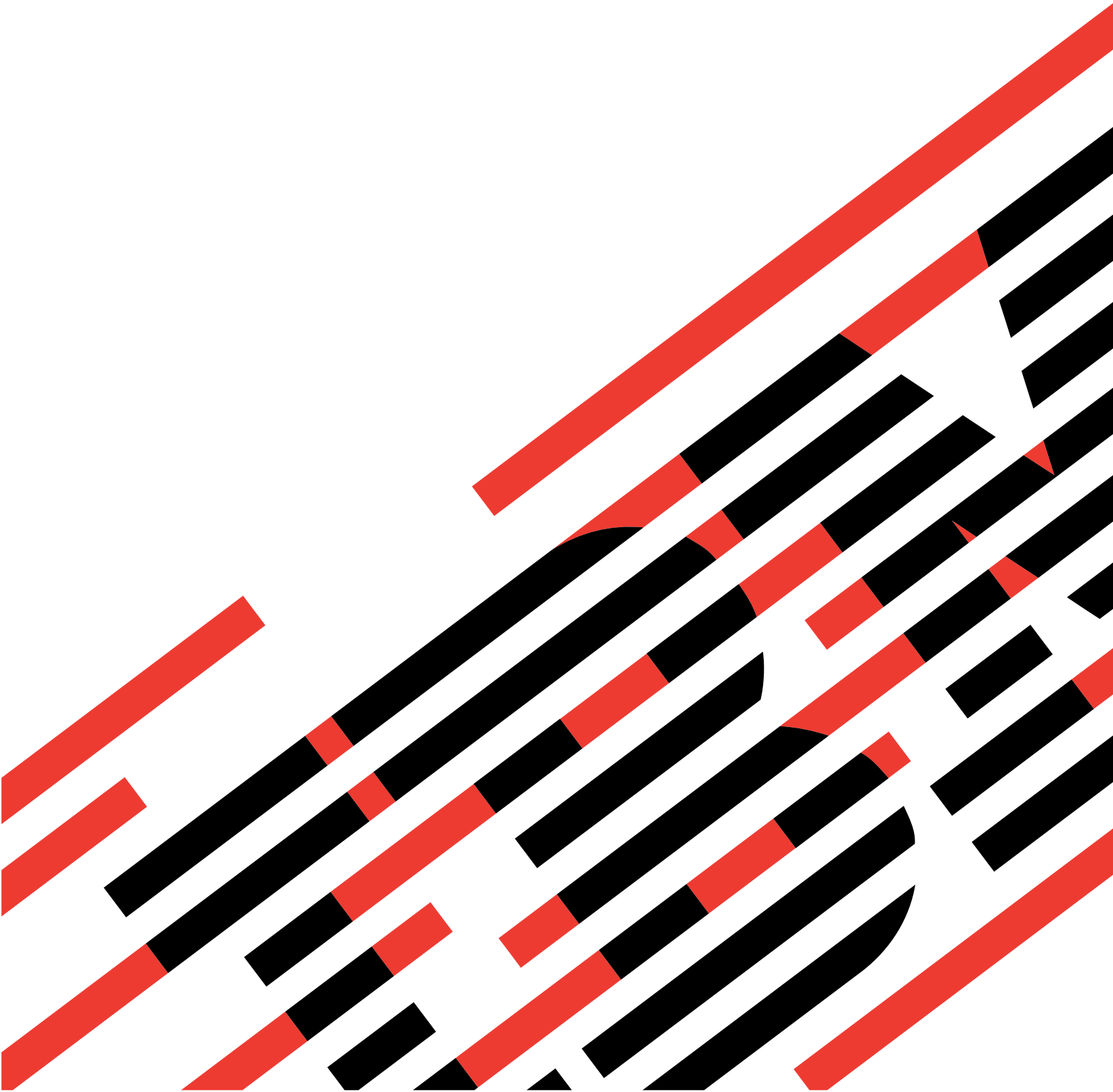
IBM Systems - iSeries

UNIX-Type -- Time APIs

Version 5 Release 4



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Version 5 Release 4

Note

Before using this information and the product it supports, be sure to read the information in "Notices," on page 29.

Sixth Edition (February 2006)

This edition applies to version 5, release 4, modification 0 of IBM i5/OS (product number 5722-SS1) and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

Contents

Time APIs

The Time APIs include two sets of APIs:

- "System Clock APIs"
- "Software Clock APIs" on page 9

Both the System Clock and Software Clock APIs use a timeval structure that is the number of seconds and microseconds since 1 January 1970, 00:00:00 Universal Coordinated Time (UTC).

The System Clock APIs allow you to work with the system clock. The system clock is a system facility that maintains the time of the system. The **gettimeofday()** and **ftime()** APIs get the current time from the system clock. The **adjtime()** and **settimeofday()** APIs set the system clock. See the Time Management topic for more information about the system clock.

The Software Clock APIs allow you to work with the software clock. The software clock is a system facility that maintains a time that is independent from the system clock. The **Qp0zGetTimeofDay()** API gets the current time from the software clock. The **Qp0zAdjTime()** and **Qp0zSetTimeofDay()** APIs set the software clock. In previous releases, the software clock was the only way to get a UTC time in seconds and microseconds. System components do not base their timestamps on the software clock, but use the system clock instead. The software clock will be removed in a future release and its use is discouraged.

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APIs

These are the APIs for this category.

System Clock APIs

The System Clock APIs are:

- "adjtime()—Adjust System Clock" (Adjust system clock) makes small adjustments to the software clock, either slowing it down or speeding it up by the time specified in the delta parameter.
- "ftime()—Get Date and Time" on page 4 (Get Date and Time) retrieves the current Coordinated Universal Time (UTC).
- "gettimeofday()—Get Current UTC Time" on page 5 (Get Current UTC Time) retrieves the current Coordinated Universal Time (UTC) and places it in the timeval structure pointed to by tp.
- "settimeofday()—Set System Clock" on page 7 (Set System Clock) sets the system clock to the Coordinated Universal Time (UTC) contained in the timeval structure pointed to by tp.

Note: These functions use header (include) files from the library QSYSINC, which is optionally installable. Make sure QSYSINC is installed on your system before using any of the functions. See "Header Files for UNIX-Type Functions" on page 16for the file and member name of each header file.

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adjtime()—Adjust System Clock

Syntax


```
#include <sys/time.h>

int adjtime (struct timeval *delta,
             struct timeval *olddelta);
```

Service Program Name: QWCTZUTC
Default Public Authority: *USE
Threadsafe: Yes

The **adjtime()** function makes small adjustments to the system clock, either slowing it down or speeding it up by the time specified in the *delta* parameter up to a maximum of two hours. If *delta* is negative, the clock is slowed down by incrementing it more slowly than normal until the correction is complete. If *delta* is positive, the clock is sped up by incrementing it more quickly than normal until the correction is complete. If *olddelta* is not NULL, the amount of time still to be corrected from a previous **adjtime()** call is returned in the structure it points to.

Parameters

delta (Input)

A pointer to a timeval structure that contains the amount of time for adjusting the clock.

olddelta

(Output)

A pointer to a timeval structure that contains the amount of time still to be corrected from a previous call to **adjtime()**.

Authorities and Locks

Special Authority

*ALLOBJ

Return Value

0 **adjtime()** was successful. The requested adjustment was initiated and the value returned in the structure pointed to by the *olddelta* parameter is the amount of time still to be corrected from a previous **adjtime()**.

-1 **adjtime()** was not successful. The *errno* variable is set to indicate the error.

Error Conditions

If **adjtime()** is not successful, *errno* usually indicates one of the following errors. Under some conditions, *errno* could indicate an error other than those listed here.

[EACCES] Permission denied.

An attempt was made to access an object in a way forbidden by its object access permissions.

[EINVAL] An invalid parameter was found.

A parameter passed to this function is not valid.

[EFAULT] The address used for an argument is not correct.

In attempting to use an argument in a call, the system detected an address that is not valid.

While attempting to access a parameter passed to this function, the system detected an address that is not valid.

[EPERM] Operation not permitted.

You must have appropriate privileges or be the owner of the object or other resource to do the requested operation.

[ENOTSUP] Operation not supported.

The operation is not supported.

[EUNKNOWN] Unknown system state.

The operation failed because of an unknown system state. See any messages in the job log and correct any errors that are indicated, then retry the operation.

Error Messages

None.

Related Information

- The <**sys/time.h**> file (see "Header Files for UNIX-Type Functions" on page 16)
- "gettimeofday()—Get Current UTC Time" on page 5
- "settimeofday()—Set System Clock" on page 7

Example

See Code disclaimer information for information pertaining to code examples.

The following example initiates a system clock adjustment:

```
#include <sys/time.h>
#include <stdio.h>
#include <errno.h>

int main(int argc, char *argv[])
{
    struct timeval adj, old;
    int rc;

    /* Speed up the clock by 1.5 seconds. */
    adj.tv_sec=1;
    adj.tv_usec=500000;

    rc=adjtime(&adj, &old);
    if(rc==0) {
        printf("adjtime() successful. "
               "Olddelta = %u.%06u\n",
                old.tv_sec, old.tv_usec);
    }
    else {
        printf("adjtime() failed, errno = %d\n",errno);
        return -1;
    }

    return 0;
}
```

Example Output:

```
adjtime() successful. Olddelta = 0.000000
```

API introduced: V4R2

ftime()—Get Date and Time

Syntax

```
#include <sys/timeb.h>

int ftime (struct timeb *tp);
```

Service Program Name: QWCTZUTC
Default Public Authority: *USE
Threadsafe: Yes

The **ftime()** function retrieves the current Coordinated Universal Time (UTC) and places it in timeb structure pointed to by *tp*.

Parameters

tp (Output) A pointer to a timeb structure that contains the time in seconds and milliseconds since 1 January 1970, 00:00:00 UTC (epoch-1970), the local time zone (measured in minutes west of Greenwich), and a flag that, if nonzero, indicates Daylight Saving Time is currently in effect.

Authorities and Locks

None

Return Value

0 **ftime()** was successful.
-1 **ftime()** was not successful. The *errno* variable is set to indicate the error.

Error Conditions

If **ftime()** is not successful, *errno* usually indicates one of the following errors. Under some conditions, *errno* could indicate an error other than those listed here.

[EINVAL] An invalid parameter was found.

A parameter passed to this function is not valid.

[EFAULT] The address used for an argument is not correct.

In attempting to use an argument in a call, the system detected an address that is not valid.

While attempting to access a parameter passed to this function, the system detected an address that is not valid.

[EUNKNOWN] Unknown system state.

The operation failed because of an unknown system state. See any messages in the job log and correct any errors that are indicated, then retry the operation.

Error Messages

None.

Related Information

- The <**sys/timeb.h**> file (see "Header Files for UNIX-Type Functions" on page 16)
- "gettimeofday()—Get Current UTC Time" on page 5

Example

See Code disclaimer information for information pertaining to code examples.

The following example gets the current date and time:

```
#include <sys/timeb.h>
#include <stdio.h>
#include <errno.h>

int main(int argc, char *argv[])
{
    struct timeb now;
    int rc;

    rc=ftime(&now);
    if(rc==0) {
        printf("ftime() successful.\n");
        printf("time = %u.%03u, "
               "timezone = %d, "
               "dstflag = %d\n",
                now.time, now.millitm,
                now.timezone,
                now.dstflag );
    }
    else {
        printf("ftime() failed, errno = %d\n",
                errno);
        return -1;
    }

    return 0;
}
```

Example Output:

```
ftime() successful.
time = 1019833362.226 timezone = 360, dstflag = 1
```

API introduced: V5R3

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---

gettimeofday()—Get Current UTC Time

Syntax

```
#include <sys/time.h>

int gettimeofday (struct timeval *tp,
                  struct timezone *tzp);
```

Service Program Name:QWCTZUTC
Default Public Authority: *USE
Threadsafe: Yes

The **gettimeofday()** function retrieves the current Coordinated Universal Time (UTC) and places it in the timeval structure pointed to by *tp*. If *tzp* is not NULL, the time zone information is returned in the time zone structure pointed to by *tzp*.

Parameters

tp (Output) A pointer to a timeval structure that contains the time in seconds and microseconds since 1 January 1970, 00:00:00 UTC (epoch-1970).

tzp (Output) A pointer to a time zone structure that contains the local time zone (measured in minutes west of Greenwich) and a flag that, if nonzero, indicates Daylight Saving Time applies locally during the appropriate part of the year.

Authorities and Locks

None

Return Value

0 **gettimeofday()** was successful.
-1 **gettimeofday()** was not successful. The *errno* variable is set to indicate the error.

Error Conditions

If **gettimeofday()** is not successful, *errno* usually indicates one of the following errors. Under some conditions, *errno* could indicate an error other than those listed here.

[EINVAL] An invalid parameter was found.

A parameter passed to this function is not valid.

[EFAULT] The address used for an argument is not correct.

In attempting to use an argument in a call, the system detected an address that is not valid.

While attempting to access a parameter passed to this function, the system detected an address that is not valid.

[EUNKNOWN] Unknown system state.

The operation failed because of an unknown system state. See any messages in the job log and correct any errors that are indicated, then retry the operation.

Error Messages

None.

Usage Notes

- For the best performance, specify NULL for the *tzp* parameter.

Related Information

- The <**sys/time.h**> file (see “Header Files for UNIX-Type Functions” on page 16)
- “adjtime()—Adjust System Clock” on page 1
- “ftime()—Get Date and Time” on page 4
- Qp0zCvtToMITime()—Convert Timeval Structure to _MI_ Time
- “settimeofday()—Set System Clock” on page 7

Example

See Code disclaimer information for information pertaining to code examples.

The following example gets the current UTC time:

```
#include <sys/time.h>
#include <stdio.h>
#include <errno.h>

int main(int argc, char *argv[])
{
    struct timeval now;
    int rc;

    rc=gettimeofday(&now, NULL);
    if(rc==0) {
        printf("gettimeofday() successful.\n");
        printf("time = %u.%06u\n",
                now.tv_sec, now.tv_usec);
    }
    else {
        printf("gettimeofday() failed, errno = %d\n",
                errno);
        return -1;
    }

    return 0;
}
```

Example Output:

```
gettimeofday() successful.
time = 866208142.290944
```

API introduced: V4R2

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---

settimeofday()—Set System Clock

Syntax

```
#include <sys/time.h>

int settimeofday (struct timeval *tp,
                  struct timezone *tzp);
```

Service Program Name: QWCTZUTC
Default Public Authority: *USE
Threadsafe: Yes

The **settimeofday()** function sets the system clock to the Coordinated Universal Time (UTC) contained in the timeval structure pointed to by *tp*. The *tzp* parameter is not used.

Parameters

tp (Input) A pointer to a timeval structure that contains the time in seconds and microseconds since 1 January 1970, 00:00:00 UTC (epoch-1970).

tzp This parameter is not used.

Authorities and Locks

Special Authority
*ALLOBJ

Return Value

0 **settimeofday()** was successful.
-1 **settimeofday()** was not successful. The *errno* variable is set to indicate the error.

Error Conditions

If **settimeofday()** is not successful, *errno* usually indicates one of the following errors. Under some conditions, *errno* could indicate an error other than those listed here.

[EACCES] Permission denied.

An attempt was made to access an object in a way forbidden by its object access permissions.

[EINVAL] An invalid parameter was found.

A parameter passed to this function is not valid.

[EFAULT] The address used for an argument is not correct.

In attempting to use an argument in a call, the system detected an address that is not valid.

While attempting to access a parameter passed to this function, the system detected an address that is not valid.

[EPERM] Operation not permitted.

You must have appropriate privileges or be the owner of the object or other resource to do the requested operation.

[EUNKNOWN] Unknown system state.

The operation failed because of an unknown system state. See any messages in the job log and correct any errors that are indicated, then retry the operation.

Error Messages

None.

Related Information

- The <**sys/time.h**> file (see "Header Files for UNIX-Type Functions" on page 16)
- "adjtime()—Adjust System Clock" on page 1
- "gettimeofday()—Get Current UTC Time" on page 5

Example

See Code disclaimer information for information pertaining to code examples.

The following example sets the system clock:

```
#include <sys/time.h>
#include <stdio.h>
#include <errno.h>

int main(int argc, char *argv[])
{
    struct timeval now;
```

```
    int rc;

    now.tv_sec=866208142;
    now.tv_usec=290944;

    rc=settimeofday(&now, NULL);
    if(rc==0) {
        printf("settimeofday() successful.\n");
    }
    else {
        printf("settimeofday() failed, "
        "errno = %d\n",errno);
        return -1;
    }

    return 0;
}
```

Example Output:

```
settimeofday() successful.
```

API introduced: V4R2

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Software Clock APIs

The Software Clock APIs are:

- "Qp0zAdjTime()—Adjust Software Clock" on page 10 (Adjust Software Clock) makes small adjustments to the software clock, either slowing it down or speeding it up by the time specified in the delta parameter.
- "Qp0zGetTimeofDay()—Get Current Software Clock Time" on page 12 (Get Current Software Clock Time) retrieves the current software clock time and places it in the timeval structure pointed to by tp.
- "Qp0zSetTimeofDay()—Set Software Clock" on page 14 (Set Software Clock) sets the software clock to the time contained in the timeval structure pointed to by tp.

Note: These functions use header (include) files from the library QSYSINC, which is optionally installable. Make sure QSYSINC is installed on your system before using any of the functions. See "Header Files for UNIX-Type Functions" on page 16 for the file and member name of each header file.

The Software Clock is a system facility that determines the current Universal Coordinated Time (UTC) in seconds and microseconds since 1 January 1970, 00:00:00 (epoch-1970). The current time is determined by keeping an internal 'time-delta', which is an offset from the system clock. When **Qp0zGetTimeofDay()** is called to retrieve the software clock time, the time returned is calculated by taking the current system time, subtracting the QUTCOFFSET system value, then adding the internal time-delta.

The **Qp0zSettTmeofDay()** API sets or changes the time-delta, without affecting the system clock or the QUTCOFFSET system value. The **Qp0zAdjtime()** API slowly changes the time-delta, without affecting the system clock either. Adjustments are made at a rate of approximately 1 second of adjustment for every 100 seconds of elapsed time.

System components do not base their timestamps on the software clock, but use the system clock instead. The software clock will be removed in a future release and its use is discouraged.

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Qp0zAdjTime()—Adjust Software Clock

Syntax

```
#include <sys/time.h>

int Qp0zAdjTime (struct timeval *delta,
                 struct timeval *olddelta);
```

Service Program Name: QP0ZSETC
Default Public Authority: *USE
Threadsafe: Yes

The **Qp0zAdjTime()** function makes small adjustments to the software clock, either slowing it down or speeding it up by the time specified in the *delta* parameter. If *delta* is negative, the clock is slowed down by incrementing it more slowly than normal until the correction is complete. If *delta* is positive, the clock is sped up by incrementing it more quickly than normal until the correction is complete. If *olddelta* is not NULL, the amount of time still to be corrected from a previous **Qp0zAdjTime()** call is returned in the structure it points to.

The software clock maintains a time that can be set independently of the system clock. It is not integrated with the system and will be removed in a future release. The "adjtime()—Adjust System Clock" on page 1 function should be used instead.

Parameters

delta (Input) A pointer to a timeval structure that contains the amount of time for adjusting the software clock.

olddelta
(Output) A pointer to a timeval structure that contains the amount of time still to be corrected from a previous call to **Qp0zAdjTime()**

Authorities and Locks

QSYS/QP0ZXCPA Service Program Authority
*USE

Return Value

0 **Qp0zAdjTime()** was successful. The requested adjustment was initiated and the value returned in the structure pointed to by the *olddelta* parameter is the amount of time still to be corrected from a previous **Qp0zAdjTime()**.

-1 **Qp0zAdjTime()** was not successful. The *errno* variable is set to indicate the error.

Error Conditions

If **Qp0zAdjTime()** is not successful, *errno* usually indicates one of the following errors. Under some conditions, *errno* could indicate an error other than those listed here.

[EINVAL] An invalid parameter was found.

A parameter passed to this function is not valid.

[EFAULT] The address used for an argument is not correct.

In attempting to use an argument in a call, the system detected an address that is not valid.

While attempting to access a parameter passed to this function, the system detected an address that is not valid.

[EPERM] Operation not permitted.

You must have appropriate privileges or be the owner of the object or other resource to do the requested operation.

[EUNKNOWN] Unknown system state.

The operation failed because of an unknown system state. See any messages in the job log and correct any errors that are indicated, then retry the operation.

Error Messages

None.

Usage Notes

If the value of the environment variable QIBM_USE_SFWCLK is "N", **Qp0zAdjTime()** calls **adjtime()** to adjust the system clock.

Related Information

- The <**sys/time.h**> file (see "Header Files for UNIX-Type Functions" on page 16)
- "adjtime()—Adjust System Clock" on page 1
- "Qp0zGetTimeofDay()—Get Current Software Clock Time" on page 12
- "Qp0zSetTimeofDay()—Set Software Clock" on page 14

Example

See Code disclaimer information for information pertaining to code examples.

The following example initiates a software clock adjustment:

```
#include <sys/time.h>
#include <stdio.h>
#include <errno.h>

int main(int argc, char *argv[])
{
    struct timeval adj, old;
    int rc;

    /* Speed up the software clock by 1.5 seconds. */
    adj.tv_sec=1;
    adj.tv_usec=500000;

    rc=Qp0zAdjTime(&adj, &old);
    if(rc==0) {
        printf("Qp0zAdjTime() successful. "
               "Olddelta = %u.%06u\n",
                old.tv_sec, old.tv_usec);
    }
    else {
        printf("Qp0zAdjTime() failed, errno = %d\n",errno);
        return -1;
```

```
    }

    return 0;
}
```

Example Output:

```
Qp0zAdjTime() successful. Olddelta = 0.000000
```

API introduced: V5R3

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Qp0zGetTimeofDay()—Get Current Software Clock Time

Syntax

```
#include <sys/time.h>

int Qp0zGetTimeofDay (struct timeval *tp,
                      struct timezone *tzp);
```

Service Program Name: QP0ZCPA
Default Public Authority: *USE
Threadsafe: Yes

The **Qp0zGetTimeofDay()** function retrieves the current software clock time and places it in the timeval structure pointed to by *tp*. If *tzp* is not NULL, the time zone information is returned in the timezone structure pointed to by *tzp*.

The software clock maintains a time that can be set independently of the system clock. It is not integrated with the system and will be removed in a future release. The "gettimeofday()—Get Current UTC Time" on page 5 function should be used instead.

Parameters

tp (Output) A pointer to a timeval structure that contains the time in seconds and microseconds since 1 January 1970, 00:00:00 UTC (epoch-1970).

tzp (Output) A pointer to a timezone structure that contains the local time zone (measured in minutes west of Greenwich) and a flag that, if nonzero, indicates daylight saving time applies locally during the appropriate part of the year.

Authorities and Locks

None

Return Value

0 **Qp0zGetTimeofDay()** was successful.
-1 **Qp0zGetTimeofDay()** was not successful. The *errno* variable is set to indicate the error.

Error Conditions

If **Qp0zGetTimeofDay()** is not successful, *errno* usually indicates one of the following errors. Under some conditions, *errno* could indicate an error other than those listed here.

[EINVAL] An invalid parameter was found.

A parameter passed to this function is not valid.

[EFAULT] The address used for an argument is not correct.

In attempting to use an argument in a call, the system detected an address that is not valid.

While attempting to access a parameter passed to this function, the system detected an address that is not valid.

Error Messages

None.

Usage Notes

- For the best performance, specify NULL for the *tzp* parameter.
- If the value of the environment variable QIBM_USE_SFWCLK is "N", **Qp0zGetTimeofDay()** calls **gettimeofday()** to get the current UTC time from the system clock.

Related Information

- The <**sys/time.h**> file (see "Header Files for UNIX-Type Functions" on page 16)
- "gettimeofday()—Get Current UTC Time" on page 5
- "Qp0zAdjTime()—Adjust Software Clock" on page 10
- "Qp0zSetTimeofDay()—Set Software Clock" on page 14

Example

See Code disclaimer information for information pertaining to code examples.

The following example gets the current software clock time:

```
#include <sys/time.h>
#include <stdio.h>
#include <errno.h>

int main(int argc, char *argv[])
{
    struct timeval now;
    int rc;

    rc=Qp0zGetTimeofDay(&now, NULL);
    if(rc==0) {
        printf("Qp0zGetTimeofDay() successful.\n");
        printf("time = %u.%06u\n",
                now.tv_sec, now.tv_usec);
    }
    else {
        printf("Qp0zGetTimeofDay() failed, errno = %d\n",
                errno);
        return -1;
    }

    return 0;
}
```

Example Output:

```
Qp0zGetTimeofDay() successful.
time = 866208142.290944
```

API introduced: V5R3

Qp0zSetTimeofDay()—Set Software Clock

Syntax

```
#include <sys/time.h>

int Qp0zSetTimeofDay (struct timeval *tp,
                      struct timezone *tzp);
```

Service Program Name: QP0ZSETC
Default Public Authority: *USE
Threadsafe: Yes

The **Qp0zSetTimeofDay()** function sets the software clock to the time contained in the timeval structure pointed to by *tp*. If *tzp* is not NULL, the time zone information is also set.

The software clock maintains a time that can be set independently of the system clock. It is not integrated with the system and will be removed in a future release. The “settimeofday()—Set System Clock” on page 7 function should be used instead.

Parameters

tp (Input) A pointer to a timeval structure that contains the time in seconds and microseconds since 1 January 1970, 00:00:00 UTC (epoch-1970).

tzp (Input) A pointer to a timezone structure that contains the local time zone (measured in minutes west of Greenwich) and a flag that, if nonzero, indicates daylight saving time applies locally during the appropriate part of the year.

Authorities and Locks

QSYS/QP0ZXCPA Service Program Authority
*USE

Return Value

0 **Qp0zSetTimeofDay()** was successful.
-1 **Qp0zSetTimeofDay()** was not successful. The *errno* variable is set to indicate the error.

Error Conditions

If **Qp0zSetTimeofDay()** is not successful, *errno* usually indicates one of the following errors. Under some conditions, *errno* could indicate an error other than those listed here.

[EINVAL] An invalid parameter was found.

A parameter passed to this function is not valid.

[EFAULT] The address used for an argument is not correct.

In attempting to use an argument in a call, the system detected an address that is not valid.

While attempting to access a parameter passed to this function, the system detected an address that is not valid.

[EPERM] Operation not permitted.

You must have appropriate privileges or be the owner of the object or other resource to do the requested operation.

[EUNKNOWN] Unknown system state.

The operation failed because of an unknown system state. See any messages in the job log and correct any errors that are indicated, then retry the operation.

Error Messages

None.

Usage Notes

If the value of the environment variable QIBM_USE_SFWCLK is "N", **Qp0zSetTimeofDay()** calls **settimeofday()** to adjust the system clock.

Related Information

- The <**sys/time.h**> file (see "Header Files for UNIX-Type Functions" on page 16)
- "settimeofday()—Set System Clock" on page 7
- "Qp0zAdjTime()—Adjust Software Clock" on page 10
- "Qp0zGetTimeofDay()—Get Current Software Clock Time" on page 12

Example

See Code disclaimer information for information pertaining to code examples.

The following example sets the software clock:

```
#include <sys/time.h>
#include <stdio.h>
#include <errno.h>

int main(int argc, char *argv[])
{
    struct timeval now;
    int rc;

    time.tv_sec=866208142;
    time.tv_usec=290944;

    rc=Qp0zSetTimeofDay(&now, NULL);
    if(rc==0) {
        printf("Qp0zSetTimeofDay() successful.\n");
    }
    else {
        printf("Qp0zSetTimeofDay() failed, "
        "errno = %d\n",errno);
        return -1;
    }

    return 0;
}
```

Example Output

```
Qp0zSetTimeofDay() successful.
```

API introduced: V5R3

Concepts

These are the concepts for this category.

Header Files for UNIX-Type Functions

Programs using the UNIX(R)-type functions must include one or more header files that contain information needed by the functions, such as:

- Macro definitions
- Data type definitions
- Structure definitions
- Function prototypes

The header files are provided in the QSYSINC library, which is optionally installable. Make sure QSYSINC is on your system before compiling programs that use these header files. For information on installing the QSYSINC library, see Include files and the QSYSINC Library.

The table below shows the file and member name in the QSYSINC library for each header file used by the UNIX-type APIs in this publication.

Name of Header File	Name of File in QSYSINC	Name of Member
arpa/inet.h	ARPA	INET
arpa/nameser.h	ARPA	NAMESER
bse.h	H	BSE
bsedos.h	H	BSEDOS
bseerr.h	H	BSEERR
dirent.h	H	DIRENT
errno.h	H	ERRNO
fcntl.h	H	FCNTL
grp.h	H	GRP
inttypes.h	H	INTTYPES
limits.h	H	LIMITS
mman.h	H	MMAN
netdbh.h	H	NETDB
netinet/icmp6.h	NETINET	ICMP6
net/if.h	NET	IF
netinet/in.h	NETINET	IN
netinet/ip_icmp.h	NETINET	IP_ICMP
netinet/ip.h	NETINET	IP
netinet/ip6.h	NETINET	IP6
netinet/tcp.h	NETINET	TCP
netinet/udp.h	NETINET	UDP
netns/idp.h	NETNS	IDP

Name of Header File	Name of File in QSYSINC	Name of Member
netns/ipx.h	NETNS	IPX
netns/ns.h	NETNS	NS
netns/sp.h	NETNS	SP
net/route.h	NET	ROUTE
nettel/tel.h	NETTEL	TEL
os2.h	H	OS2
os2def.h	H	OS2DEF
pwd.h	H	PWD
Qlg.h	H	QLG
qp0lchsg.h	H	QP0LCHSG
qp0lflop.h	H	QP0LFLOP
qp0ljrnl.h	H	QP0LJRNL
qp0lror.h	H	QP0LROR
qp0lrro.h	H	QP0LRRO
qp0lrtsg.h	H	QP0LRTSG
qp0lscan.h	H	QP0LSCAN
Qp0lstdi.h	H	QP0LSTDI
qp0wpid.h	H	QP0WPID
qp0zdipc.h	H	QP0ZDIPC
qp0zipc.h	H	QP0ZIPC
qp0zolip.h	H	QP0ZOLIP
qp0zolsm.h	H	QP0ZOLSM
qp0zripc.h	H	QP0ZRIPC
qp0ztrc.h	H	QP0ZTRC
qp0ztrml.h	H	QP0ZTRML
qp0z1170.h	H	QP0Z1170
qsoasync.h	H	QSOASYNC
qtnxaapi.h	H	QTNXAAPI
qtnxadtp.h	H	QTNXADTP
qtomeapi.h	H	QTOMEAPI
qtossapi.h	H	QTOSSAPI
resolv.h	H	RESOLVE
semaphore.h	H	SEMAPHORE
signal.h	H	SIGNAL
spawn.h	H	SPAWN
ssl.h	H	SSL
sys/errno.h	H	ERRNO
sys/ioctl.h	SYS	IOCTL
sys/ipc.h	SYS	IPC
sys/layout.h	H	LAYOUT
sys/limits.h	H	LIMITS

Name of Header File	Name of File in QSYSINC	Name of Member
sys/msg.h	SYS	MSG
sys/param.h	SYS	PARAM
sys/resource.h	SYS	RESOURCE
sys/sem.h	SYS	SEM
sys/setjmp.h	SYS	SETJMP
sys/shm.h	SYS	SHM
sys/signal.h	SYS	SIGNAL
sys/socket.h	SYS	SOCKET
sys/stat.h	SYS	STAT
sys/statvfs.h	SYS	STATVFS
sys/time.h	SYS	TIME
sys/types.h	SYS	TYPES
sys/uio.h	SYS	UIO
sys/un.h	SYS	UN
sys/wait.h	SYS	WAIT
ulimit.h	H	ULIMIT
unistd.h	H	UNISTD
utime.h	H	UTIME

You can display a header file in QSYSINC by using one of the following methods:

- Using your editor. For example, to display the **unistd.h** header file using the Source Entry Utility editor, enter the following command:

  ```
  STRSEU SRCFILE(QSYSINC/H) SRCMBR(UNISTD) OPTION(5)
  ```

- Using the Display Physical File Member command. For example, to display the **sys/stat.h** header file, enter the following command:

  ```
  DSPPFM FILE(QSYSINC/SYS) MBR(STAT)
  ```

You can print a header file in QSYSINC by using one of the following methods:

- Using your editor. For example, to print the **unistd.h** header file using the Source Entry Utility editor, enter the following command:

  ```
  STRSEU SRCFILE(QSYSINC/H) SRCMBR(UNISTD) OPTION(6)
  ```

- Using the Copy File command. For example, to print the **sys/stat.h** header file, enter the following command:

  ```
  CPYF FROMFILE(QSYSINC/SYS) TOFILE(*PRINT) FROMMBR(STAT)
  ```

Symbolic links to these header files are also provided in directory /QIBM/include.

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Errno Values for UNIX-Type Functions

Programs using the UNIX(R)-type functions may receive error information as *errno* values. The possible values returned are listed here in ascending *errno* value sequence.

Name	Value	Text	Details
EDOM	3001	A domain error occurred in a math function.	
ERANGE	3002	A range error occurred.	
ETRUNC	3003	Data was truncated on an input, output, or update operation.	
ENOTOPEN	3004	File is not open.	You attempted to do an operation that required the file to be open.
ENOTREAD	3005	File is not opened for read operations.	You tried to read a file that is not open for read operations.
EIO	3006	Input/output error.	» A physical I/O error occurred or a referenced object was damaged. «
ENODEV	3007	No such device.	
ERECIO	3008	Cannot get single character for files opened for record I/O.	The file that was specified is open for record I/O and you attempted to read it as a stream file.
ENOTWRITE	3009	File is not opened for write operations.	You tried to update a file that has not been opened for write operations.
ESTDIN	3010	The stdin stream cannot be opened.	
ESTDOUT	3011	The stdout stream cannot be opened.	
ESTDERR	3012	The stderr stream cannot be opened.	
EBADSEEK	3013	The positioning parameter in fseek is not correct.	
EBADNAME	3014	The object name specified is not correct.	
EBADMODE	3015	The type variable specified on the open function is not correct.	The mode that you attempted to open the file in is not correct.
EBADPOS	3017	The position specifier is not correct.	
ENOPOS	3018	There is no record at the specified position.	You attempted to position to a record that does not exist in the file.
ENUMMBRS	3019	Attempted to use ftell on multiple members.	Remove all but one member from the file.
ENUMRECS	3020	The current record position is too long for ftell.	
EINVAL	3021	The value specified for the argument is not correct.	A function was passed incorrect argument values, or an operation was attempted on an object and the operation specified is not supported for that type of object.
EBADFUNC	3022	Function parameter in the signal function is not set.	
ENOENT	3025	No such path or directory.	The directory or a component of the path name specified does not exist.
ENOREC	3026	Record is not found.	
EPERM	3027	The operation is not permitted.	You must have appropriate privileges or be the owner of the object or other resource to do the requested operation.
EBADDATA	3028	Message data is not valid.	The message data that was specified for the error text is not correct.

Name	Value	Text	Details
EBUSY	3029	Resource busy.	An attempt was made to use a system resource that is not available at this time.
EBADOPT	3040	Option specified is not valid.	
ENOTUPD	3041	File is not opened for update operations.	
ENOTDLT	3042	File is not opened for delete operations.	
EPAD	3043	The number of characters written is shorter than the expected record length.	The length of the record is longer than the buffer size that was specified. The data written was padded to the length of the record.
EBADKEYLN	3044	A length that was not valid was specified for the key.	You attempted a record I/O against a keyed file. The key length that was specified is not correct.
EPUTANDGET	3080	A read operation should not immediately follow a write operation.	
EGETANDPUT	3081	A write operation should not immediately follow a read operation.	
EIOERROR	3101	A nonrecoverable I/O error occurred.	
EIORECERR	3102	A recoverable I/O error occurred.	
EACCES	3401	Permission denied.	An attempt was made to access an object in a way forbidden by its object access permissions.
ENOTDIR	3403	Not a directory.	A component of the specified path name existed, but it was not a directory when a directory was expected.
ENOSPC	3404	No space is available.	The requested operations required additional space on the device and there is no space left. This could also be caused by exceeding the user profile storage limit when creating or transferring ownership of an object.
EXDEV	3405	Improper link.	A link to a file on another file system was attempted.
EAGAIN	3406	Operation would have caused the process to be suspended.	
EWOULDBLOCK	3406	Operation would have caused the process to be suspended.	
EINTR	3407	Interrupted function call.	
EFAULT	3408	The address used for an argument was not correct.	In attempting to use an argument in a call, the system detected an address that is not valid.
ETIME	3409	Operation timed out.	
ENXIO	3415	No such device or address.	
EAPAR	3418	Possible APAR condition or hardware failure.	
ERECURSE	3419	Recursive attempt rejected.	
EADDRINUSE	3420	Address already in use.	

Name	Value	Text	Details
EADDRNOTAVAIL	3421	Address is not available.	
EAFNOSUPPORT	3422	The type of socket is not supported in this protocol family.	
EALREADY	3423	Operation is already in progress.	
ECONNABORTED	3424	Connection ended abnormally.	
ECONNREFUSED	3425	A remote host refused an attempted connect operation.	
ECONNRESET	3426	A connection with a remote socket was reset by that socket.	
EDESTADDRREQ	3427	Operation requires destination address.	
EHOSTDOWN	3428	A remote host is not available.	
EHOSTUNREACH	3429	A route to the remote host is not available.	
EINPROGRESS	3430	Operation in progress.	
EISCONN	3431	A connection has already been established.	
EMSGSIZE	3432	Message size is out of range.	
ENETDOWN	3433	The network currently is not available.	
ENETRESET	3434	A socket is connected to a host that is no longer available.	
ENETUNREACH	3435	Cannot reach the destination network.	
ENOBUFS	3436	There is not enough buffer space for the requested operation.	
ENOPROTOOPT	3437	The protocol does not support the specified option.	
ENOTCONN	3438	Requested operation requires a connection.	
ENOTSOCK	3439	The specified descriptor does not reference a socket.	
ENOTSUP	3440	Operation is not supported.	The operation, though supported in general, is not supported for the requested object or the requested arguments.
EOPNOTSUPP	3440	Operation is not supported.	The operation, though supported in general, is not supported for the requested object or the requested arguments.
EPFNOSUPPORT	3441	The socket protocol family is not supported.	
EPROTONOSUPPORT	3442	No protocol of the specified type and domain exists.	
EPROTOTYPE	3443	The socket type or protocols are not compatible.	
ERCVDERR	3444	An error indication was sent by the peer program.	

Name	Value	Text	Details
ESHUTDOWN	3445	Cannot send data after a shutdown.	
ESOCKTNOSUPPORT	3446	The specified socket type is not supported.	
ETIMEDOUT	3447	A remote host did not respond within the timeout period.	
EUNATCH	3448	The protocol required to support the specified address family is not available at this time.	
EBADF	3450	Descriptor is not valid.	A file descriptor argument was out of range, referred to a file that was not open, or a read or write request was made to a file that is not open for that operation.
EMFILE	3452	Too many open files for this process.	An attempt was made to open more files than allowed by the value of OPEN_MAX. The value of OPEN_MAX can be retrieved using the sysconf() function.
ENFILE	3453	Too many open files in the system.	A system limit has been reached for the number of files that are allowed to be concurrently open in the system.
EPIPE	3455	Broken pipe.	
ECANCEL	3456	Operation cancelled.	
EEXIST	3457	Object exists.	The object specified already exists and the specified operation requires that it not exist.
EDEADLK	3459	Resource deadlock avoided.	An attempt was made to lock a system resource that would have resulted in a deadlock situation. The lock was not obtained.
ENOMEM	3460	Storage allocation request failed.	A function needed to allocate storage, but no storage is available.
EOWNERTERM	3462	The synchronization object no longer exists because the owner is no longer running.	The process that had locked the mutex is no longer running, so the mutex was deleted.
EDESTROYED	3463	The synchronization object was destroyed, or the object no longer exists.	
ETERM	3464	Operation was terminated.	
ENOENT1	3465	No such file or directory.	A component of a specified path name did not exist, or the path name was an empty string.
ENOEQFLOG	3466	Object is already linked to a dead directory.	The link as a dead option was specified, but the object is already marked as dead. Only one dead link is allowed for an object.
EEMPTYDIR	3467	Directory is empty.	A directory with entries of only dot and dot-dot was supplied when a nonempty directory was expected.

Name	Value	Text	Details
EMLINK	3468	Maximum link count for a file was exceeded.	An attempt was made to have the link count of a single file exceed LINK_MAX. The value of LINK_MAX can be determined using the pathconf() or the fpathconf() function.
ESPIPE	3469	Seek request is not supported for object.	A seek request was specified for an object that does not support seeking.
ENOSYS	3470	Function not implemented.	An attempt was made to use a function that is not available in this implementation for any object or any arguments.
EISDIR	3471	Specified target is a directory.	The path specified named a directory where a file or object name was expected.
EROFS	3472	Read-only file system.	You have attempted an update operation in a file system that only supports read operations.
EUNKNOWN	3474	Unknown system state.	The operation failed because of an unknown system state. See any messages in the job log and correct any errors that are indicated, then retry the operation.
EITERBAD	3475	Iterator is not valid.	
EITERSTE	3476	Iterator is in wrong state for operation.	
EHRICLSBAD	3477	HRI class is not valid.	
EHRICLBAD	3478	HRI subclass is not valid.	
EHRITYPBAD	3479	HRI type is not valid.	
ENOTAPPL	3480	Data requested is not applicable.	
EHRIREQTYP	3481	HRI request type is not valid.	
EHRINAMEBAD	3482	HRI resource name is not valid.	
EDAMAGE	3484	A damaged object was encountered.	
ELOOP	3485	A loop exists in the symbolic links.	This error is issued if the number of symbolic links encountered is more than POSIX_SYMLOOP (defined in the limits.h header file). Symbolic links are encountered during resolution of the directory or path name.
ENAMETOOLONG	3486	A path name is too long.	A path name is longer than PATH_MAX characters or some component of the name is longer than NAME_MAX characters while _POSIX_NO_TRUNC is in effect. For symbolic links, the length of the name string substituted for a symbolic link exceeds PATH_MAX. The PATH_MAX and NAME_MAX values can be determined using the **pathconf()** function.
ENOLCK	3487	No locks are available.	A system-imposed limit on the number of simultaneous file and record locks was reached, and no more were available at that time.

Name	Value	Text	Details
ENOTEMPTY	3488	Directory is not empty.	You tried to remove a directory that is not empty. A directory cannot contain objects when it is being removed.
ENOSYSRSC	3489	System resources are not available.	
ECONVERT	3490	Conversion error.	One or more characters could not be converted from the source CCSID to the target CCSID.
E2BIG	3491	Argument list is too long.	
EILSEQ	3492	Conversion stopped due to input character that does not belong to the input codeset.	
ETYPE	3493	Object type mismatch.	The type of the object referenced by a descriptor does not match the type specified on the interface.
EBADDIR	3494	Attempted to reference a directory that was not found or was destroyed.	
EBADOBJ	3495	Attempted to reference an object that was not found, was destroyed, or was damaged.	
EIDXINVAL	3496	Data space index used as a directory is not valid.	
ESOFTDAMAGE	3497	Object has soft damage.	
ENOTENROLL	3498	User is not enrolled in system distribution directory.	You attempted to use a function that requires you to be enrolled in the system distribution directory and you are not.
EOFFLINE	3499	Object is suspended.	You have attempted to use an object that has had its data saved and the storage associated with it freed. An attempt to retrieve the object's data failed. The object's data cannot be used until it is successfully restored. The object's data was saved and freed either by saving the object with the STG(*FREE) parameter, or by calling an API.
EROOBJ	3500	Object is read-only.	You have attempted to update an object that can be read only.
EEAHDDSI	3501	Hard damage on extended attribute data space index.	
EEASDDSI	3502	Soft damage on extended attribute data space index.	
EEAHDDS	3503	Hard damage on extended attribute data space.	
EEASDDS	3504	Soft damage on extended attribute data space.	
EEADUPRC	3505	Duplicate extended attribute record.	
ELOCKED	3506	Area being read from or written to is locked.	The read or write of an area conflicts with a lock held by another process.
EFBIG	3507	Object too large.	The size of the object would exceed the system allowed maximum size.

Name	Value	Text	Details
EIDRM	3509	The semaphore, shared memory, or message queue identifier is removed from the system.	
ENOMSG	3510	The queue does not contain a message of the desired type and (msgflg logically ANDed with IPC_NOWAIT).	
EFILECVT	3511	File ID conversion of a directory failed.	» To recover from this error, run the Reclaim Storage (RCLSTG) command as soon as possible. «
EBADFID	3512	A file ID could not be assigned when linking an object to a directory.	The file ID table is missing or damaged. » To recover from this error, run the Reclaim Storage (RCLSTG) command as soon as possible. «
ESTALE	3513	File or object handle rejected by server.	
ESRCH	3515	No such process.	
ENOTSIGINIT	3516	Process is not enabled for signals.	An attempt was made to call a signal function under one of the following conditions: • The signal function is being called for a process that is not enabled for asynchronous signals. • The signal function is being called when the system signal controls have not been initialized.
ECHILD	3517	No child process.	
EBADH	3520	Handle is not valid.	
ETOOMANYREFS	3523	The operation would have exceeded the maximum number of references allowed for a descriptor.	
ENOTSAFE	3524	Function is not allowed.	Function is not allowed in a job that is running with multiple threads.
EOVERFLOW	3525	Object is too large to process.	The object's data size exceeds the limit allowed by this function.
EJRNDAMAGE	3526	Journal is damaged.	A journal or all of the journal's attached journal receivers are damaged, or the journal sequence number has exceeded the maximum value allowed. This error occurs during operations that were attempting to send an entry to the journal.
EJRNINACTIVE	3527	Journal is inactive.	The journaling state for the journal is *INACTIVE. This error occurs during operations that were attempting to send an entry to the journal.

Name	Value	Text	Details
EJRNRCVSPC	3528	Journal space or system storage error.	The attached journal receiver does not have space for the entry because the storage limit has been exceeded for the system, the object, the user profile, or the group profile. This error occurs during operations that were attempting to send an entry to the journal.
EJRNRMT	3529	Journal is remote.	The journal is a remote journal. Journal entries cannot be sent to a remote journal. This error occurs during operations that were attempting to send an entry to the journal.
ENEWJRNRCV	3530	New journal receiver is needed.	A new journal receiver must be attached to the journal before entries can be journaled. This error occurs during operations that were attempting to send an entry to the journal.
ENEWJRN	3531	New journal is needed.	The journal was not completely created, or an attempt to delete it did not complete successfully. This error occurs during operations that were attempting to start or end journaling, or were attempting to send an entry to the journal.
EJOURNALED	3532	Object already journaled.	A start journaling operation was attempted on an object that is already being journaled.
EJRNENTTOOLONG	3533	Entry is too large to send.	The journal entry generated by this operation is too large to send to the journal.
EDATALINK	3534	Object is a datalink object.	
ENOTAVAIL	3535	Independent Auxiliary Storage Pool (ASP) is not available.	The independent ASP is in Vary Configuration (VRYCFG) or Reclaim Storage (RCLSTG) processing. To recover from this error, wait until processing has completed for the independent ASP.
ENOTTY	3536	I/O control operation is not appropriate.	
EFBIG2	3540	Attempt to write or truncate file past its sort file size limit.	
ETXTBSY	3543	Text file busy.	» An attempt was made to execute an i5/OS PASE program that is currently open for writing, or an attempt has been made to open for writing an i5/OS PASE program that is being executed. «
EASPGRPNOTSET	3544	ASP group not set for thread.	
ERESTART	3545	A system call was interrupted and may be restarted.	
ESCANFAILURE	3546	Object had scan failure.	An object has been marked as a scan failure due to processing by an exit program associated with the scan-related integrated file system exit points.

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