful, or an appropriate error message. If you have tried to close an unopened socket, then the `close` method returns a null string ("").

7.2.8. description



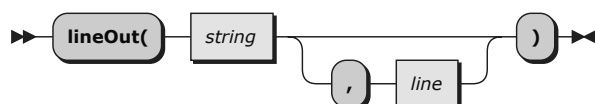
Returns any descriptive string associated with the current state of the stream or the Nil object if no descriptive string is available. The `description` method is identical with the `state` method except that the string that `description` returns is followed by a colon and, if available, additional information about **ERROR** or **NOTREADY** states. (The [state](#) method describes these states.)

7.2.9. lineIn



Returns the next *count* lines. The count must be **0** or **1**. If you omit *count*, it defaults to **1**. A *line* number may be given but it will be ignored since sockets are not considered to be a persistent stream. If the stream is not already open, then it tries to open the stream for reading and writing.

7.2.10. lineOut



Returns **0** if successful in writing *string* to the output stream or **1** if an error occurs while writing the line. If you specify *line* it will be ignored since a socket is not considered to be a persistent stream.

7.2.11. lines



Returns **1** if the stream is open. Otherwise returns **0**.

7.2.12. open



Opens the stream for input and output and returns **READY**:. If the method is unsuccessful, it returns an error message string in the same form that the `description` method uses.

For most error conditions, the additional information is in the form of a numeric return code. This return code is the value of **ERRNO**, which is set whenever one of the file system primitives returns with a **-1**.

7.2.13. position



This method is invalid for this class and will raise an error if invoked.

7.2.14. say



Returns **0** if successful in writing *string* to the output stream or **1** if an error occurs while writing the line.

7.2.15. state



Returns a string indicating the current stream state.

The returned strings are as follows:

ERROR

The stream has been subject to an erroneous operation (possibly during input or output. You might be able to obtain additional information about the error with the `description` method.

NOTREADY

The stream is known to be in such a state that the usual input or output operations attempted upon would raise the NOTREADY condition.

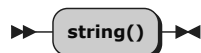
READY

The stream is known to be in such a state that the usual input or output operations might be attempted. This is the usual state for a stream, although it does not guarantee that any particular operation will succeed.

UNKNOWN

The state of the stream is unknown. This generally means that the stream is closed or has not yet been opened.

7.2.16. string



Returns a string that indicates the name of the object the stream represents i.e. the **hostname:port**.

SMTP Class Reference

The following sections describe the SMTP class supplied with ooRexx. This class can send SMTP messages to an SMTP server. It utilizes the [Section 7.2, “The StreamSocket Class”](#) to perform the communications with the server.

8.1. Installation

The SMTP class package is contained in the file smtp.cls. This file must be placed in a directory listed in your PATH. To get access to the class and methods in the SMTP class, include the following statement in your Rexx program:

```
::requires 'smtp.cls'
```

8.2. The SMTP Class

This class encapsulates all the communications necessary to send mail via an SMTP server.

Table 8.1. Smtplib Class

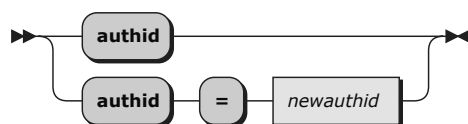
Object		
Smtplib		
<i>new (Inherited Class Method)</i>		
<i>authid/=</i>	<i>localhost</i>	<i>send</i>
<i>cmdresponse</i>	<i>logoff</i>	<i>smtpErrno</i>
<i>connect</i>	<i>password/=</i>	
<i>debug/=</i>	<i>response</i>	

8.2.1. new (Inherited Class Method)



Initializes the object. Returns the new SMTP object.

8.2.2. authid/=



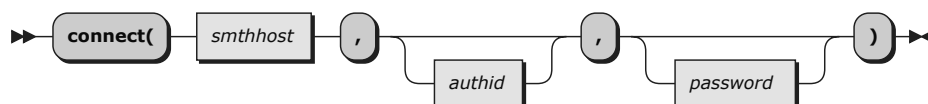
This method either sets the authid or returns the current authid. The default value for the authid is a zero-length string.

8.2.3. cmdresponse



This method returns an array containing all the commands sent to the SMTP server and the responses from that server.

8.2.4. connect



This opens the connection to the SMTP host machine.

smthphost

The host name or TCP/IP address of the SMTP host. This string can contain a port designation.

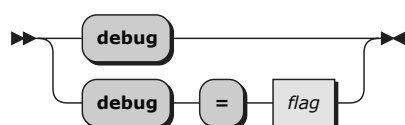
authid

(Optional) The account authid to be used if needed.

password

(optional) The password for the specified authid.

8.2.5. debug/=



This method either sets the debug flag or returns the current flag value. The default value for the flag is 0 (false) which suppresses debug messages.

8.2.6. localhost



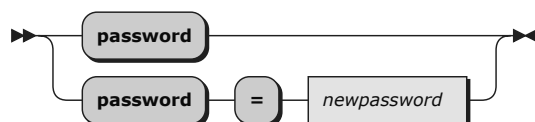
This method returns the local host name.

8.2.7. logoff



This method logs off the session to the SMTP host.

8.2.8. password/=



This method either sets the SMTP server account password, or returns the password value. The default value for the password is a zero-length string.

8.2.9. response



This method returns the parsed response to the last command sent to the SMTP server. The initial value for the response is a zero-length string.

8.2.10. send



This method sends an SMTP message to the SMTP server. The *msg* must be an instance of the [SMTPMsg](#) class.

8.2.11. smtpErrno



This method returns the return code of the last command sent to the SMTP server. The initial value for the response is a zero-length string.

8.3. The SMTPMsg Class

This class encapsulates all information needed to communicate a complete message to the SMTP server.

Table 8.2. Smtplib Class

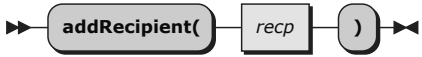
Object		
Smtplib		
<i>new (Inherited Class Method)</i>		
<i>addRecipient</i> <i>content/=</i>	<i>from/=</i> <i>recipients</i>	<i>subject/=</i>

8.3.1. new (Inherited Class Method)



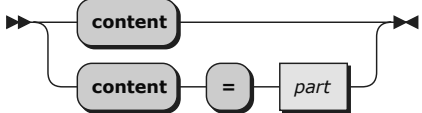
Initializes the object. Returns the new SMTPMsg object.

8.3.2. addRecipient



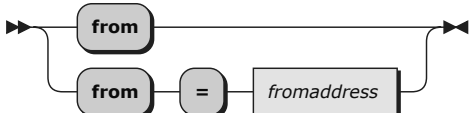
This method adds a new recipient of the message.

8.3.3. content/=



This method returns or sets a piece of the SMTP message. The *part* must be an instance of the [MimePart](#) or [MimeMultiPart](#) class, or a plain string.

8.3.4. from/=



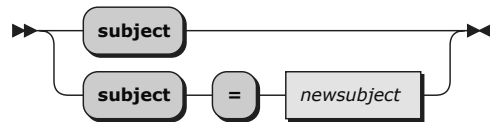
This method sets or fetches the "From" mail header field.

8.3.5. recipients



This returns an array of the mail header "Recipient" fields.

8.3.6. subject/=



This method sets or fetches the "Subject" mail header field.

MIME Classes Reference

The following sections describe the Multipurpose Internet Mail Extensions (MIME) classes supplied with ooRexx. These classes encapsulate MIME objects. This is most useful for sending complicated email messages via the [SMTP](#) class.

9.1. Installation

The MIME class package is contained in the file mime.cls. This file must be placed in a directory listed in your PATH. To get access to the class and methods in the Mime class, include the following statement in your Rexx program:

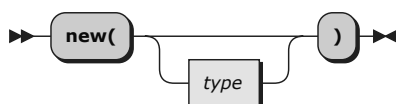
```
::requires 'mime.cls'
```

9.2. The MimePart Class

Table 9.1. MimePart Class

Object		
MimePart		
<i>new</i> (Inherited Class Method)		
<i>crlf</i> (Class Method)		
<i>addContent</i>	<i>description/=</i>	<i>id/=</i>
<i>content</i>	<i>disposition/=</i>	<i>string</i>
<i>crlf</i>	<i>encoding/=</i>	<i>type/=</i>

9.2.1. new (Inherited Class Method)



This is a class method. It returns an instance of the [MimePart](#) class.

type

(Optional) The MIME type string. The default if not given is "**text/plain**".

9.2.2. crlf (Class Method)



Returns the carriage return/line feed characters '**0d 0a**'x.

9.2.3. addContent



This method adds content to the MIME-content field. This field may only contain ASCII strings.

string

The ASCII string to be added to the content.

9.2.4. content



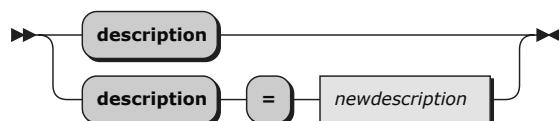
This method returns the MIME-content string.

9.2.5. crlf



Returns the carriage return/line feed characters '`\n\r`'.

9.2.6. description/=

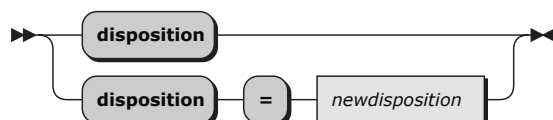


This method sets or returns the MIME-description string.

`newdescription`

The MIME-description string.

9.2.7. disposition/=

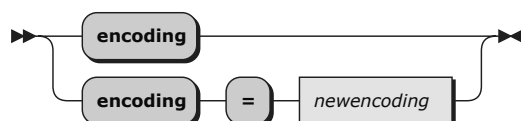


This method sets or returns the MIME-disposition string.

`newdisposition`

The MIME-disposition string.

9.2.8. encoding/=

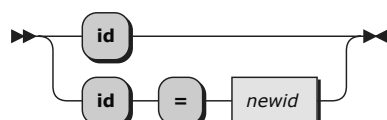


This method sets or returns the MIME-encoding string.

`newencoding`

The MIME-encoding string.

9.2.9. id/=



This method sets or returns the MIME-id string.

`newid`

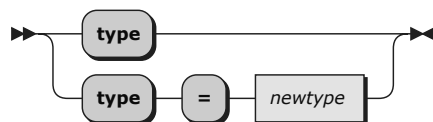
The MIME-id string.

9.2.10. string



This method returns the formatted MIME part string.

9.2.11. type/=



This method sets or returns the MIME-type string.

newtype

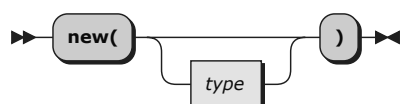
The MIME-type string.

9.3. The MimeMultiPart Class

Table 9.2. MimeMultiPart Class

Object		
MimeMultiPart		
<i>new (Inherited Class Method)</i>		
<i>crlf</i>		
<i>addPart</i>	<i>disposition/=</i>	<i>string</i>
<i>crlf</i>	<i>encoding/=</i>	<i>type/=</i>
<i>description/=</i>	<i>id</i>	

9.3.1. new (Inherited Class Method)



This is a class method. It returns an instance of the [MimeMultiPart](#) class.

type

(Optional) The MIME type string. The default if not given is "multipart/mixed".

9.3.2. crlf



Returns the carriage return/line feed characters '0d 0a'x.

9.3.3. addPart



This method adds a new part to the MIME object.

part

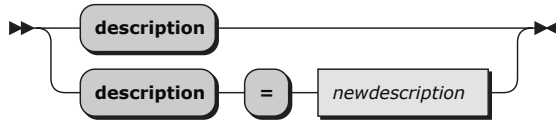
The part to be added. The *part* must be an instance of the [MimePart](#) class.

9.3.4. crlf



Returns the carriage return/line feed characters `'0d 0a'x`.

9.3.5. description/=

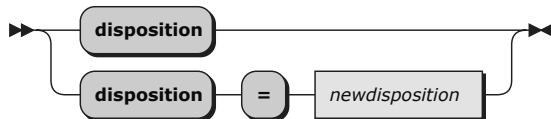


This method sets or returns the MIME-description string.

`newdescription`

The MIME-description string.

9.3.6. disposition/=

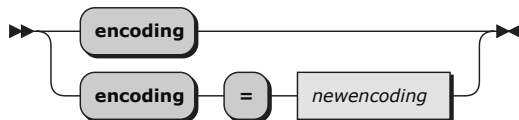


This method sets or returns the MIME-disposition string.

`newdisposition`

The MIME-disposition string.

9.3.7. encoding/=

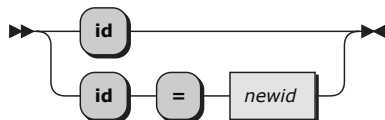


This method sets or returns the MIME-encoding string.

`newencoding`

The MIME-encoding string.

9.3.8. id



This method sets or returns the MIME-id string.

`newid`

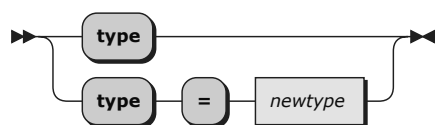
The MIME-id string.

9.3.9. string



This method returns the formatted MIME part string.

9.3.10. type/=



This method sets or returns the MIME-type string.

`newtype`

The MIME-type string.

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The source code for this document is maintained in DocBook SGML/XML format.



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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Appendix C. Revision History

Revision 0-0 Aug 2016

Initial creation for 5.0

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