Honeywell

Experion PKS
Application Development Guide

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Honeywell holds technical training classes on Experion PKS. These classes are taught by experts in the field of process control systems. For more information about these classes, contact your Honeywell representative, or see `http://www.automationcollege.com`.

Related documentation

For a complete list of publications and documents for Experion PKS, see the *Experion PKS Overview*.

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This guide describes how to write applications for Experion PKS, Release 210.

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This section describes how to write applications for Experion PKS using the API.

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Prerequisites

Before writing applications for Experion PKS, you need to:

- Install Experion PKS and third-party software as described in the *Installation Guide*.
- Be familiar with user access and file management as described in the *Configuration Guide*.

Prerequisite skills

This guide assumes that you are an experienced programmer with a good understanding of either C or C++.

It also assumes that you are familiar with the Microsoft Windows development environment and know how to edit, compile and link applications.

About the development environment

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If development is to be conducted on a target system, consideration must be given to the potential impact on the systems performance during the development.

Use of these facilities requires a high level of expertise in the development tools, including C compiler, C++ compiler, linker, make files and batch files.

Folder structures

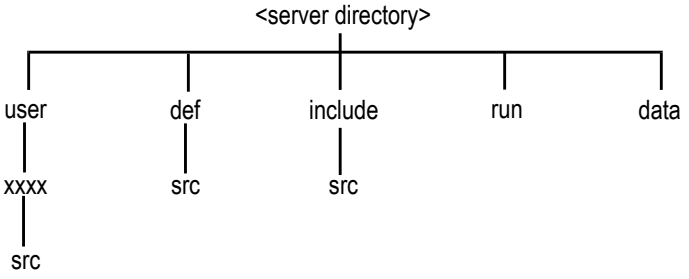
The structure shown below should be used for development of applications which will run on the server.

The `user\`*`xxxx`*`\src` folder contains all source code files and make files for a particular application. *`xxxx`* should be representative of the function of the application.

The `include` and `include\src` folders contain global server definitions, such as system constants or data arrays in the form of C/C++ include files.

The `run` folder contains all server programs (including applications). This folder is included in the path of any server user.

The `data` folder contains all server database files.



Compiling, linking and editing

The supported compilers for developing applications are:

- C—Microsoft Visual C/C++ Version 6.0 SP5 and Version 7.1
- C++—Microsoft Visual C/C++ Version 6.0 SP5 and Version 7.1

For whichever language you use, the appropriate application should be installed and the environment variables set up.

When compiling C/C++ application programs you need to have the Microsoft Windows Platform SDK installed using the August 2001 version or later. The latest SDK is available from Microsoft at `http://www.microsoft.com/msdownload/platformsdk/sdkupdate/`.

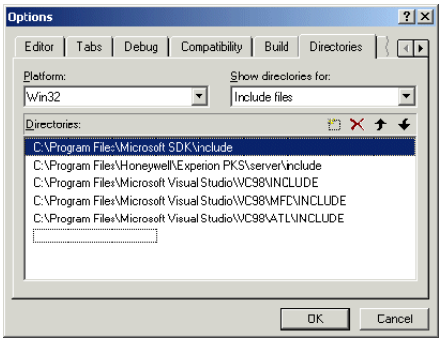
The SDK's include and lib directories need to be the first directories listed in the include and library paths.

Considerations

- Complete this procedure only if you have Microsoft Visual C/C++ Version 6.0 SP5.

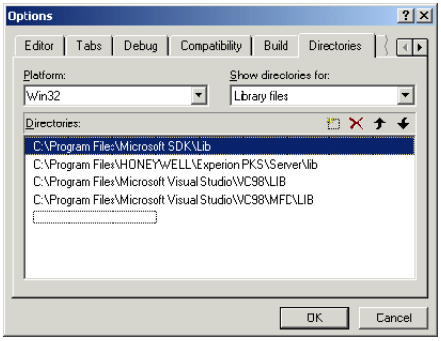
To modify the paths (after having installed the SDK):

1. In the Microsoft Visual Studio application window, choose **Tools > Options** to open the Options dialog box.
2. Click the **Directories** tab.
3. From **Show directories for**, select **Include files**.
4. Add `C:\Program Files\Microsoft SDK\include` as the first entry, as shown in the following figure.



5 From **Show directories for**, select **Library files**.

6 Add `C:\Program Files\Microsoft SDK\lib` as the first entry, as shown in the following figure.



7 Click **OK** to save your changes and close the dialog box.

Editing of source files can be achieved using any of the editors that come with Windows 2000 (for example, Notepad) or the programs listed above.

When creating source files, it is important to remember that they must be in the `src` folder, under your application folder. C source files have a ".c" suffix and C++ source files have a ".cpp" suffix.

In order for the applications to have access to the server database, the Windows account under which they run must belong to the `Honeywell Administrators` Windows group.

Using Microsoft Visual Studio

To use Microsoft Visual Studio to develop applications in C or C++, you first need to set up Visual Studio.

Setting up Microsoft Visual Studio

Setting up Microsoft Visual Studio involves:

- Modifying the `library` and `include` paths to include the Experion PKS folders.
- Creating a project workspace.
- Defining the project settings for Experion PKS application development.

Considerations

- If Experion PKS is not installed in `C:\Program Files\Honeywell\Experion PKS\server`, change the paths used in steps 4 and 6 to reflect where it is installed.

Setting up Microsoft Visual Studio Version 6 SP5

To modify the paths:

1. In the Microsoft Visual Studio application window, choose **Tools > Options** to display the Options dialog box.
2. Click the **Directories** tab.
3. From **Show directories for**, select **Include files**.
4. Add `C:\Program Files\Honeywell\Experion PKS\server\include` to the `include` file folders.
5. From **Show directories for**, select **Include files**.
6. Add `C:\Program Files\Honeywell\Experion PKS\server\lib` to the `library` file folders.
7. Click **OK** to save your changes and close the dialog.

To create a project workspace in Visual Studio version 6:

1. In the Microsoft Visual Studio application window, from the **File** > **New** menu, select the **Projects** tab.
2. Select the **Type** of project you are developing (**Win 32 Console Application**, **MFC AppWizard (exe)**, and so on).
3. Complete the project details and click **OK** to create the project and close the dialog box.

To define the project settings:

1. Choose **Project** > **Settings** to open the Project Settings dialog box.
2. Click the **C/C++** tab to display the C/C++ property sheet.

3. From the **Category** list, select **General**.
4. Add **NT** to the **Preprocessor Definitions**.
5. From the **Category** list, select **Code Generation**.
6. From the **Use run-time library** list, select **Multithreaded DLL**.

   For debugging, use **Debug Multithreaded DLL**. Use Multithreaded DLL only for release compiles. If you use the incorrect library for a debug compile, `errno` does not propagate correctly (it will be always zero).
7. Click the **Link** tab to display the Link property sheet.
8. From the **Category** list, select **General**.
9. In the **Object/library modules** field add **hscsrvapi.lib**.

   For debugging, use **hscsrvapid.lib**. Use library `hscsrvapi.lib` only for release compiles. If you use the incorrect library for a debug compile, `errno` does not propagate correctly (it will be always zero).
10. Ensure that the **Ignore all default libraries** check box is cleared.
11. If you are developing an MFC application and want to dynamically link to MFC:
    a. Click the **General** tab, and from the **Microsoft Foundation Classes** list select `Use MFC in a Shared Library`.
    b. Select `Input` from the **Category** list and ensure that `msvcrt` is *not* in the **Ignore Libraries** text box.
12. If you are developing an MFC application and want to statically link to MFC:
    a. Click the **General** tab, and from the **Microsoft Foundation Classes** list select `Use MFC in a Static Library`.
    b. Select `Input` from the **Category** list and add `msvcrt` to the **Ignore Libraries** text box.
13. Click **OK** to save your project settings and close the dialog box.

Setting up Microsoft Visual Studio Version 7.1

To modify the paths:

1. In the Microsoft Visual Studio application window, choose **Tools > Options** to display the Options dialog box.
2. In the tree view expand the **Projects** folder and click **VC++ Directories**.
3. From **Show directories for**, select **Include files**.
4. Add `C:\Program Files\Honeywell\Experion PKS\server\include` to the `include` file folders.

5 From **Show directories for**, select **Library files**.

6 Add `C:\Program Files\Honeywell\Experion PKS\server\lib` to the `library` file folders.

7 Click **OK** to save your changes and close the dialog.

To create a project workspace in Visual Studio .Net 2003:

1 In the Microsoft Visual Studio application window, from the **File** > **New** menu, select the **Projects** tab.

2 Select the **Type** of project you are developing (**Win 32 Console Application**, **MFC AppWizard (exe)**, and so on).

3 Complete the project details and click **OK** to create the project and close the dialog box.

To define the project settings:

1 Choose **Project** > ***Projectname*** **Properties** to open the Property Pages dialog box where *Projectname* is the name of your project.

2 In the tree view click the **C/C++** folder to display the C/C++ property sheet.

3 From the **C/C++** list, select **Preprocessor**.

4 Add **NT** to the **Preprocessor Definitions**.

5 From the **C/C++** list, select **Code Generation**.

6 From the **Runtime library** list, select **Multithreaded DLL**.

For debugging, use **Debug Multithreaded DLL**. Use Multithreaded DLL only for release compiles. If you use the incorrect library for a debug compile, `errno` does not propagate correctly (it will be always zero).

7 In the tree view click the **Linker** folder to display the Link property sheet.

8 From the **Linker** list, select **Input**.

9 In the **Additional Dependencies** box add **hscsrvapi.lib**.

For debugging, use **hscsrvapid.lib**. Use library `hscsrvapi.lib` only for release compiles. If you use the incorrect library for a debug compile, `errno` does not propagate correctly (it will be always zero).

10 Ensure that **Ignore all default libraries** is set to **No**.

11 If you are developing an MFC application and want to dynamically link to MFC:

a. In the tree view under Configuration Properties click **General**, and from the **Use of MFC** list select `Use MFC in a Shared Library`.

b. In the tree view, expand the **Linker** folder and click **Input**. Ensure that `msvcrt` is *not* in the **Ignore Libraries** box.

12 If you are developing an MFC application and want to statically link to MFC:

   a. In the tree view under Configuration Properties click **General**, and from the **Use of MFC** list select `Use MFC in a Static Library`.

   b. In the tree view, expand the **Linker** folder and click **Input**. Add `msvcrt` to the **Ignore Libraries** box.

13 Click **OK** to save your project settings and close the dialog box.

Compiling and linking C and C++ projects using Visual Studio

To compile and link your project in Microsoft Visual Studio, select **Build Build <project name>**.

Attention

This procedure will only work with C and C++ projects. After compiling and linking, all executable files should be copied to the run folder.

Error codes in the API

Error status information is returned from functions in the API using one of two different methods. The first method is used by most of the C functions in the server API. These functions return FALSE (0) if they were completely successful, otherwise they return TRUE (-1).

If TRUE (-1) is returned, **errno** will be set to the return status of the function. This value can be checked to see whether it indicates an error or a warning using the functions `hsc_IsError()` and `hsc_IsWarning()`. To safely retrieve the value of errno, call the function `c_geterrno()`. Any applications which use this function should include the `M4_err_def` file, that is, `#include "src\M4_err_def"`. The following example shows how to check the error status.

```
if (c_server_api_function(arg1, arg2) == -1)
{
    if (hsc_IsError(c_geterrno()))
    {
      // real error occurred
    }
    else
    {
      // only a warning has been issued
      // safe to ignore
    }
}
```

Debugging utilities and tasks

Before a utility or task can be debugged, it needs to be compiled and linked with debugging information.

To compile and link with debugging information for C/C++ applications using Visual Studio, select the Debug build as the active configuration. To do this, select **Build Configuration Manager** and then select the debug build.

To set up the debugging utilities:

1. Open the project using Visual Studio.
2. Open up the source files for the utility. In the case of a C/C++ program, the filenames will not have been altered.
3. Set break points as required in the source files.
4. Start the debugger (select **Debug Go**).

To set up the debugging tasks:

1. Run the server utility program DBG, passing it the LRN the task is using.
2. Complete the procedure described for debugging a utility.
3. Execute and ETR on the LRN. (For more information see “ETR” on page 122.)
4. Debug the program.

Attention

When using the **DBG** utility, make sure that no other application executes a gbload() before your application, otherwise it will be assigned the LRN you specified in step 1.

Disabling the default debugger (Dr Watson)

By default, every time the server starts it sets Dr Watson as the default debugger.

You can prevent the server doing this (which allows you to use another debugger such as Visual Studio) by updating the registry as follows: go to the registry key `HKEY_LOCAL_MACHINE\Software\Honeywell`, and create a string value called `EnableDebug`. (You do not have to specify a value.)

Multithreading restrictions

Windows 2000 supports multithreading. This is a form of multi-tasking which allows an application to multitask within itself. It is possible to write a multithreaded application that uses the application programming library but it is not recommended.

If there is a requirement for multithreading then the following should be observed:

- Call c_gbload before any threads are created.
- Keep all access to the application programming library serialized. This can be achieved in two ways. Keep all calls to the application programming library in one thread (for example, the main thread of the program) or encase any calls in a critical section. See the code fragment below for an example.

Example

```
// Main code segment
CRITICAL_SECTION serAPI;   /*critical section for
calling the Server APIs */
InitializeCriticalSection(&serAPI);
if (c_gbload())
{
    /* Could not attach to database */
    exit(-1);
}
... Create threads
... Execution continues on
//End of main code segment

// Thread code segment
EnterCriticalSection(&serAPI);
... Call to Experion PKS API
LeaveCriticalSection(&serAPI);
```

Implementing a server application

4

Application choices

Before you can implement an application you will need to make a choice on the programming language you will use and the type of application you are going to implement.

Programming languages

The Application Programming Library supports the development of C/C++ applications.

The language you choose to use will largely depend on your experience with these languages. Alternatively, it is possible to develop an OPC Client to access server data via the Experion PKS OPC Server. The client can be written in C or C/++.

Type of application

There are two types of application you can develop:

- **Utility**. A utility runs interactively from the command line using a command prompt window. (A command prompt is opened by choosing **Start** > **Programs > Accessories** > **Command Prompt**.)

  Utilities typically perform an administrative function or a function that is performed occasionally.

  A utility can prompt the user for more information and can display information directly to the user via the command prompt window.

  An example of a utility is an application to dump the contents of a database file to the command prompt window, for example FILDMP.

- **Task**. Tasks are usually dormant, waiting for a request to perform some form of function. When they are activated, they perform the function and then go back to sleep to wait for the next request to come along.

  An example of a task is an application that periodically fetches some point values, performs a calculation on the values and stores the result back in the database.

C/C++ application template

This section provides a generic C/C++ application template that can be used for any application you may develop. Again, it doesn't contain much functionality but it should give you an idea of the parts necessary for an application.

Definitions

A C/C++ application also needs to contain several include files that declare and define items used by the application programming library routines. These include files should be incorporated in the main source file as well as any function source files that make calls to the application programming library routines. The include files used by this template are:

Include file	Description
`defs.h`	Defines system constants and some useful macros.
`files`	Defines all the logical file numbers of the database.
`parameters`	Defines all the point parameters of a point.
`GBtrbtbl.h`	Defines the structure of one of the database files.

The include folder also contains many other `GB`*`xxxxxx`*`.h` include files that may be needed if you make calls to other application programming library routines.

```
#include <src\defs.h>
#include <files>
#include <parameters>
#include <src\GBtrbtbl.h>
char *progname=”myapp.c”;

main()
{
uint2 ierr;
char string[80];
struct prm prmblk;
```

Initialization

The first function you must call in any application is GBLOAD. This function makes the global common memory available to the application, allowing it to accesses the memory-resident part of the database. If this call fails you should terminate the program. This function should only be called once for the whole program.

```
if (ierr=c_gbload())
{
//The next line number is 137
c_logmsg(progname, "137", "Common Load Error %d\n", ierr);
c_deltsk(-1);
c_trmtsk(ierr);
}
```

Main body of a utility

This is where the majority of the work of the application is done. If your application requires arguments from the command line, you can call GETPAR to retrieve individual arguments. You may also use the `argv` and `argc` parameters if your utility has a C/C++ main function.

As the application is run interactively you may `printf` messages to the command prompt window and also `scanf` messages back from the command prompt window. A C++ application may use `std::cin` and `std::cout`.

After the application has completed its work you should call DELTSK and TRMTSK to mark the application for deletion and to terminate the application. It is your responsibility to close any files you may have opened in the application.

```
c_getpar(1,string,sizeof(string))
**** Perform some Function ****
printf("Results of Function\n");
c_deltsk(-1);
c_trmtsk(0);
}
```

Main body of a task

The main body of a task is slightly different in that it is usually all contained in an endless loop. After the task is started, it will remain in this loop until the system is shut down.

As the application is not run interactively, you cannot “scanf” responses from a command prompt window. You can use the `c_logmsg` function to write messages and information to the log file. The log file can be viewed by looking at the file `server\data\log.txt` with Notepad or the `tail` utility.

After the task enters the endless loop, it should call GETREQ to see if any other application has requested it to perform some function. The call to GETREQ will return a parameter block that provides information about who and why the task was requested. Based on this information, the task should perform the desired function, loop back up and check for the next request.

If no request is outstanding, the task should call TRM04 to cause it to go to sleep. This will cause the task to block (or hibernate) until the next request.

When the next request comes along, the task:

1. Returns from the TRM04 call.
2. Loops back up.
3. Gets the parameter block associated with the request.
4. Performs the function.
5. Continues.

```
while (1)
{
    if (c_getreq((int2 *) &prmblk))
    {
      if (errno != M4_EOF_ERR)
      {
        /* it is a real error so report and */
        /* handle it */
      }
      /* Now terminate and wait for the */
      /* next request */
      c_trm04(ZERO_STATUS);
    }
    else
    {
      /* Perform some function */
    }
}
```

The `c_getreq` function will return a FALSE (0) if there is has been a request. It will return the error M4_EOF_ERR (0x21f) if there are no requests pending. If any other error is returned, then this should be reported and optionally handled.

Data types

In the definitions section, you may have noticed the use of the C/C++ data type "`uint2`". This is one of several data types that are defined in the header file `defs.h`. This is necessary because different C and C++ compilers define the different sizes for: int, long, float, and double.

The following data types are used throughout the application programming library routines:

Data type	Description
int2	Equivalent to INTEGER*2
uint2	Unsigned version of int2
int4	Equivalent to INTEGER*4
uint4	Unsigned version of int4

They are defined in the header file `defs.h`.

The `defs.h` file also provides several macros which should be used whenever the user wishes to access int4, double or real database values, including user table values of these types. The available macros are:

Macro	Description
ldint4(int2_ptr)	Load an int4 value from the database (pointed to by int2_ptr).
stint4(int2_ptr, int4_val)	Store an int4 value in the database at the position pointed to by int2_ptr.
ldreal(int2_ptr)	Load a real value from the database.
streal(int2_ptr,real_val)	Store a real value in the database.
lddble(int2_ptr)	Load a double value from the database.
stdble(int2_ptr,dble_val)	Store a double value in the database.

These macros help to ensure that all types are properly assigned in C/C++ programs, to provide portability between different computer architectures.

One example of the use of such macros is provided below. This example shows how a C program would assign a floating point value to a variable, and also how a floating point value may be stored in the database.

```
#include <src\defs.h>
#include <src\GBsysflg.h>
.
float fval1;
float fval2;
```

```
.
.
.
/*load the seconds since midnight into the variable fval1 */
fval1 = ldreal(GBsysflg->syssec);
.
.
/* store the value of fval2 into the seconds since midnight */
streal (&GBsysflt->syssec, fval2);
.
.
.
```

The other macros mentioned above are used in a similar manner. For the definitions of these macros, consult the `defs.h` file.

Writing messages to the log file

When programming in C/C++ you should not use `printf`, `fprintf` calls or the `std::cout` or `std::cerr` streams to write messages to the log file. Instead the API routine `c_logmsg()` should be used.

It has the prototype:

```
void c_logmsg
(
  char*  progname,  //(in) name of program module
  char*  lineno,    //(in) line number in program module
  char*  format,    //(in) printf type format of message
  …
);
```

Instead of:

```
printf("Point ABSTAT001 PV out of normal range
      (%d)\n" abpv);
```

or

```
fprintf(stderr,"Point ABSTAT001 PV out of normal range
      (%d)\n",abpv);
```

or

```
std::cout <<"Point ABSTAT001 PV out of normal range"
          <<abpv <<std::endl;
```

Use:

```
c_logmsg ("abproc.c", "134",
           "Point ABSTAT001 PV out of normal range
         (%d)",abpv);
```

Attention

`c_logmsg` handles all carriage control. There is no need to put line feed characters in calls to `c_logmsg`.

If `c_logmsg` is used to write messages in a utility then the message will appear in the command prompt window.

Server redundancy

If your task follows the guidelines described in this document and only accesses data from user tables and points, you do not have to do anything special for redundancy. (Your task doesn't need to determine which server is primary because GBload only allows the task on the primary to run.)

On a redundant system the task is started on both servers. If the server is primary, the task continues normal operation after GBLoad. However, if the server is backup the task waits at GBLoad.

When the backup becomes primary, the task continues on from GBLoad. In the meantime, what was the primary will reboot and restart as backup and the task will wait at GBLoad.

Developing an OPC client

Experion PKS provides an OPC Server which enables OPC clients to access Experion PKS point data.

The Experion PKS OPC Server supports two standard OPC interfaces—a custom interface for use by clients written in C, and an automation interface for use by clients written in Visual Basic. You can write an OPC client in either of these languages.

For more information about:

- The Experion PKS OPC Server, see the *Configuration Guide* and the *OPC Controller Reference*.
- OPC interfaces, see the OPC Standard. This standard can be downloaded from `http://www.opcfoundation.org`.

Developing an ODBC client

Visual Basic or C++ applications can access the server database by using the Experion PKS ODBC driver.

For more information about writing an application that uses the Experion PKS ODBC driver, see the *Configuration Guide*.

Controlling the execution of a server application

5

Starting an application

These topics describe how to start an application.

Running a utility from the command line

After a utility has been compiled and linked, as described in “About the development environment” on page 19, it is ready to be run from the command line. The utility’s output should direct the user on what to do to use the utility.

Selecting an LRN for a task

Before you start a task, select a unique number to use to identify the task. This number is called the Logical Resource Number (LRN) of the task.

Several LRNs are reserved by the server for internal use and should not be used for applications. Use the **USRLRN** utility to determine a free application LRN that can be allocated to your task.

To use **USRLRN** and select one of the numbers it displays, type:

```
usrlrn
```

If there are no free application LRNs, search through the reserved LRNs for any free numbers by typing:

```
usrlrn -a
```

When a task is executing, you can identify its LRN by calling the library routine **GETLRN**. This LRN is needed in some other library routines and it prevents you from having to hard-code it into your source code.

Starting a task automatically

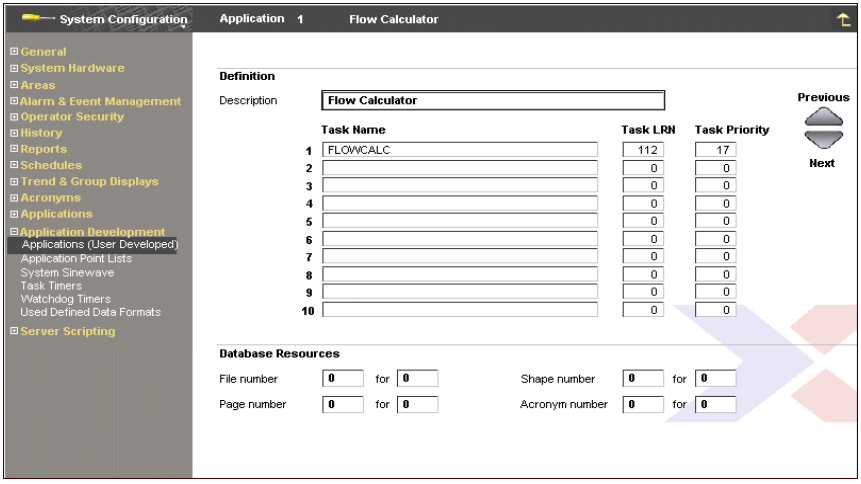
You can configure your system to start your task automatically whenever the server starts up. Your task will always be up and ready to be activated whenever the server system is running.

Attention

Configuring the task to start automatically it only takes effect after you have stopped and started the server. Also note that once the task is started, it needs to be activated before any of its commands are executed.

To configure your task to start automatically:

1. Log on to Station with `MNGR` security level.
2. Choose **Configure > Application Development > Application Summary** to call up the Applications Summary display.
3. Click an empty record line to call up the System Configuration–Application display.
4. Type a suitable descriptive title in **Description**.
5. Type the name of the executable without the `.exe` extension in **Task Name**. This is the name you use to link your application.



6. Type the LRN you have selected for your task in **Task LRN**. See “Selecting an LRN for a task” on page 48.
7. Type **`17`** (the recommended priority for user tasks) in **Task Priority**.

The **Database Resources** fields are used to store further configuration information about your application. The task may access this information by using the GETAPP function.

Starting a task manually

It can often be useful to start a task manually from the command line, either for debugging purposes or because you do not have the opportunity to stop and start the server to do it automatically. Several utilities are provided to allow you to manipulate a task from the command line.

The syntax for starting a task is:

```
addtsk name lrn [priority]
```

Item	Description
name	The executable file name of your task.
lrn	The LRN for the task, see “Selecting an LRN for a task” on page 48.
priority	The priority of task execution (use 0 as a default).

To activate a task from the command line use:

```
etr lrn
```

To mark a task for deletion from a command line use:

```
remtsk lrn
```

where *lrn* is the task’s LRN.

For details about these utilities, see ADDTSK, ETR and REMTSK.

Activating a task

After a task has been started it is ready to receive requests to be activated. The server can be configured to activate your task whenever one or more of the following events occurs.

To activate a task:	Go to:
On a regular basis	page 53
While a point is on scan	page 54
When a status point changes state	page 55
When a Station function key is pressed	page 56
When a Station menu item is selected	page 57
When a display button is selected	page 58
When a Station prompt is answered	page 59
When a display is called up	page 60
When a report is requested	page 61
When another application requests it	page 62

When your task is woken from its TRM04 call by one of these events you can usually obtain more information about the event by calling GETREQ. The parameter block returned from GETREQ can provide event specific information that can used to determine what action your task should take. Note that if GETREQ is not called, then the request will not be flushed from the request queue and no further requests to the task can be made.

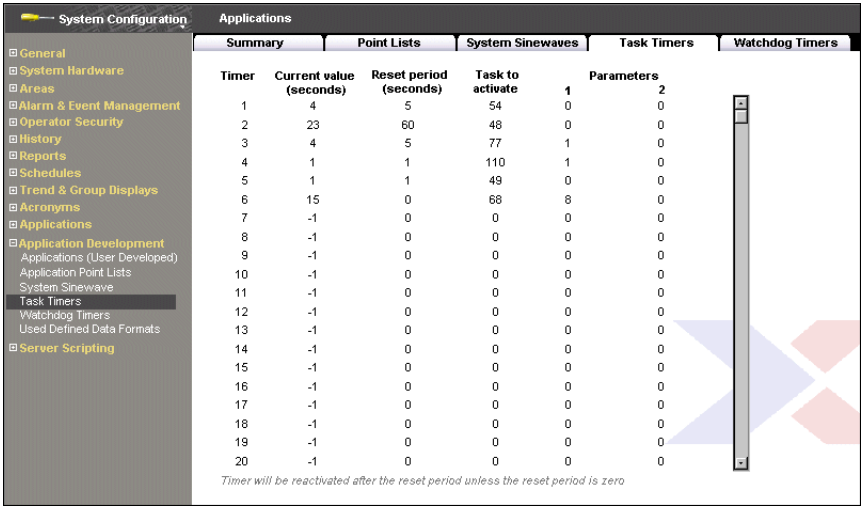
The remainder of this section describes how to configure the server to activate your task for each of these events and also what event specific information you can obtain from the parameter block.

Activating a task on a regular basis

To get the server to request your task on a regular basis you can make a call to the application programming library routine TMSTRT while the task is initializing. This will set up an entry in the server timer table that will cause the server to activate your task on a regular basis.

To view the current timer table entries:

1 In Station, choose **Configure > Application Development** > **Task Timers** to call up the Task Timers display.



To stop the periodic requests

To stop the periodic requests you can use **TMSTOP**. Note that the TMSTRT application programming library routine can also be used to activate your task once-off at some time in the future, rather than periodically.

When activated using this method, your task can call GETREQ to obtain the following information in the parameter block.

Word	Description
1	Set to 0.
2	param1 passed to TMSTRT.
3	param2 passed to TMSTRT.
4-10	Not used.

Activating a task on while a point is on scan

You may wish to have an operator control when your task is to be requested on a regular basis. This can be done by using the PV Algorithm No 16: Cyclic Task Request.

While a point with this Algorithm is ON SCAN, it will cause the application task with the specified LRN to be activated on a regular basis. To configure the Algorithm in Quick Builder, you need to define the following parameters:

Parameter	Description
Block No.	Algorithm data block number. For details, see the *Configuration Guide*.
Task LRN	The logical resource number of your task.
Task Request Rate	The task request rate in seconds, (must be multiple of point scan rate).
Word 1(param1)	Must be a non-zero number.
Word 2-10 (param2-10)	Numerical parameters that will be passed to your task.

Notes

- The algorithm block can also be configured from the Cyclic Task Request Algorithm display. Using the Point Detail display, click the Algorithm number to display the Algorithm configuration.
- This algorithm must be attached to either a Status or Analog point with no database or hardware address (that is, Controller number only).
- Time of the last request (in seconds) is stored by the system in ALG(04).

  When activated using this method, your task can call GETREQ to obtain the following information in the parameter block:

  Words 1 -10.

Activating a task on when a status point changes state

You may wish to have a task requested based on some change in the field. This can be done by using the Action Algorithm No 69: Status Change Task Request.

A single request is made to the task with the specified LRN each time the Status point changes to the nominated state (0-7). Alternatively, a nominated state of -1 will request the task for all state transitions. To configure the Algorithm in Quick Builder, you need to define the following parameters:

Parameter	Description
Block No.	Algorithm data block number. For details, see the *Configuration Guide*.
Task LRN	The logical resource number of your task.
Task Request Rate	Nominated state (0-7), or -1 for all state transactions.
Word 1(param1)	Must be a non-zero number.
Word 2-10 (param2-10)	Numerical parameters that will be passed to your task.

Notes

- The algorithm block can also be configured from the Status Change Task Request Algorithm display. Using the Point Detail display, click the Algorithm number to display the Algorithm configuration.
- This algorithm must be attached to a Status point.
- This algorithm does not queue requests to the task.

  When activated using this method, your task can call GETREQ to obtain the following information in the parameter block:

  Words 1-10

Activating a task on when a Station function key is pressed

The Station function keys can be configured to activate a specific task. The function keys are configured for each Station. For details, see the *Configuration Guide*.

Activating a task on when a Station menu item is selected

You can configure a menu item to activate your task. For details, see the *Configuration Guide*.

Activating a task on when a display button is selected

If the operator only needs to activate your task when looking at a particular display, you can place a pushbutton object on that display. The pushbutton object is configured to activate your task. For details, see the *Display Building Guide* (for DSP displays) or the *HMIWeb Display Building Guide* (for HMIWeb displays).

Activating a task on when a Station prompt is answered

A task may often require information from an operator using a particular Station. You can prompt the operator to type a string in Station's Command Zone by using the OPRSTR routine. This routine displays a message prompt in the Message Zone and returns to the calling function.

When the operator has typed a response and pressed ENTER your task is re-activated, and you can call GETREQ to obtain the following information in the parameter block.

Word	Description
1	Parameter 1 passed to the OPRSTR routine.
2-10	Not used.

Activating a task on when a display is called up

You can develop an application task that sits behind a display and performs additional processing. The display can be configured to activate your task whenever it is called up, or at regular intervals while it is visible. For details, see the *Display Building Guide* (for DSP displays) or the *HMIWeb Display Building Guide* (for HMIWeb displays).

Activating a task on when a report is requested

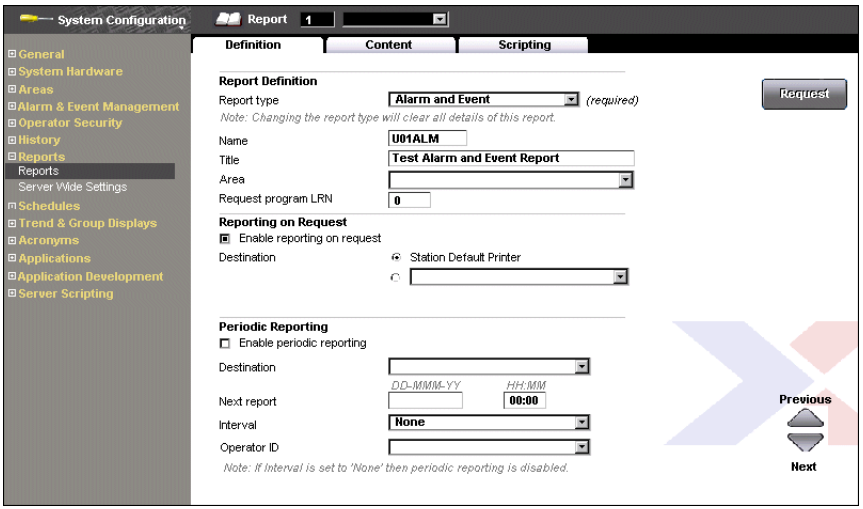
After a server report has been requested, you may require extra processing of the report in an application specific way. This is achieved by configuring the report to request your application task after the report generation is complete.

To configure a report to activate a task:

1 In Station, choose **Configure > Reports**.

2 Use the scroll bar to find the report you want to change and click the report name. The report details are displayed.

3 Click the **Definition** tab on the display. The report definition appears.



4 In the **Request program LRN** field, type the logical resource number of your task.

When activated using the display, your task can call GETREQ to obtain the following information in the parameter block.

Word	Description
1	Station number requesting the report
2	Not used
3	Report number
4-10	Not used

Attention

The report output file will reside in the `report` folder of the server and will have the name RPT*nnn* where *nnn* is the report number.

Activating a task on from another task

For a complicated application, you may need to implement a solution using more than one task. To synchronize the execution of each of your tasks, you can request one task from another.

Use the application programming library routine RQTSKB to request another task to be activated if it is not already active.

When activated using this method, the receiving task can call GETREQ to obtain the following information in the parameter block.

Word	Description
1-10	Values passed into the requesting tasks call to RQTSKB.

Testing the status of a task

There are two library routines provided to allow you to wait for or check up on the status of another task.

In some cases you may wish to suspend execution until another task has performed an operation for you. To do this, call the routine WTTSKB after you have activated the other task with RQTSKB. WTTSKB will block your task, and only return when the other task has called its own TRM04.

Rather than suspending your own task, you can check the status of the other task by calling the routine TSTSKB. This routine will indicate whether the specified task is active performing some function or dormant in a TRM04 call.

Monitoring the activity of a task

In some critical applications that you write, it may be desirable to know that the task written is actually working, and if not, to then take certain actions. Watchdog timers are provided for this purpose.

Watchdog timers are used to monitor tasks. They operate a countdown timer which is periodically checked for a zero or negative value. If the timer value is zero or negative, then the watchdog will trigger a certain predetermined action. The timer value can be reset at anytime by the task associated with that timer, thus avoiding the timeout condition.

Watchdog timers are started with a call to the watchdog start routine, WDSTRT, by the calling task. An action upon failure and a timeout interval (poll interval) must be specified. The following table describes the actions that can be taken on failure.

Action on failure setting	Description
`Alarm`	Generate an alarm upon failure.
`Reboot`	Restart the server system on failure.
`Restart`	Restart the task on first failure, and reboot the system on subsequent failures.

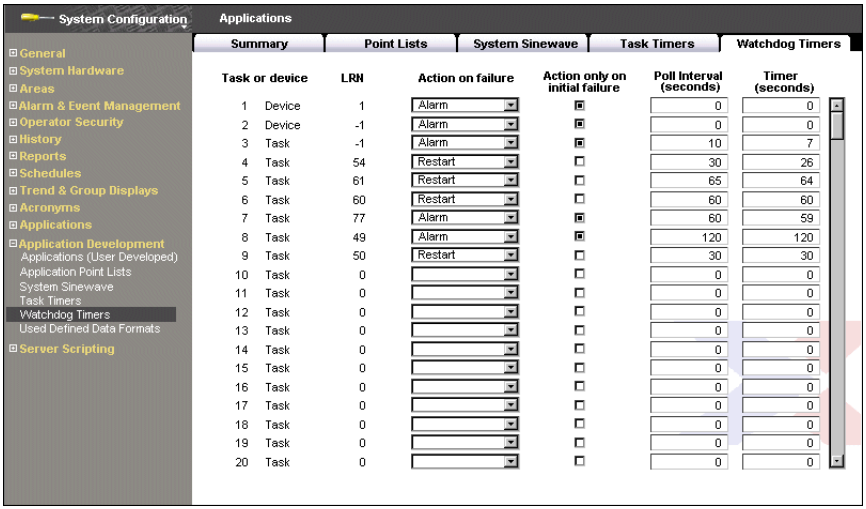
The tasks may then reset their watchdog timers by calling the watchdog timer pulse routine, WDON, which resets the countdown timer to the poll interval value.

For details on the routines, see WDSTRT and WDON (C and C++).

To check the watchdog timers:

1 In Station, choose **Configure > Application Development** > **Watchdog Timers** to call up the Watchdog Timers display.

Figure 1 Watchdog timer display



Accessing server data

6

Introduction to databases

Databases are basically a store of information to be referenced, altered or deleted at a later date. Many types of databases exist, but the majority of them can be classified into three main categories:

- **Relational**. Relational databases are used heavily in business applications where the data is represented as various tables, each containing a series of records and each record containing a set of fields. Due to the nature of the relational database structures, their strength lies in their ability to support ad hoc queries and quick searches.
- **Object oriented**. Object oriented databases are used more in Computer Aided Design (CAD) applications, where the data relationships are too complex to map into a table, record and field format. They are usually bound very closely to an object oriented language and provide better performance than relational databases.
- **Real-time**. Real-time databases are used in process control applications where the performance of the database is paramount. These databases usually consist of a memory-resident portion to ensure fast operation. The tasks that references the memory-resident fields can reference them just as if they were local variables in the program.

The server database

A knowledge of the server database is essential for programming in the server environment. Use of the database involves considerations of both performance and maintenance to ensure minimal impact on other system functions. This section aims to describe the internal structure of the server database to aid with this understanding.

The server system makes use of a real-time database to store its data. This data can be used throughout the whole server system, and by any applications that you intend to develop. The database provides the primary interface between an application and the standard server software.

The types of data stored in the server database can be classified as follows:

Type of data	Description
Acquired Data	Data that has been read from or is related to Controllers.
Process History	A historical store of acquired data.
Alarms and Events	Details on alarm and event conditions that have occurred.
System Status	Details on the state of communications with remote devices.
Configuration Data	Details on how the server system has been configured to operate.
User Defined Data	Structures to store your own application specific data.

Physical structure

The term “physical structure” of the server database is referring to the files that are used by the native operating system to store data. When using the application programming library routines you will only be referring to the logical structure of the database, but it is useful to understand how it is physically stored.

The physical structure of the database

The database is made up of a number of files that reside in the `data` folder. The `data` folder is located in `<server folder>`.

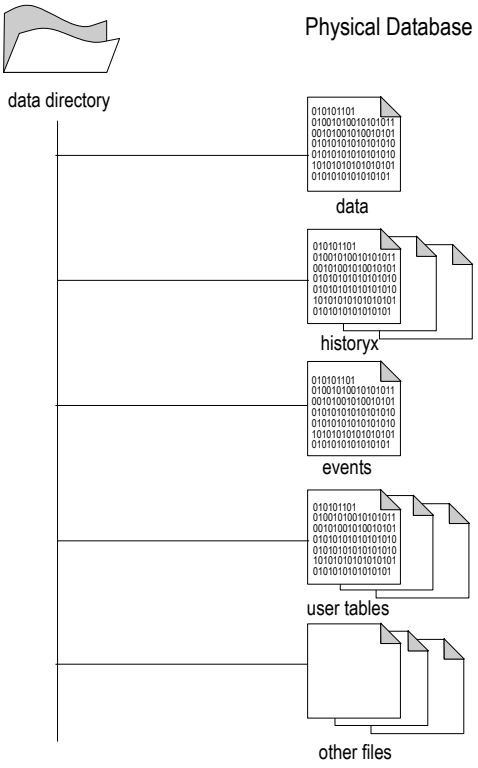
To increase performance, some parts of the database are loaded from the hard disk into the computer’s memory when the system starts. Periodically this memory-resident data is written back to the hard disk so that it will not be lost if the system stops.

The database folder contains the following main files.

File	Description
data	Holds many of the smaller database tables and all of the memory-resident tables.
history	Contains the process history data for each history interval.
events	Holds event data.
crtbkr, crtdfd, crtsha	Holds the display definition.
points	Contains all the point and parameter details.

The following figure shows how the database is stored.

Figure 2 Physical database



Logical structure

When accessing server data, you will typically work with two types of logical files in the server real-time database:

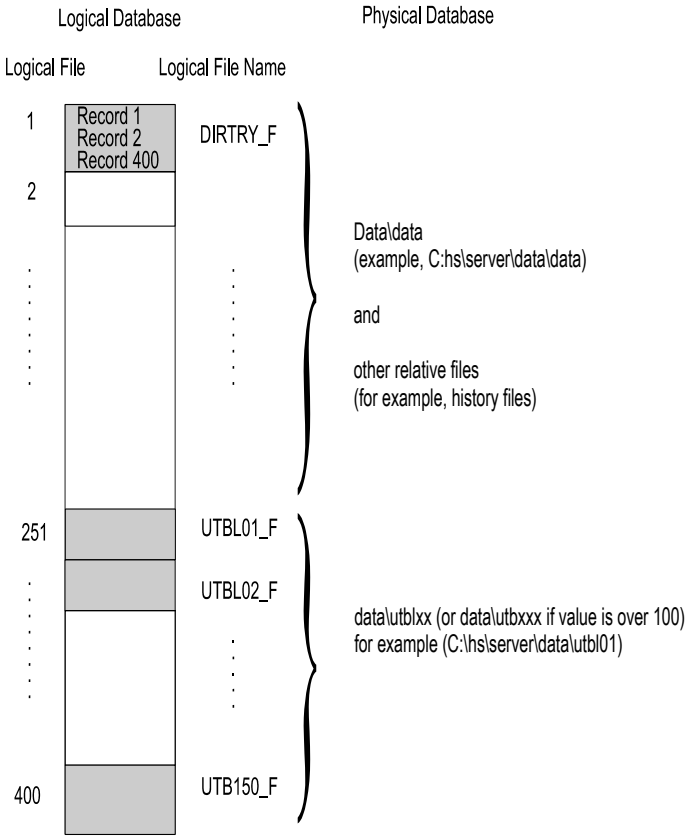
- **Flat logical files**. These are arranged as a set of fixed size flat files, containing a fixed number of records, with a fixed number of words per record.
- **Object-based real-time database files**. These are flexible data structures for which the underlying structure is hidden from the user and can only be accessed via functions which manipulate the data.

Flat logical files

To an application, these appear as a set of approximately 400 logical files. Each logical file stores a set of records of data related to some part of the server system.

An example of a logical file is CRTTBL. This table contains a single record for each Station on the system. The records of CRTTBL define items like the type of keyboard connected, the update rate, the current page number and so on.

Figure 3 Logical verses physical structure of database



Flat logical file numbers

A unique file number (ranging from 1 to 400) is used to identify each of the flat logical files. Labels for all the valid file numbers are defined in the include file `files`. See the C/C++ Application Template section on how to include this file into your application.

Whenever you are reading or writing on a file basis you will need to identify the flat logical file by providing one of these labels as the file number.

Definition files for flat logical files

The layout of each of the flat logical files is described in a separate definition file that can be included at the top of your source code. The naming convention for these definitions files is as follows:

- `GB`*`xxx`*`tbl.h` for C/C++ definition files.

Where *`xxx`* is part of the flat logical file's name.

In our example above the definition file for CRTTBL would `GBcrttbl.h` for C/C++.

Types of flat logical files

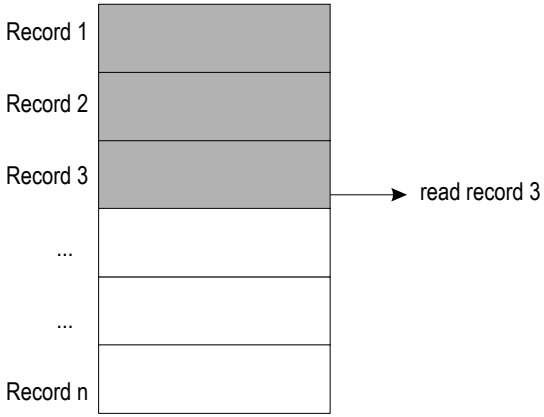
There are two common types of record structures for the flat logical files used in the server database: *relative* and *circular*. The structure of the logical file determines to some extent how you access the data within the file.

Relative files

Relative files are used where data needs to be stored in a structured way, with each record representing a single, one off entity. An example of a relative file is the CRTTBL where each record represents a single Station. The majority of flat logical files in the server are relative files.

Access to a relative file is achieved using specific functions like GETVAL or using a generic read and write function of DATAIO. If you use DATAIO you will need to provide a record number which is relative to the beginning of the logical file. The record number acts like an index to identify the data—that is, to access data regarding the third Station you would access record three of the logical file CRTTBL.

Figure 4 Relative file structure

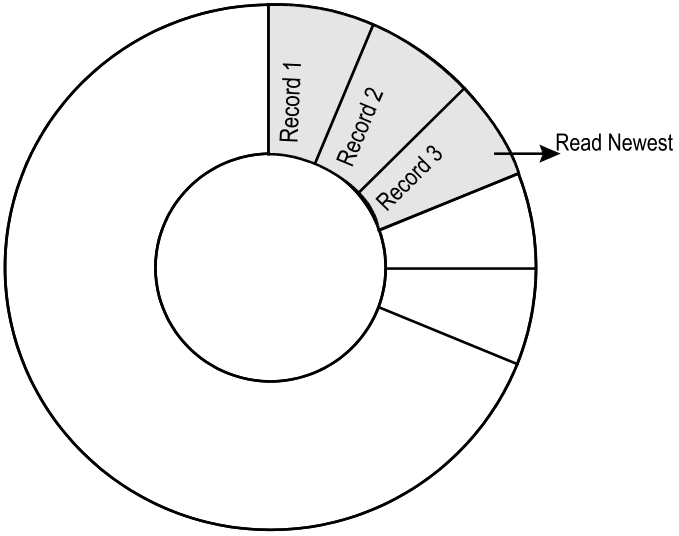


Circular files

Circular files are used where data needs to be recorded on a regular basis, but there is a limit on the amount of disk space that is to be used. When the circular file is full, and a new record is written to it, the oldest record will be removed. An example of a circular file is a HISTORY file where each record represents a set of point parameter values at a given time.

Access to a circular file is achieved using specific functions like GETHST or using the generic dequeue, queue, read oldest, read newest, or write newest functions of DATAIO.

Figure 5 Circular file structure



Object-based real-time database files

In addition to the logical files, some data is stored in object-based real-time database files. This data is accessed by various API calls, and the structure of the data is hidden from the user.

An example of such a file is the points database file, whose manipulation functions (or methods) are described in “Accessing acquired data” on page 79.

Ensuring database consistency

The logical files in the server database are shared by all the tasks and users of the system. This data sharing capability can cause problems if data is not sufficiently protected.

For example, consider the situation where two tasks are simultaneously accessing the same record in a logical file. They both read the record into a buffer in memory and proceed to modify its contents. The first task completes its modification and writes the buffer back to the record in the logical file. A moment later the second task does the same, but it will overwrite the changes made by the first task.

There are two ways to overcome this problem. The first method is to design your tasks so that only one task is responsible for changing the record contents. This task (**hsc_lock_record**) knows that it is the only one changing the record, so it can go ahead and read and write to its hearts content.

The second method is to use file locking. Before performing a read, modify, write sequence your task can call **hsc_lock_file** to request permission to change the file. If another task has the file already locked you will be denied access. If the file is not locked, it will be locked on your behalf and you will be able to read, modify and write the record. After you are complete you should call **hsc_unlock_file** to allow other tasks to access the file.

Object-based real-time database files do not require such locking. Instead the methods of the file will ensure database consistency.

In most cases you will not need to lock and unlock files or records in your application as the server will perform the necessary locking on your behalf. The exception to this rule is when you are using user tables (see “Accessing user-defined data” on page 91) with more than one task reading and writing to their records. In this case you will need to use the file locking functions of **hsc_lock_file** or **hsc_lock_record**.

Accessing acquired data

The data acquired from controllers is stored in an object-based real-time database file, and is accessible to all processes via API calls. The structure of this file is hidden from the API user by the calls used to manipulate it.

Identifying a point

Before you can access the data from a particular point you need to determine its internal point number. This internal point number is used by several of the application programming library routines to quickly identify the point.

An application will normally determine the internal point number of several points during initialization. To do this the application passes the Point Name in ASCII to the library routine `hsc_point_number`. If the point exists in the database, this function will return its corresponding internal point number.

Identifying a parameter

A point comprises many individual point parameters, for example, SP, OP, PV and so on. When you wish to refer to one of these parameters in your application you need to use `hsc_param_number` to resolve the parameter name to its appropriate number. This routine accepts an ASCII string for the parameter name and the point number and if the parameter exists for this point then its corresponding number will be returned. Parameter numbers may vary from point to point (even within the same point type), so parameter names need to be resolved to parameter numbers on a point by point basis.

Accessing parameter values

To read the current value of a list of parameters, use the `hsc_param_values` function, which accepts a list of point and parameter numbers and returns their current value(s).

To write to the value of a particular point's parameter you can call `hsc_param_value_put`, passing it the internal point number, the point's parameter number and the new value. If the parameter has a destination address the Controller will be controlled to the new value. If you do not wish such control to be performed use the related write function `hsc_param_value_save`, which performs an identical function but without the control to the parameters destination address.

If the current value for the point is a bad value, then an error code will be returned, and the parameter value you receive will be the last good value for that point's parameter.

Using point lists

If your application needs to simultaneously read from/write to several point parameters, you can create a *point list* which defines the relevant point parameters. (You configure the point list in Station.)

After you have created the point list, your application can use the library routine GETLST to read the set of point parameters, and GIVLST to write the set of point parameters.

For details on the routines, see GETLST and GIVLST (C and C++).

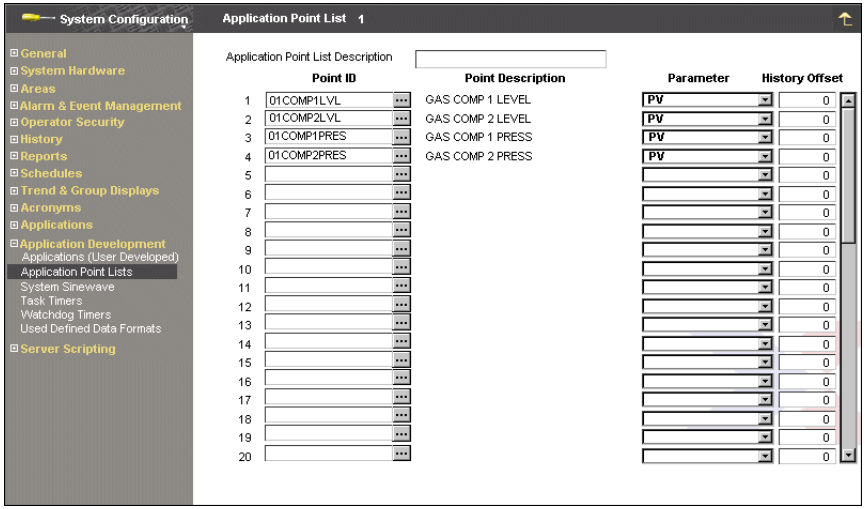
To create a point list:

1 Choose **Configure > Application Development > Application Point Lists** to call up the Point Lists display.

2 Use the scrollbar to show the point list you wish to change.

3 Click the list you want to configure to call up the Application Point List display.

Figure 6 System configuration–Application Point display



4 For each point parameter you want to control, type the point ID and parameter.

5 If the point parameter is a history parameter you can also define the history offset.

Controlling when data is acquired and processed for standard points

This section only applies to analog, status and accumulator points

Rather than having data acquired on a periodic basis, you can configure specific points to have the data acquired at the control of an application. This is typically done if the acquired data is only used by the application, or if the data is critical in a calculation and it must be the current field value.

If the acquired data need only be used by the application, you can configure the point so that it does not have a PV PERIOD entry. This will mean that no periodic scanning of the value is performed.

There are several library routines that can be used to control when data is acquired and processed from status, analog, and accumulator points:

Routine	Description
SPSW	Scan Point Special and Wait for Completion
SPVW	Scan Point Value and Wait for Completion
SPS	Scan Point Special
SPV	Scan Point Value
PPSW	Process Point Special and Wait for Completion
PPVW	Process Point Value and Wait for Completion
PPS	Process Point Special
PPV	Process Point Value

The routine SPSW will demand a point parameter to be scanned from the field. If the value scanned has changed then the point parameter will be processed (that is, checked for alarm conditions, execute algorithms where necessary, and so on), store the value in the point record, and then return.

The routine SPVW is used when there is no source address for the point parameter. This allows you to point process a calculated value from your application just as if it were scanned from the field, i.e. store the value in the PV, and process algorithms, alarms etc.

The routines SPS and SPV are exactly the same as SPSW and SPVW respectively but they return immediately and do not wait for the processing to complete. These are typically used to improve performance if you have several point parameters on the same Controller to demand scan. Call SPS to quickly queue all the point parameters except the last one. Then call SPSW to queue the last point parameter and wait for all to be processed.

The routines PPSW, PPVW, PPS and PPV are again very similar to the previous routines mentioned except that they will always force the processing of the point parameter even if it has not changed. For performance reasons, we do not recommend you to use these routines unless absolutely necessary.

The routine SPV may also effect the performance of the server adversely if used heavily. If you need to perform a lot of point processing of application values you may consider using the user scan task instead.

Accessing process history

The server can be configured to keep a historical record of acquired data. This historical data can be shown in Station using the standard trend displays or custom charts.

There are three categories of historical data that can be retained.

- Standard history allows the recording of a snapshot value every minute, and calculated averages at six minute, one hour, eight hour, twenty four hour intervals.
- Fast history allows the recording of a snapshot value at regular intervals (configurable between 1 and 30 seconds).
- Extended history allows the recording of snapshot values at one hour, eight hour and twenty four hour intervals.

Note that these intervals can be changed using the **sysbld** utility. For details, see the *Configuration Guide*.

Accessing blocks of history

An application can also access the historical data stored in the server database using the library routine GETHSTPAR. This routine allows you to retrieve a block of historical values for certain point parameters.

When referencing what history to retrieve you may specify it by either a date and time or by an offset of sample periods from the current time.

Accessing other data

All other data in the server database (configuration, status, alarm and event data) can be accessed in a more generic fashion.

Attention

Accessing other data in this way requires knowledge of the internal structures used by the server. Although these are described in the definition files, Honeywell does not guarantee that these formats will not change from release to release of the server.

Accessing logical files

The library routine DATAIO is a generic means of reading and writing to any of the 400 or so logical files in the server database. It allows you to read or write records (in blocks or one at a time) to or from an `integer*2` buffer.

After the record is in the `integer*2` buffer you need to refer to the relevant definition file on the layout of the record. Based on the definition file you can access the individual fields as follows:

- 16 bit integer data can simply be assigned to other variables.
- 32 bit integer data can be equivalenced or accessed via the macros `ldint4()` and `stint4()` in C/C++.
- floating point data can be equivalenced or accessed via the macros `ldreal()` and `streal()` in C/C++.
- double precision floating point data can be equivalenced or accessed via the macros `lddbl()` and `stdbl()` in C/C++.
- strings can be retrieved from the buffer using `INTCHR`.
- strings can be stored into the buffer using `CHRINT`.
- strings can be converted to upper case before storing using `UPPER`.
- dates stored in Julian days can be converted to day, month and year using `GREGOR` and back again using `JULIAN`.

Accessing memory-resident files

When the logical file is memory-resident you can reference the records by way of global variables rather than using DATAIO. These global variables are located in shared memory, and are common to all tasks.

Caution

Accessing other data using shared memory not only requires knowledge of the internal structures but also requires care. It is very easy to accidentally alter database values just by setting these global variables.

Values are read from the memory-resident file simply by assigning the global variable to another variable. Values are written to the memory-resident file simply by setting the value of the global variable. The set value will be written back to disk automatically when the server performs its next checkpoint if the value is stored in a checkpointed file.

In C the variables for the memory-resident files are defined in separate include files called `GBxxxtbl.h`, *where* `xxx` is the name of the logical file. The global variables are arrays of structures (one structure per record) that have a name of `GBxxxtlb[]`. For example:

```
#include "src\GBtrbtbl.h"
```

DIRTRY (The first logical file in the server database)

The first logical file in the server database is a memory-resident file called DIRTRY. It contains one record for every logical file in the server database. Record 1 represents logical file 1, record 2 represents file 2 and so on right up to the last record.

Each of these records defines the attributes of the corresponding logical file. This includes the type of logical file, whether the file is memory-resident, the maximum number of records the file can contain, the number of active records, the record size in words and other data used internally by the server.

For example, if you wanted to determine the number of Stations that have been implemented in your system.

In C/C++ we would reference the global variable `GBdirtry[n-1].actvrc`. The field actvrc contains the number of active records, and the value n represents the nth record of DIRTRY. In this case, n is CRTTBL_F since we are concerned with the number of Stations defined in the CRTTBL.

```
crtmax = GBdirtry[CRTTBL_F - 1].actvrc;
```

Accessing user-defined data

The server system provides the application developer with 150 database files for application-specific storage. These files are called *user tables* (or *user files*), and are referred to as user tables 1 through to 150, occupying file numbers 251 to 400 respectively.

In order to use these tables with applications, you must first configure the table(s) to be used. This involves specifying the type of table, the number of records in the table, and the size of each record.

The type of table may be either *relative* (direct) or *circular*. Direct or relative tables are linear in structure, and may be indexed via a record number. Circular files are, as the name implies, circular in nature, giving you the ability to continually write to a table by incrementing the index, with the actual index simply looping back to the beginning of the table when the record pointer exceeds the maximum number of records in the table.

The server has the first three user tables (tables 1-3, database file numbers 251-253) preconfigured to certain values, the values being:

Table Number	File Type	Number of Records	Record Size (words)
1	DIRECT	20	128
2	DIRECT	20	128
3	DIRECT	20	128

If you want to configure or modify any of the 150 user tables, you can use the user table builder utility, **utbbld**.

Displaying and modifying user table data

Experion PKS gives the you the ability to view and modify data within database files using custom displays. Thus if an application uses a user table, you can also create a display to view and/or modify this data.

For details about creating displays, see the *Display Building Guide* (for DSP displays) and the *HMIWeb Display Building Guide* (for HMIWeb Displays).

Setting up user tables using the UTBBLD utility

The **utbbld** command-line utility can be used to:

- View the existing table configurations
- Configure new user tables
- Modify existing user table configurations
- Delete existing user tables

For usage notes, see “UTBBLD usage notes” on page 99.

UTBBLD example

This example shows a session that uses **utbbld** to carry out its full range of actions, namely:

- Display the existing user table configurations
- Modify the configuration of user table `42`
- Add user table `21`, with the configuration: `CIRCULAR` file type, `64` records, `18` words per record
- Delete user table `4`
- Display the new user table configurations

The session which carried out these actions is as follows:

```
utbbld
System status is OFF-LINE
USER TABLE BUILDER
~~~~ ~~~~~ ~~~~~~~
Main Menu.
1. Display current user table configuration
2. Modify existing user tables
3. Add user tables
4. Delete user tables
c. Commit changes
q. Quit
Please choose one of the above (default is q):
1
System User Table Configuration
~~~~~~ ~~~~ ~~~~~ ~~~~~~~~~~~~~
User Table     File Number    File Type        Number of      Words per
Number                                         Records        Record
1              251            DIRECT           20             128
2              252            DIRECT           20             128
3              253            DIRECT           20             128
4              254            DIRECT           20             12
42             292            CIRCULAR         10             1
```

```
Total configured tables = 5. Number of free tables = 145
Hit ENTER to continue:

USER TABLE BUILDER
~~~~ ~~~~~ ~~~~~~~
Main Menu.
1. Display current user table configuration
2. Modify existing user tables
3. Add user tables
4. Delete user tables
q. Quit

Please choose one of the above (default is q):
2

Modify One or More User Tables.
The following tables are configured:
  1   2   3   4  42

Please enter the user table number you wish to modify, or q to
return to the main menu (default is q):
42

File number selected is 292
The configuration for this user table is:
File type is CIRCULAR
 There are     10 records,
And the record size is      1 words.

Do you want the file to be circular?

Please type (y)es, (n)o or ENTER (default is NO)? (Y/N) NO
Direct (relative) File Type

Record Size Is      1 words
  Enter required record size
  ( 1 to 32767 are allowed, or <return> to leave unchanged)
    42         entered.
There are     10 records
  Enter required number of records
  ( 1 to 32767 are allowed, or <return> to leave unchanged)
    42         entered.
```

```
The configuration for this user table is:
File type is RELATIVE (DIRECT)
There are     42 records,
And the record size is     42 words.

Are these values OK?
Please type (y)es, (n)o or ENTER (default is YES)
y

Do you wish to view/modify another table?
Please type (y)es, (n)o or ENTER (default is NO)
no

USER TABLE BUILDER
~~~~ ~~~~~ ~~~~~~~
Main Menu.
1. Display current user table configuration
2. Modify existing user tables
3. Add user tables
4. Delete user tables
q. Quit
Please choose one of the above (default is q):
3

Add a New User Table

You may choose the user table number to add, or
let the system choose the next available user
number for you.
1. Choose the user table number to add
2. Let system choose the new number
q. Return to the main menu

Please choose one of the above (default is q):
1

Currently configured tables are:
  1   2   3   4  42

There are 145 free tables remaining, please
choose a free user table number (between 1 and 150).

Enter required table number
```

```
  ( 0 to 150 are allowed, or <return> to leave unchanged)
    21          entered.
(This is file number 271).

Do you want the file to be circular?
Please type (y)es, (n)o or ENTER (default is NO)? (Y/N)
YES
Circular File Type

Record Size Is      1 words
  Enter required record size
  ( 1 to 32767 are allowed, or <return> to leave unchanged) 18
   entered.
There are      1 records
  Enter required number of records
 ( 1 to 32767 are allowed, or <return> to leave unchanged) 64
   entered.

The configuration for this user table is:
File type is CIRCULAR
 There are     64 records,
And the record size is     18 words.

Is this information OK?
Please type (y)es, (n)o or ENTER (default is YES) (Y/N)
YES

Would you like to add more user tables?
Please type (y)es, (n)o or ENTER (default is NO) (Y/N)
NO

USER TABLE BUILDER
~~~~ ~~~~~ ~~~~~~~
Main Menu.
1. Display current user table configuration
2. Modify existing user tables
3. Add user tables
4. Delete user tables
c. Commit changes
q. Quit

Please choose one of the above (default is q):
4
```

```
Delete One or More User Tables.
The following user tables are configured:
  1   2   3   4  21  42
Please enter the user table number you wish to
delete, or q to return to the main menu (default is q):
4

File number selected is 254
Do you wish to delete this table?
Please type (y)es, (n)o or ENTER (default is no) (Y/N)
YES

WARNING : this will remove all information in this table.
Do you still wish to delete this table ((y)es/(n)o[default])?
  (Y/N)
YES
Table has been deleted.

The following user tables are configured:
  1  2   3  21  42

Please enter the user table number you wish to
delete, or q to return to the main menu (default is q):
q

USER TABLE BUILDER
~~~~ ~~~~~ ~~~~~~~
Main Menu.
1. Display current user table configuration
2. Modify existing user tables
3. Add user tables
4. Delete user tables
c. Commit changes
q. Quit

Please choose one of the above (default is q):
1

System User Table Configuration
```

```
 ~~~~~~ ~~~~ ~~~~~ ~~~~~~~~~~~~~~

User Table     File Number    File Type          Number of      Words per
Number                                           Records        Record
1              251            DIRECT             20             128
2              252            DIRECT             20             128
3              253            DIRECT             20             128
21             271            CIRCULAR           64             18
42             292            DIRECT             42             42


Total configured tables = 5. Number of free tables = 145.

Hit ENTER to continue:


USER TABLE BUILDER
 ~~~~ ~~~~~ ~~~~~~~

Main Menu.

1. Display current user table configuration

2. Modify existing user tables

3. Add user tables

4. Delete user tables

q. Quit

Please choose one of the above (default is q):

c

Updating the modified user tables.......

USER TABLE BUILDER
 ~~~~ ~~~~~ ~~~~~~~

Main Menu.

1. Display current user table configuration

2. Modify existing user tables

3. Add user tables

4. Delete user tables

q. Quit

Please choose one of the above (default is q):

q
```

UTBBLD usage notes

Running UTBBLD with the server running/stopped

It is recommended that any changes to user tables using the **utbbld** command be made with the server system stopped. However, the server database service should be left running as **utbbld** requires access to the server database. Making changes to user tables with the server running is not recommended, as doing so can affect applications that are currently accessing the user tables.

Viewing user table configuration

If you only use **utbbld** for viewing the current configuration, then **utbbld** can be safely executed while the server is running.

To use **utbbld** without stopping the server, use the `-force` option:

```
utbbld -force
```

Attention

This option is not recommended because it may disrupt applications that are running, and changes may not be able to be made to files that are in use.

Preservation of existing files

utbbld attempts to preserve data in existing user tables. However, any changes to the number of records or the size of the records in the user table might cause loss of data. The user table could become smaller if either the number of records is reduced, or, the number of words per record is reduced.

Running UTBBLD in a redundant server system

When you make changes to user tables using the **utbbld** command on the primary server, synchronization with the backup server is lost. You need to manually synchronize the servers so that the changes are replicated to the backup server.

After you have synchronized the servers, it is good practice to ensure the user table changes have been correctly replicated to the backup server.

Using the database scanning software

The database scanning software, DBSCN, enables Experion PKS to utilize user table addresses as point source and destination addresses.

In most cases, where a point is required to access the server database, a “database point” can be built to accomplish this. These database points are best suited to accessing small amounts of data which may be dispersed throughout the server database.

Occasionally, applications require a substantial amount of point data to be derived from the server database. This data would normally reside in user tables. As scanning data using standard database points can result in significant system loading, it should be avoided. Instead, DBSCN should be used to provide a more efficient method of scanning point data from the server database.

Working from a Station

7

The application interface library provides routines that, when working from a Station, enable you to perform the following tasks:

- Generate alarms
- Display messages
- Print files
- Control custom built X-Y charts

Running a task from a Station

You run a task from a Station by:

- Pressing a function key
- Selecting a menu item
- Clicking a button on a display
- Answering a prompt
- Calling up a display

Each of these methods of task activation, and the parameters passed in the parameter block, are described in the section “Activating a task” on page 52.

Routine for generating an alarm

When a task determines some critical condition has occurred, to alert all the operators at each Station you can generate an application alarm or event using the routine hsc_notif_send.

Alarms usually indicate that an abnormal condition has occurred and that some action should be taken by the operator. Alarms can be given one of three priorities; low, high, or urgent. Depending on other alarms in the system and how the alarm is configured, the alarm can appear in the Alarm Zone on each Station and cause the audible annunciator to sound. The alarm can also be printed to an alarm/event printer. All alarms are recorded in the event file.

Events usually indicate that some condition has occurred that needs to be logged or recorded. They are not added to the alarm list but are printed to the alarm printer if it has been configured.

Routine for using the Station Message and Command Zones

You can use the OPRSTR library routine to display less-important messages on a particular Station's Message Zone.

This routine enables your task to display the following types of messages:

- **Information** messages that remain in the Message Zone until another message appears.
- **Indicator** messages that are automatically cleared after a certain period of time.
- **Prompt** messages that ask the operator to enter some information in the Command Zone. When the operator types a response in the Command Zone and presses ENTER, Station activates the task enabling you to retrieve the operator's response by calling OPRSTR in C/C++.

Routine for printing to a Station printer

An application can generate information associated with a particular Station that you want to print to a printer. For this to happen, you need to write the information to an operating system file and use the library routine PRSEND.

PRSEND enables you to queue the operating system file to print on the Demand Report printer associated with the Station. It also enables you to queue the operating system file to print on a specific printer as well.

Developing user scan tasks

8

To introduce unsupported controller-like devices into your system, you can either create an OPC server for your device, or you can use the User Scan Task option to write an application which provides an interface between the device and Experion PKS.

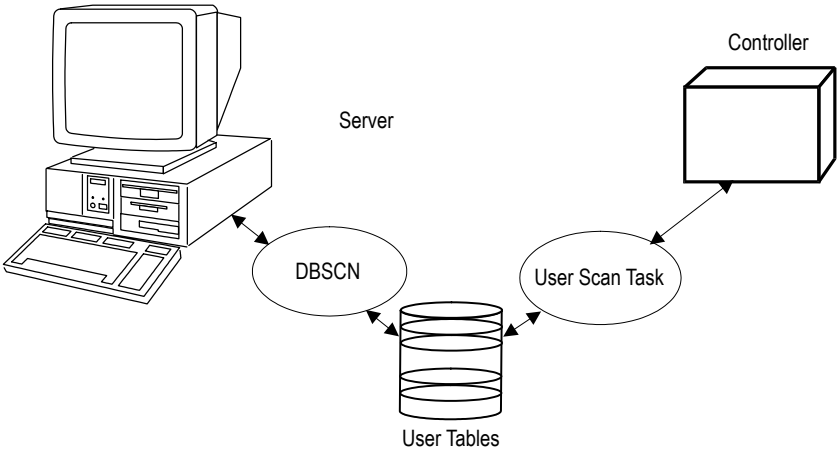
The recommended way is to create an OPC server. This method eliminates the requirement of writing a custom interface by defining a common, high performance interface that permits this work to be done once, and then reused.

You will find the OPC specification on the Internet at: `http://www.opcfoundation.org`. The OPC Specification is a non-proprietary technical specification that defines a set of standard interfaces based upon Microsoft's OLE/COM technology. The application of the OPC standard interface makes possible interoperability between automation/control applications, field systems/devices and business/office applications.

However, should you choose to use the User Scan Task to write an interface application, you will find this option described below.

The link between the server and the User Scan Task is the Experion PKS database user tables. The server provides database scanning software (DBSCN) to scan data from the user tables into server points. The User Scan Task reads data from the remote device and writes it into the user tables. Experion PKS can also send controls to the remote device by way of the User Scan Task.

Figure 7 User scan task



The option works by using channels defined as “User Scan Task” type channels. These channels operate in exactly the same manner as a conventional channel. They interact, however, with “User Scan Task” controllers rather than physical controllers.

Point parameters are sourced from these database controllers by specifying the word address within the specific record.

For details about defining a user scan task controller, and its associated channel and points, see Quick Builder’s help.

Designing the database for efficient scanning

In order to achieve maximum efficiency when using DBSCN to scan the database, the greatest number of point source addresses should be scanned using the fewest scan packets.

When considering the physical layout of data within a user scan task controller, the following points should be noted:

- Addresses which are scanned at the same rate should be grouped together so that they fall into the same scan packet where possible. The scan processor automatically processes the controller from lowest to highest address and starts a new scan packet each time a scan rate change is detected.
- The number of scan rates in use should be minimized. If only a few points are built for a given scan rate, it may be more efficient to scan them at the next fastest scan rate of many points that are already built on that scan rate.

Example user scan task

This section includes an example of how to use a User Scan Task.

The example alters the first four values of user table #1 (file number UTBL01_F) every 10 seconds. It employs many important routines from the application library described in this manual, including DATAIO, GBLOAD, TRM04 and TRMTSK.

The example also demonstrates the use of two important routines, GDBCNT and STCUPD. GDBCNT is used to fetch and decode point control requests from the Station, while STCUPD is used to manipulate the sample time counter used to monitor tasks. For a further description of these routines, see “Application Library for C and C++” on page 129.

Note that the program does not actually communicate with a real physical device. This would be accomplished using standard techniques for accessing the device to be used in the section of the program which is labelled “(`read data from some device or file`)”.

The example provides a C/C++ version of the user-written scan task. It also provides the point and hardware definition files used in conjunction with the program in order to define the database channels, and so on. The example can be found in the folder: <***server folder***>`\user\examples\src`.

You may want to create a custom display that shows the contents of the first four locations of user table 1 so that table updates can be viewed as they occur. For details, see the *Display Building Guide* (for DSP displays) and the *HMIWeb Display Building Guide* (for HMIWeb displays).

C/C++ version

The C version of the example User Scan Task is included here. For more information regarding any of the functions called in this program, see “Application Library for C and C++” on page 129.

```
/*****************************************************************************/
/************** COPYRIGHT © 1996-1999 HONEYWELL PACIFIC ***************/
/*****************************************************************************/

     #include <errno.h>
     #include "src/defs.h"
     #include "src/environ.h"
     #include "src/M4_err.h"
     #include "src/dataio.h"
     #include "files"
     #include "src/trbtbl_def"

     #define   FILE UTBL03_F     /* user file number */
     #define   RECORD 1          /* user record number */
     #define   RTU 1             /* user controller number */

     #ifndef lint
     static char *ident="@(#)c_dbuser.c,v 720.3";
     #endif
     static char *progname="c_dbuser.c,v";
/*
BEGIN_DOC
------------------------------------------------------------------------------
-
C_DBUSER - user scan task for use with DBSCAN
------------------------------------------------------------------------------
-
SUMMARY:
   Example user scan task
*/

main ()
{

/*
DESCRIPTION:
```

```
Add DBUSER as application via application display.
Give it a user lrn and a user file number.

DBUSER acquires data and stores the data in a user file.
DBUSER accepts control requests to write data.
DBUSER updates controller's Sample Time Counter (watchdog) to keep
       controller 'healthy'.

------------------------------------------------------------------------
NOTES -
------------------------------------------------------------------------

RETURN VALUES:

FUNCTIONS CALLED:

RELATED FUNCTIONS:

DIAGNOSTICS:

EXAMPLES:

END_DOC
*/

#define BUFSZ 10000
int2       buffer[BUFSZ];  /* file buffer */
struct prm prmblk;    /* task parameter block */
int2       cntfil;    /* control file number */
int2       cntrec;    /* control record number */
int2       cntwrd;    /* control word number */
int2       cntbit;    /* control bit number */
int2       cntwid;    /* control data width */
double     cntval;    /* control value */
int        tsklrn;    /* task's lrn */
int        recnum;    /* dataio record number */

/*
*            Attach global common
*/
     if (c_gbload() == -1)
     {
          c_logmsg(progname,"214","DBUSER: common load error %x",errno);
```

```
          return (errno);
     }
/*
*           Find task's lrn
*/
     tsklrn = c_getlrn();
     if (tsklrn != -1)
     {
     /*
     *               Start a timer
     */
           c_tmstrt_cycle ( 10, 1, 0 ); /* every 10 seconds */
     /*
     *               Get task request
     */
           while (TRUE)
        {
            if (c_gdbcnt(&cntfil,&cntrec,&cntwrd,&cntbit,&cntwid,&cntval)
            == -1)
            {
            if (errno != M4_QEMPTY)
            {
               c_logmsg(progname,"236","DBUSER: gdbcnt() error
               %x",errno);
            }
               if (c_getreq((int2 *)&prmblk)==0)
               {
               switch (prmblk.param1)
               {
               case 1:
     /* ---------------- service periodic requests----------------------*/
     /*                                    */
     /*      Perform data gathering */
     /*                                    */
     /*      (read data from some device or file) */
     /*                                    */
     /*      Lock user file          */
     /*                                    */
        /*   if (hsc_lock_file(file,10000) == -1)
                  c_logmsg(progname,"252","DBUSER: file %d lock
                     error %x",errno);
            else
               {...}
```

```
        */
        /*
        *       Read user file
        */
                   recnum = RECORD;
                   if (c_dataio_read_newest(FILE,&recnum,
                      LOC_MEMORY,buffer,BUFSZ)==-1)
                   {
                      c_logmsg(progname,"262","DBUSER: file %d
                      record %d read error %x",
                       FILE,recnum,errno);
                   }
                   else/* dataio succeeded */
                   {
        /*
        *       Update data in user file
*
        *       [The following is to provide live data to dbscan for testing]
        *       [increment and decrement some values]
        */
                                    buffer[0] += 10;
                                    buffer[1] -= 10;
                                    buffer[2] += 10;
                                    if (buffer[2]>10000) buffer[2] -= 10000;
                                    buffer[3] -= 10;
                                    if (buffer[3]< 0) buffer[3] += 10000;
        /*
        *       Write user file
        */
                                   if (c_dataio_write(FILE,recnum,
                                        LOC_MEMORY,buffer,BUFSZ)==-1)
                                        c_logmsg(progname,"283","DBUSER:
                                             file %d record %d write error
                                             %x",
                                                   FILE,recnum,errno);
                                   else
        /*
        *       Update sample time counter if all is OK
        */
                                         if (c_stcupd (RTU,65) == -1) /* must
                                              be >60 */
c_logmsg(progname,"290","DBUSER: stcupd error %x",errno);
                              }          /* if dataio succeeded */
```

```
     /*
     *       Unlock user file
     */
                              (hsc_unlock_file (file)(tsklrn,FILE);

     /* ---------------- end periodic requests------------------------- */
                              break;

                         default:
                              c_logmsg(progname,"301","DBUSER: unknown
                                   function %d",prmblk.param1);
                         }     /* end switch */
                    }     /* end if getreq succeeded */
                    else if(errno != M4_EOF_ERR)
                    {
                    /* getreq failed, and it's not simply because there is
                        nothing to do */
                        c_logmsg(progname,"308","DBUSER: GETREQ error
                             0x%x",errno);
                        c_trm04(0);
                    }
                    else
                    {
                        c_trm04(0); /* no work to do */
                    }
               }
               else /* GDBCNT succeeded */
     /* ----------------- service control requests
---------------------------- */
               {
                   c_logmsg(progname,"319","DBUSER: has control request for
                     %d %d %d %d %d %f",
cntfil,cntrec,cntwrd,cntbit,cntwid,cntval);
     /*
     *              Interpret what file/record/word/bit/width means
     *              Perform required action
     */
               }
          }   /* end while */
     /* This point is never reached */
     }
     else      /* tsklrn == -1 */
     {
```

```
            c_logmsg(progname,"","Start c_dbuser as a task. Use \"ct\" and
                supply a user lrn");
        }           /* if tsklrn == -1 */
        return (0);
}

/*************************************************************************/
/************** COPYRIGHT © 1996-1999 HONEYWELL PACIFIC ***************/
/*************************************************************************/
```

Development utilities

9

ADDTSK

Add application task.

Synopsis

```
addtsk name lrn [priority]
```

Part	Description
lrn	The LRN you have chose for the task, see “Selecting an LRN for a task” on page 48.
priority	The priority of task execution (use 0 as a default).
name	The executable file name of your task.

Description

This utility loads the executable program identified by name and prepares it for execution. Once loaded the executable becomes a task with the given LRN and priority ready to be activated.

This utility only works with application LRNs, preventing you from accidentally overwriting a server system task. Use CT if you need to use a reserved LRN for your task.

Example

```
addtsk usrapp 111 0
```

CT

Create task.

Synopsis

```
ct lrn priority -efn name
```

Part	Description
lrn	The LRN you have chose for the task, see “Selecting an LRN for a task” on page 48.
priority	The priority of task execution (use 0 as a default).
name	The executable file name of your task.

Description

This utility loads the executable program identified by name and prepares it for execution. Once loaded the executable becomes a task with the given lrn and priority ready to be activated.

Only use this utility if you have run out of application LRNs and you need to use a reserved LRN for your task. It is preferable to use the ADDTSK utility because it will check that you are not overwriting server system tasks.

Example

```
ct 111 0 -efn usrapp
```

DBG

Configure Experion PKS so that the next task started from the command line or Visual Studio that calls `gbload()` will automatically be assigned the specified LRN.

Synopsis

```
dbg lrn
```

Part	Description
lrn	The LRN you have chosen for the task, see “Selecting an LRN for a task” on page 48.

Description

This utility sets up Experion PKS so that the next manually started task will run with a specified LRN. This is useful for debugging purposes, as it allows a task to be run from within Visual Studio.

Example

```
dbg 111
```

DT

Delete task.

Synopsis

```
dt lrn
```

Part	Description
lrn	The LRN you have chose for the task, see “Selecting an LRN for a task” on page 48.

Description

This utility marks the specified task for deletion. When the task next calls either TRM04 or TRMTSK, the task will be deleted.

Only use this utility if you have run out of application LRNs and you needed to use a reserved LRN for your task. It is preferable to use the remtsk utility because it will check that you are not removing server system tasks.

Example

```
dt 111
```

ETR

Enter task request

Synopsis

```
etr lrn [-wait] [-arg arg1]
```

Part	Description
lrn	The LRN you have chose for the task, see “Selecting an LRN for a task” on page 48.
-wait	Wait for the task to become dormant
-arg *arg1*	Additional argument passed to the task via rqstsk **Note:** The task is requested via rqstsk—the additional argument can only be an int2.

Description

This utility requests the specified task to be activated.

Example

```
etr 111 -arg 5
```

FILDMP

Dump/restore the contents of a logical file.

Synopsis

```
fildmp
```

Description

This interactive utility is used to dump, restore or compare the contents of server logical files with standard text files.

When dumping the contents of a logical file to an ASCII operating system file you will need to provide the operating system file name to dump to, the server file number, the range of records to dump, and the data format to dump. Note that the logical file can be dumped to the screen by not specifying an operating system file.

The data format to dump defines how the logical file data will be written to the ASCII operating system file. You can specify INT for integer data, HEX for hexadecimal data, ASC for ASCII data, and FP for floating point data.

When restoring from an operating system file you will only need to provide the operating system file name. The utility will overwrite the current contents of the logical file with what is defined in the operating system file.

Example

```
System status is OFF-LINE
Reading from disc. Writing to memory,disc,link.


Enter FUNCTION: 1-dump, 2-restore, 3-compare
1
Enter DEVICE/FILE name
sample.dmp
Enter FILE number
251
Enter START,END record number
1,2
Enter FORMAT: "INT","HEX","ASC","FP"
HEX
File   251 record    1 dumped
```

```
File   251 record    2 dumped
Enter FILE number
Enter FUNCTION: 1-dump, 2-restore, 3-compare
```

FILEIO

Modify contents of a logical file.

Synopsis

```
fileio
```

Description

This interactive utility is used to modify the contents of individual fields in a logical file.

You will need to provide the file number, whether to modify memory/disk/both, the record number and the word number of the field to modify and the new value.

Example

```
Database contains   400 files
File number (=0 to exit) ? 251
Use memory image [YES|NO|BOTH(default)] ?
File   1 contains   400 records of size    16 words
Record number (=0 to back up) ? 1
Word offset (=0 to back up) ? 1
Mode =0 to back up
     =1 for INTEGER (int2)
     =2 for HEX     (int2)
     =3 for ASCII
     =4 for F.P.    (real)
     =5 for SET bit
     =6 for CLR bit
     =7 for LONG INTEGER (int4)
     =8 for LONG F.P.    (dble) ? 1
INTEGER VALUE = -32768   NEW VALUE = 100
Save value [YES|NO(default)] ? YES
Word offset (=0 to back up) ?
Record number (=0 to back up) ?
File number (=0 to exit) ?
```

REMTSK

Remove application task.

Synopsis

```
remtsk lrn
```

Part	Description
lrn	The LRN you have chose for the task, see “Selecting an LRN for a task” on page 48.

Description

This utility marks the specified task for deletion. When the task next calls either TRM04 or TRMTSK, the task will be deleted.

This utility only works with application LRNs, preventing you from accidentally removing a server system task. Use DT if you need to use a reserved LRN for your task.

Example

```
remtsk 111
```

TAGLOG

List point information

Synopsis

```
taglog
```

Description

This utility lists information associated with the specified points in the server database. This utility is useful to find out if a point exists and to determine its internal point number.

Example

An example of output from the utility:

```
Point IPCSTA1          Type 0 Number    1     STALOG PERFORM TEST 1

DAT file C800 0000 0000 0000 00F0 0000                      ............

EXT file 0000 0000 0000                                     ......

CNT file 0000 0000 0005 0030 0000 FF00 FFFF 0000 FF00 FFFF .....0.......
         FF00 FFFF 0000 FF00 FFFF FF00 FFFF FF10 0000      ............

DES file 4950 4353 5441 3120 2020 2020 2020 2020 5354 414C IPCSTA1   STAL
         4F47 2050 4552 464F 524D 2054 4553 5420 3120 2020 OG PERFORM TEST
1
         2020 2020 2020 0000 0000 0000 0018 3000 0000 0000 ......0.....
         0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 ..............
         0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 ..............
         0000 0000 0000 0000 0000 0000                     ............
```

USRLRN

Lists LRNs. For details about this utility, see the *Configuration Guide*.

Application Library for C and C++

10

The C/C++ application library contains the following functions:

ALMMSG

AssignLrn

BADPAR

CHRINT

CTOFSTR

DATAIO

DeassignLrn

DELTSK

DbletoPV

dsply_lrn

EX

FTOCSTR

GBLOAD

GDBCNT

GETAPP

GetGDAERRcode

GETHSTPAR

GETLRN

GETLST

GETPRM

GETREQ

GIVLST

hsc_asset_get_ancestors

hsc_asset_get_children
hsc_asset_get_descendents
hsc_asset_get_parents
hsc_em_FreePointList
hsc_em_GetLastPointChangeTime
hsc_enumlist_destroy
hsc_insert_attrib
hsc_insert_attrib_byindex
hsc_IsError
hsc_IsWarning
hsc_notif_send
hsc_param_enum_list_create
hsc_param_enum_ordinal
hsc_param_enum_string
hsc_param_format
hsc_param_limits
hsc_param_list_create
hsc_param_name
hsc_param_number
hsc_param_range
hsc_param_type
hsc_param_value
hsc_param_values
hsc_param_value_put
hsc_param_values_put
hsc_param_value_save
hsc_pnttyp_list_create
hsc_pnttyp_name
hsc_pnttyp_number
hsc_point_name
hsc_point_number
hsc_point_type

Int2toPV

Int4toPV

INTCHR

IsGDAerror

IsGDAnoerror

IsGDAwarning

JULIAN

LOGMSG

MZERO

OPRSTR

PPS

PPSW

PPV

PPVW

PritoPV

PRSEND

RealtoPV

RQTSKB

SPS

SPSW

SPV

SPVW

STCUPD

stn_num

StrtoPV

TimetoPV

TMSTOP

TMSTRT

TRM04

TRMTSK

TSTSKB

UPPER

WDON

WDSTRT

WTTSKB

See also

“Examples” on page 352

ALMMSG

Send general message.

hsc_notif_send and hsc_insert_attrib supersede ALMMSG.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

void __stdcall c_almmsg_event
(
   char*   text
);
void __stdcall c_almmsg_alarm
(
   char*   text,
   int     priority
);
void __stdcall c_almmsg_event_area
(
   char*   text,
   char*   area
);
void __stdcall c_almmsg_alarm_area
(
   char*   text,
   int     priority,
   char*   area
);
char* __stdcall c_almmsg_format
(
   char*   name,
   char*   id,
```

```
    char*   level,
    char*   descr,
    char*   value,
    char*   units
);
```

Arguments

Argument	Description
text	(in) pointer to a null-terminated string of text to be sent to the alarm system (maximum of 76 characters).
priority	(in) Message priority (see Description).
name	(in) pointer to a null-terminated string containing the alarm name (characters 1-16 of text).
id	(in) pointer to a null-terminated string containing the alarm identifier (for example, PVHI, SVCHG: characters 18-24 of text).
level	(in) pointer to a null-terminated string containing the alarm level (for example, U, L, H, STN01, characters 26-30 of text).
descr	(in) pointer to a null-terminated string containing the alarm descriptor (characters 32-61 of text).
value	(in) pointer to a null-terminated string containing the alarm value (characters 63-69 of text).
units	(in) pointer to a null-terminated string containing the alarm units (characters 71-76 of text).
area	(in) pointer to a null-terminated string containing the desired asset of the alarm/event.

Description

ALMMSG is used to send the specified text to the alarm system for storage into the alarm and/or event file, and printing on all printers.

`c_almmsg_event` will send the text to all printers and log the text to the event file.

`c_almmsg_alarm` will send the text to all printers and log the text to the alarm list and event file. It also sets the first character of the level field of the alarm to either “L”, “H” or “U” depending on the value of priority.

The priority of the alarm is defined as follows:

`ALMMSG_LOW`	Low priority
`ALMMSG_HIGH`	High priority
`ALMMSG_URGENT`	Urgent priority

`c_almmsg_event_area` and `c_almmsq_alarm_area` perform the same function as the `c_almmsg_event` and `c_almmsg_alarm` routines, except that the asset can be specified.

`c_almmsg_format` will format up a message given all the relevant fields. It returns a pointer to a null-terminated string that can then be passed onto `c_almmsg_event` or `c_almmsg_alarm`.

The text string can be broken up into six fields. The starting character of each field is defined by the following identifiers:

`ALMMSG_NAME`	Alarm name (equals 0)
`ALMMSG_ID`	Alarm ID (for example, PVHI, SVCHG)
`ALMMSG_LEVEL`	Alarm level (for example, L, U, H, STN01)
`ALMMSG_DESCR`	Alarm description
`ALMMSG_VALUE`	Alarm value
`ALMMSG_UNITS`	Alarm units

`c_almmsg_format2_malloc` will format up a message given all the relevant fields. It returns a pointer to a null-terminated string that can then be passed onto `c_almmsg_event` or `c_almmsg_alarm`.

For an example of the use of this routine, see example 2 (in the server install folder in `users\examples\src folder`).

See also

PRSEND

AssignLrn

Assigns an LRN to the current thread.

C/C++ Synopsis

```
#include <src\defs.h>
#include <src\trbtbl_def>
int2 AssignLrn
(
    int2* pLrn // (in/out) lrn to be allocated
        //   -1 == find an unused lrn
        //   >0 == allocate the specified lrn
);
```

Arguments

Argument	Description
pLrn	(in/out) A pointer to the lrn to be allocated. If *pLrn == -1 then the system will allocate the first available lrn. If *pLrn >0 then the system will use the specified lrn. At the end of a successful call, *pLrn will equal the just assigned lrn number.

Description

This function is designed to assign a particular lrn to the current thread. You may choose your own free lrn to use, or you may ask the system to select one for you.

Diagnostics

This function returns 0 if successful. pLrn will then contain the newly assigned lrn.

See also

DeassignLrn

GETLRN

BADPAR

Test for a bad value.

C/C++ synopsis

```
#include <src\defs.h>
int __stdcall c_badpar
(
      uint2    point,
      uint2    param
);
```

Arguments

Argument	Description
point	(in) point type/number to be tested.
param	(in) parameter to be tested.

Description

BADPAR returns TRUE if the system is not running, if the specified point is not implemented or if the parameter value is in error. Otherwise FALSE is returned.

See also

MZERO

CHRINT

Copy character buffer to integer buffer.

C/C++ synopsis

```
#include <src\defs.h>

void __stdcall c_chrint
(
   char*    chrbuf,
   int      chrbuflen,
   int2*    intbuf,
   int      intbuflen
);
```

Arguments

Argument	Description
chrbuf	(in) source character buffer containing ASCII
chrbuflen	(in) size of character buffer in bytes (to allow non null-terminated character buffers)
intbuf	(out) destination integer buffer
intbuflen	(in) size of destination buffer in bytes

Description

CHRINT copies characters from a character buffer into an integer buffer. It will either space fill or truncate so as to ensure that `intbuflen` characters are copied into the integer buffer.

If the system stores words with the least significant byte first then byte swapping will be performed with the copy.

See also

INTCHR

CTOFSTR

Converts a C string to a FORTRAN string.

C/C++ synopsis

```
#include <src\defs.h>
void ctofstr
(
   char*    Cstr,
   char*    Fstr,
   int Flen
);
```

Arguments

Argument	Description
Cstr	(in) null terminated C string
Fstr	(out) memory array for C string (`Fstr` can be the same as `Cstr`)
Flen	(in) length of the Fstr buffer in bytes

Description

Given a null terminated C string and the length of the string, this routine will convert it into a FORTRAN string space, padding it if necessary.

If the Cstr does not fit, it will be truncated.

See also

INTCHR

CHRINT

FTOCSTR

DATAIO

Database file access routines.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\dataio.h>

int __stdcall c_dataio_open
(
    int    file
);
int __stdcall c_dataio_close
(
    int    file
);
int __stdcall c_dataio_size
(
    int    file,
    int*   records,
    int*   length
);
int __stdcall c_dataio_read
(
    int    file,
    int    record,
    int    location,
    int2*  buffer,
    int    buflen
);
int __stdcall c_dataio_write
(
```

```
    int    file,
    int    record,
    int    location,
    int2*  buffer,
    int    buflen
);
int __stdcall c_dataio_read_blk
(
    int    file,
    int    record,
    int    number,
    int    location,
    int2*  buffer,
    int    buflen
);
int __stdcall c_dataio_write_blk
(
    int    file,
    int    record,
    int    number,
    int    location,
    int2*  buffer,
    int    buflen
);
int __stdcall c_dataio_queue
(
    int    file,
    int    location,
    int2*  buffer,
    int    buflen
);
int __stdcall c_dataio_dequeue
(
```

```
    int    file,
    int    location,
    int2*  buffer,
    int    buflen
);
int __stdcall c_dataio_read_newest
(
    int    file,
    int*   rrecord,
    int    location,
    int2*  buffer,
    int    buflen
);
int __stdcall c_dataio_read_oldest
(
    int    file,
    int*   rrecord,
    int    location,
    int2*  buffer,
    int    buflen
);
int __stdcall c_dataio_write_newest
(
    int    file,
    int*   rrecord,
    int    location,
    int2*  buffer,
    int    buflen
);
```

Arguments

Argument	Description
file	(in) server file number.
**records*	(out) the number of records in the file.
**length*	(out) the number of bytes in each record.
record	(in) record number (record 1 is the first record).
number	(in) number of records to be transferred.
location	(in) location of data (see description).
**buffer*	(in/out) integer buffer large enough for read/write function.
buflen	(in) size of integer buffer in bytes (must be a multiple of 2).
**rrecord*	(in/out) relative record number within a circular file (record 1 is the first record). On exit from read_newest and read_oldest, *rrecord is the physical record number that is required for any subsequent writes.

Description

DATAIO performs all data transactions between an application and the server files.

`c_dataio_open`	opens a server file.
`c_dataio_close`	closes a server file.
`c_dataio_size`	returns the size of a server file.
`c_dataio_read`	reads a record from a RELATIVE server file into an integer buffer. Use LOC_ALL for applications running on a redundant system.
`c_dataio_write`	writes a record from an integer buffer to a server file. Use LOC_ALL for applications running on a redundant system.
`c_dataio_read_blk`	reads a number of records from a RELATIVE server file into an integer buffer.
`c_dataio_write_blk`	writes a number of records from an integer buffer to a server file.
`c_dataio_queue`	queues (writes plus increment pointers) a record from an integer buffer to the top (newest record) of a CIRCULAR server file.
`c_dataio_dequeue`	dequeues (reads plus decrement pointers) a record from the bottom (oldest record) of a CIRCULAR server file into an integer buffer.

c_dataio_read_newest	reads a record relative to the top of a CIRCULAR server file into an integer buffer and returns the relative record number for use in subsequent writes. This call is equivalent to c_dataio_read.
c_dataio_read_oldest	reads a record relative to the bottom of a CIRCULAR server file into an integer buffer and returns the relative record number for use in subsequent writes.
c_dataio_write_newest	writes a record from an integer buffer to a CIRCULAR server file record relative to the top.
c_dataio_read and c_dataio_write	operate on data in a specified location. Location values are constructed by OR-ing flags from the following list. The recommended configuration to use is LOC_ALL.
LOC_MEMORY	read/write from memory.
LOC_DISK	read/write from the local disk.
LOC_ALL	read/write from/to memory, disk, link1 and link2.

Diagnostics

Upon successful completion the number of bytes transferred is returned. Otherwise, a value of -1 is returned and errno is set to one of the following error codes:

[M4_BAD_READ]	Read error.
[M4_BAD_WRITE]	Write error.
[M4_BAD_FILE]	Illegal file number.
[M4_BUF_SMALL]	Buffer is too small to receive data.
[M4_BEYOND_FILE]	Attempt to read outside file.
[M4_RANGE_ERROR]	Size of transfer exceeds 32k.
[M4_ILLEGAL_LFN]	Illegal lfn.
[M4_NO_BACKUP]	Backup access not permitted.
[M4_BAD_INTFLG]	Illegal location value.
[M4_FILE_LOCKED]	File locked to another task.

Example

```
#include <errno.h>          /* for external errno */
#include "files"            /* for UTBL01's file number */
#include "applications"     /* for UTBL01's record size */
#include "src\defs.h"
#include "src\M4_err.h"
#include "src\dataio.h"
```

```
...
...
...

int   rec;
int2  buffer[UT1SZ];

/* read one record from the disk resident user table UTBL01 */
if (c_dataio_read(UTBL01_F, rec, LOC_DISK, buffer, UT1SZ) == -1)

{
printf("c_dataio_read error %x", errno);
exit(errno);
}
```

See also

hsc_param_values

hsc_param_value_put

GETLST

GIVLST

DeassignLrn

Removes the current LRN assignment for a thread.

C/C++ Synopsis

```
#include <scr\defs.h>
#include <src\trbtbl_def>

int2 DeassignLrn ();
```

Description

This function will remove the association between this thread and its LRN.

Diagnostics

Upon successful completion, a value of 0 is returned. Otherwise, -1 is returned and **errno** is set to the error code.

See also

AssignLrn

GETLRN

DELTSK

Mark a task for deletion.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int __stdcall c_deltsk
(
    int   lrn
);
```

Arguments

Argument	Description
lrn	(in) Logical resource number of the task to mark for deletion or -1 for the calling task.

Description

DELTSK is used to mark a task for deletion. After the marked task terminates (by calling TRMTSK or TRM04) it will be deleted from the system.

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and **errno** is set to the following error code:

`[M4_ILLEGAL_LRN]` An illegal LRN has been specified.

Example

```
#include <errno.h> /*  for external errno */
#include <lrns>    /*  for task lrns */
#include <src\M4_err.h>
#include <src\defs.h>
 ...
 ...
```

```
 ...
/* mark the first user task for deletion on next
termination */
if (c_deltsk(USR1LRN) == -1)
 {
 c_logmsg(progname,"123","c_deltsk error %x",
errno);
 exit(errno);
 }
```

See also

TRMTSK

TRM04

DbletoPV

Inserts a double value into a PARvalue union.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

PARvalue* DbletoPV(
    double          dble_val,
    PARvalue*       pvvalue
);
```

Arguments

Argument	Description
pvvalue	(in) A pointer to a PARvalue structure.
double_val	(in) The double value to insert into the PARvalue structure.

Description

This function inserts a double value into a PARvalue, and then returns a pointer to the PARvalue passed in. This function allows you to set attributes into a notification structure using calls to hsc_insert_attrib and hsc_insert_attrib_byindex functions in a single line of code.

Diagnostics

If this function is successful, the return value is a pointer back to the PARvalue passed in, otherwise, the return value is NULL and errno is set.

Possible errors returned are:

BUFFER_TOO_SMALL	The pointer to the PARvalue is invalid, that is, null.

Example

See the examples in hsc_insert_attrib and hsc_insert_attrib_byindex.

See also

hsc_insert_attrib

hsc_insert_attrib_byindex

Int2toPV

Int4toPV

PritoPV

RealtoPV

StrtoPV

TimetoPV

dsply_lrn

Finds out the LRN of the display task for a Station based on the Station number.

C/C++ Synopsis

```
#include <src\defs.h>


int2 dsply_lrn
(
    int2* pStationNumber  // (in) A pointer to the
Station number
);
```

Arguments

Argument	Description
pStationNumber	(in) pointer to the Station number that will be used to find the lrn.

Description

This function quickly determines the lrn of a particular Station's display task.

Diagnostics

This function returns the lrn (>0) if successful. Otherwise it returns -1.

See also

stn_num

EX

Execute command line.

C/C++ synopsis

```
#include <src\defs.h>

int __stdcall c_ex
(
    char*    command
);
```

Arguments

Argument	Description
command	(in) pointer to a null-terminated string containing the command line to execute.

Description

EX passes a command line string as input to the command line interpreter and executes it as if the command line was entered in from a Console Window.

Diagnostics

If successful completion a value of 0 is returned. Otherwise, -1 is returned and **errno** is set to an error code depending on the command line executed.

FTOCSTR

Converts a FORTRAN string to a C string.

C/C++ synopsis

```
#include <src\defs.h>
char* ftocstr
(
   char*   from_str,
   int     from_len,
   char*   to_str,
   int     to_len
);
```

Arguments

Argument	Description
from_str	(in) FORTRAN string to convert.
from_len	(in) length of FORTRAN string
to_str	(out) memory array for C string (`to_str` can be the same as `from_str`)
to_len	(in) size of array for C string

Description

Given a FORTRAN string and the length of the string, this routine will convert it into a null terminated C string. The string is returned in data buffer supplied.

A pointer to the string is returned if the conversion was successful and NULL pointer is returned if the string passed in (minus trailing blanks) is longer than the output buffer length. In this case a truncated string is returned in the output data buffer.

Warning

This routine searches from the end of the string for the last non space character. Thus if the string contains something other than spaces on the end of the string, the routine will not work.

If the name to convert is coming from C, then the `strlen` should be passed to this routine rather than the size of the memory allocated for the name.

See also

INTCHR

CHRINT

CTOFSTR

GBLOAD

Global common load.

C/C++ synopsis

```
#include <src\defs.h>
int __stdcall c_gbload();
```

Description

GBLOAD makes the server database accessible to the calling task.

The memory-resident sections of the database are attached to the calling task. This allows the calling task to reference the database directly.

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, the application should report an error and terminate.

Warnings

GBLOAD should be called only once per execution of a task. It should be called before any other application routines are called.

Example

```
#include <src\defs.h>
#include <errno.h>
/* attach to the Server database */
if (c_gbload() == -1)
 {
 c_logmsg(progname,“123”,“c_gbload error %x”,
errno);
 exit(errno);
 }
```

GDBCNT

Get database control request.

C/C++ synopsis

```
#include <src\defs.h>
int __stdcall c_gdbcnt
(
    int2*    file,
    int2*    record,
    int2*    word,
    int2*    bit,
    int2*    width,
    double*  value
);
```

Arguments

Argument	Description
file	(out) file number that was controlled.
record	(out) record number that was controlled.
word	(out) word number that was controlled.
bit	(out) bit number that was controlled. 0-15 for int2 data, 0 for int4, float, dble.
width	(out) width of the data that was controlled. 1-16 for int2 data, 32 for int4 and float, 64 for dble.
value	(out) value to which the file, record, word, bit, width was controlled.

Description

GDBCBT is used to fetch and decode a control request from the database scan task.

See “Developing user scan tasks” on page 107

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and errno is set to one of the following error codes:

`[M4_QEMPTY]`	The queue is empty.
`[M4_ILLEGAL_RTU]`	The Controller number is not legal.
`[M4_ILLEGAL_CHN]`	The channel number is not legal.
`[M4_ILLEGAL_CHN_TYPE]`	The channel type is not that of a database scan channel.

GETAPP

Get application record for task.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\apptbl_def>

int __stdcall c_getapp
(
    char*    taskname,
    uint2    task_lrn,
    struct   apptbl appbuf
);
```

Arguments

Argument	Description
task_name	(in) character string containing the name of the task to find
task_lrn	(in) logical resource number of the task to find. If -1 then not checked
appbuf	(out) application record buffer as defined in APPTBL_DEF

Description

This function finds the corresponding application table record that contains a reference to the specified task. If successful, it will load the record into the supplied appbuf and return.

GetGDAERRcode

Returns the error code from a GDAERR status structure.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\gdamacro.h>

DWORD GetGDAERRcode
(
    GDAERR* pGdaError
);
```

Arguments

Argument	Description
pGdaError	(in) pointer to the GDAERR structure containing the status.

Description

This macro returns the error code associated with the GDAERR structure.

See also

IsGDAwarning

IsGDAerror

IsGDAnoerror

GETHSTPAR

Get history interface parameters.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\gethst.h>

int __stdcall c_gethstpar_date
(
    int     type,
    int     date,
    float   time,
    int     numhst,
    uint2*  points,
    uint2*  params,
    int     numpnt,
    char*   archive,
    float*  values
);
int __stdcall c_gethstpar_ofst
(
    int     type,
    int     offset,
    int     numhst,
    uint2*  points,
    uint2*  params,
    int     numpnt,
    char*   archive,
    float*  values
);
```

Arguments

Argument	Description
type	(in) history type (see Description).
date	(in) start date of history to retrieve in Julian days (number of days since 1 Jan 1981).
time	(in) start time of history to retrieve in seconds since midnight.
offset	(in) offset from latest history value in history intervals (where offset=1 is the most recent history value).
numhst	(in) number of history values to be returned per Point.
points	(in) array of Point type/numbers to process (maximum of 100 elements).
params	(in) array of point parameters to process. Each parameter is associated with the corresponding entry in the points array. The possible parameters are defined in the file "parameters" in the `def` folder (maximum 100 elements).
numpnt	(in) number of Points to be processed.
archive	(in) pointer to a null-terminated string containing the folder name of the archive files relative to the archive folder. A NULL pointer implies that the system will use current history and any archive files which correspond to the value of the date and time parameters. The archive files are found in `<server folder>\archive`. For example, to access the files in `<server folder>\archive\ay1996m09d26h11r008`, the archive argument is "ay1996m09d26h11r008".
values	(out) two dimensional array large enough to accept history values. If there is no history for the requested time or if the data was bad, then -0.0 is stored in the array. Sized `numpnt` * `numhst`.

Description

GETHSTPAR is used to retrieve a particular type of history values for specified Points and time in history. History will be retrieved from a specified time or Offset going backwards in time `numhst` intervals for each Point specified.

`c_gethstpar_date`	retrieves history values from a specified date and time.
`c_gethstpar_ofst`	retrieves history values from a specified number of history intervals in the past.

The history values are stored in sequence in the values array. values[x][y] represents the y^{th} history value for the x^{th} point.

The history type is specified by using one of the following values:

Value	Description
HST_1MIN	one minute standard history
HST_6MIN	six minute standard history
HST_1HOUR	one hour standard history
HST_8HOUR	eight hour standard history
HST_24HOUR	twenty four hour standard history
HST_5SECF	Fast history
HST_1HOURE	one hour extended history
HST_8HOURE	eight hour extended history
HST_24HOURE	twenty four hour extended history

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and **errno** is set to one of the following error codes:

[M4_ILLEGAL_VAL]	Illegal number of Points or history values specified.
[M4_ILLEGAL_HST]	Illegal history type or interval specified.
[M4_VAL_NOT_FND]	value not found in history.

Example

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\gethst.h>
#include "parameters"
#define NHST 50
#define NPNT 3
int date;/*  julian date*/
float time;/*  seconds from midnight  */
int year;/*  year from OAD*/
int month;/*  month (1 - 12)*/
int day;  /*  day (1 - 31)*/
int i;
int hour;/*  hour (0 - 23)*/
int minute;/*  min (0 - 59)*/
uint2 points[NPNT];  /*  point numbers*/
unit2 params[NPNT];  /*  parameters*/
float values[NPNT][NHST];  /*  history values*/
```

```
. . .
. . .
. . .
/*   attach database  */
if (c_gbload())
  {
  c_logmsg(progname,"123","c_gbload error %#x",errno);
exit(errno);
}

/*get the point numbers of the following points*/
c_getpnt("C1TEMP",&points[0]);
c_getpnt("C1PRES",&points[1]);
c_getpnt("C2TIME",&points[2]);

/*set up for all PV parameters*/
for (i=0; i<NPNT; i++)
    params[i]=PV;

/*set up seconds since midnight and julian date*/
time = (hour* 60+minute)* 60;
date = c_gtoj(year, month, day);
. . .
. . .
. . .
/*retrieve the history*/
if (c_gethstpar_date(type, date, time, nhst, params,
points, npnt, NULL, values) == -1)
{
c_logmsg(progname,"123"," c_gethstpar_date error %#x",errno);
exit(errno);
}
. . .
. . .
. . .
```

See also

hsc_param_values

GETLRN

Get logical resource number.

C/C++ synopsis

```
#include <src\defs.h>


int __stdcall c_getlrn();
```

Arguments

None

Description

GETLRN fetches the calling task's Logical resource Number. The LRN is unique for the thread of each process. Each thread can only be associated with one LRN and each LRN can only be associated with one thread.

Diagnostics

Upon successful completion, the task's LRN is returned. Otherwise, -1 is returned indicating that the task has not been created as a server task.

See also

AssignLrn

DeassignLrn

GETLST

Get values of a list of points.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\lstfil_def>

void __stdcall c_getlst
(
    int2    list,
    float*  values,
    int2*   errors
);
```

Arguments

Argument	Description
list	(in) list number (valid list numbers declared in `def\src\lstfil_def`)
values`[ ]`	(out) real array of values of point\parameter list. Sized GGLNM.
errors`[ ]`	(out) array of returned error codes. Sized GGLNM.

Description

GETLST is used to retrieve values for a list of points and parameters. These point lists can be viewed and modified using the “Application Point Lists” display.

The arrays values[ ] and errors[ ] must be large enough to hold the number of items in a list as declared in the parameter GGLNM in the file `def\src\listfil_def`.

Diagnostics

Upon successful completion zeros will be returned in all elements of the errors[ ] array. Otherwise one of the following error codes will be returned in the corresponding element of the errors[ ] array:

[M4_INVALID_NO_ARGS]	An invalid number of parameters was passed to the subroutine.
[M4_INV_POINT]	An invalid point type\number has been specified.
[M4_INV_PARAMETER]	An invalid parameter has been specified.
[M4_ILLEGAL_TYPE]	A parameter with an illegal type has been specified.

See also

GIVLST

DATAIO

hsc_param_values

hsc_param_value_put

GETPRM

Get parameters from a queued task request. (Requested via Action Algorithm 71).

C/C++ synopsis

```
#include <src/defs.h>
#include <src/M4_err.h>

int2 __stdcall c_getprm
(
    int    paramc,      //Parameter count (3)
    int2*  par1,        //Parameter 1 value
    int2*  rqstblk,     //Pointer to request block buffer
    int    rqstblk_sz   //Size of request block buffer
);
```

Arguments

Argument	Description
paramc	(in) Parameter count. For standard use this value must be set to 3.
par1	(out) Parameter 1 value.
rqstblk	(out) Pointer to request block buffer.
rqstblk_sz	(in) Size of request block buffer in bytes.

Description

GETPRM gets parameters from a queued task request. The routine retrieves a parameter block from the request queue. The words in the parameter block are copied to the argument rqstblk. If the task is expecting data and the request queue is empty, a value of M4_EOF_ERR (0x21F) is returned and the task should terminate and wait for the next request. If the parameter block is larger than the size of rqstblk, a value of M4_RECORD_LENGTH_ERR (0x21A) is returned to indicate the data has been truncated. This routine enables a task to be requested via a point build with Algorithm 71.

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and errno is set to the following error code: M4_ILLEGAL_LRN (0x802). The calling process has not been created as a Experion PKS task.

Example

```
#include "src/defs.h"
#include "src/M4_err.h"

#define BUFSZ 20
#define FOREVER 1

main()
{
int2  paramc = 3;
int2  par1 = 0;
int2  rqstblk[BUFSZ];
int2  rqstblk_sz;
int2  rqst_status;
int2  status;

rqstblk_sz = BUFSZ* sizeof(int2);

while ( FOREVER )
{
  /* get the parameter block for this request */
  rqst_status = c_getprm(&paramc, &par1, (int2 *)rqstblk,
   &rqstblk_sz);
  if ( rqst_status == M4_EOF_ERR )
  {
      /*terminate and wait for next request*/
      c_trm04(status);
      continue;
  }

/*******************************/
/*     Main processing loop     */
/*                             */
/*******************************/
}
}
```

Contents of request buffer

The request buffer will be filled with the contents of the requesting points, Algo Block from word 6 of the Algo Block onwards, that is:

rqstblk[0] = Algo Block Word 6 (Task Parameter 1)

rqstblk[1] = Algo Block Word 7 (Task Parameter 2)

In addition the requesting point's point number will be passed in the request buffer:

rqstblk[3] = Point number of requesting point.

See also

RQTSKB

GETREQ

GETREQ

Get parameters from task request block.

C/C++ synopsis

```
#include <src/defs.h>
#include <src/M4_err.h>
#include <src/trbtbl_def>

int __stdcall c_getreq
(
    int2*    prmblk
);
```

Arguments

Argument	Description
prmblk	(out) pointer to parameter block

Description

GETREQ retrieves a ten word parameter block from the TRBTBL of the calling task. If no requests are pending, GETREQ returns TRUE (-1) and sets `errno` to M4_EOF_ERR (0x21F), otherwise, the ten word parameter block is copied into the argument prmblk. The parameter block in the TRBTBL of the calling task is then cleared and the function returns FALSE (0).

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, TRUE (-1) is returned and **errno** is set to the following error codes:

`[M4_ILLEGAL_LRN]`	The calling process has not been created as a server task.
`[M4_EOF_ERROR]`	There are no requests pending.

Example

```
#include <src/defs.h>
#include <src/M4_err.h>
#include <src/trbtbl_def>
```

```
main()
{
     struct prm prmblk;
     if (c_gbload() == -1)
     exit(errno);
     while (1)
     {
       if (c_getreq((int2 *) &prmblk))
       {
         if (errno != M4_EOF_ERR)
         {
           /* Report an error */
         }
         /* Now terminate and wait for the */
         /* next request */
         c_trm04(ZERO_STATUS);
       }
       else
       {
         /* Perform some function */
         /* Perhaps switch on the first */
         /* Parameter */
         switch(prmblk.param1)
         {
         case 1:
           ...
           break;
         case 2:
           ...
           break;
         } /* end switch */
       } /* if */
```

```
        } /* end while */
    }
```

See also

RQTSKB

TRM04

GIVLST

Give values to a list of points.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\lstfil_def>

void __stdcall c_givlst
(
    int2    list,
    float*  values,
    int2*   errors
);
```

Arguments

Argument	Description
list	(in) list number (valid list numbers declared in `lstfil_def`)
values`[ ]`	(in) real array of values of point/parameter list. Sized GGLNM
errors`[ ]`	(out) array of returned error codes. Sized GGLNM

Description

GIVLST is used to store values into a list of points and parameters and controls those parameters if they have a Destination address. Note that each individual parameter control is performed sequentially using a separate scan packet.

These point lists can be viewed and modified using the “Application Point Lists” display.

The arrays values[ ] and errors[ ] must be large enough to hold the number of items in a list as declared in the parameter GGLNM in the file `lstfil_def`.

Diagnostics

Upon successful completion zeros will be returned in all elements of the errors[ ] array. Otherwise one of the following error codes will be returned in the corresponding element of the errors[ ] array:

[M4_INVALID_NO_ARGS]	An invalid number of parameters was passed to the subroutine.
[M4_INV_POINT]	An invalid point type/number has been specified.
[M4_INV_PARAMETER]	An invalid parameter has been specified.
[M4_ILLEGAL_TYPE]	A parameter with an illegal type has been specified.
[M4_PNT_ON_SCAN]	It is illegal to store the PV parameter of a point that is currently on scan.

See also

GETLST

DATAIO

hsc_param_values

hsc_param_value_put

hsc_asset_get_ancestors

Gets the asset ancestors for an asset.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_asset_get_ancestors
(
    PNTNUM   ASSET
    int*     piNumAncestors
    PNTNUM** ppAncestors
);
```

Arguments

Argument	Description
Asset	(in) asset point number
piNumAncestors	(out) number of ancestors
ppAncestors	(out) array of ancestors

Description

This functions returns the asset ancestors for the specified asset.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned with `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumAncestors = 0;
PNTNUM *pAncestors = NULL
if (hsc_asset_get_ancestors (point, &iNumAncestors,
&pAncestors) ! = 0)
```

```
        return -1
    .
    .
    .
    hsc_em_FreePointList (pAncestors);
```

hsc_asset_get_children

Gets the children of an asset.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_asset_get_children
(
    PNTNUM   ASSET
    int*     piNumChildren
    PNTNUM** ppChildren
);
```

Arguments

Argument	Description
Asset	(in) asset point number
piNumChildren	(out) number of children
ppChildren	(out) array of children

Description

This functions returns the asset children for the specified asset.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned with `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumChildren = 0;
PNTNUM *pChildren = NULL
if (hsc_asset_get_children (point, &iNumChildren,
&pChildren) ! = 0)
```

```
        return -1
    .
    .
    .
    hsc_em_FreePointList (pAncestors);
```

hsc_asset_get_descendents

Gets the descendents of an asset.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_asset_get_descendents
(
    PNTNUM   ASSET
    int*     piNumDescendents
    PNTNUM** ppDescendents
);
```

Arguments

Argument	Description
Asset	(in) asset point number
piNumDescendents	(out) number of descendents
ppDescendents	(out) array of descendents

Description

This functions returns the asset descendents for the specified asset.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned with `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumDescendents = 0;
PNTNUM *pDescendents = NULL
if (hsc_asset_get_descendents (point,
&iNumDescendents, &pDescendents) ! = 0)
```

```
        return -1
    .
    .
    .
    hsc_em_FreePointList (pDescendents);
```

hsc_asset_get_parents

Gets the parent assets of an asset.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_asset_get_parents
(
    PNTNUM   ASSET
    int*     piNumParents
    PNTNUM** ppParents
);
```

Arguments

Argument	Description
Asset	(in) asset point number
piNumParents	(out) number of parents
ppParents	(out) array of parents

Description

This functions returns the asset parents for the specified asset.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned with `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumParents = 0;
PNTNUM *pParents = NULL
if (hsc_asset_get_parents (point, &iNumParents,
&pParents) ! = 0)
```

```
        return -1
    .
    .
    .
    hsc_em_FreePointList (pParents);
```

hsc_em_FreePointList

Frees the memory used to hold a list of points.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_em_FreePointList
(
    PNTNUM*   pPointList
);
```

Arguments

Argument	Description
pPointList	(in) pointer to point list

Description

This function frees the memory used to hold a list of points.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned with `errno` set.

hsc_em_GetLastPointChangeTime

Gets the last time a point was changed.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

void hsc_em_GetLastPointChangeTime
(
     HSCTIME*   pTime
);
```

Description

This function returns the last time that a point was changed on the server due to a Quick Builder or Enterprise Model Builder download.

hsc_em_GetRootAlarmGroups

Gets the point numbers of the root alarm groups.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_em_GetRootAlarmGroups
(
    int*      pCount
    PNTNUM**  ppRootAlarmGroups
);
```

Arguments

Argument	Description
pCount	(out) number of root alarm groups
ppRootAlarmGroups	(out) array of root alarm groups

Description

This function returns the point numbers for all of the root alarm groups.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned with `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumRootAlarmGroups = 0;
PNTNUM *pRootAlarmGroups = NULL
if (hsc_em_GetRootAlarmGroups
(&iNumRootAlarmGroups, &pRootAlarmGroups) ! = 0)
    return -1
.
```

```
.
.
hsc_em_FreePointList (pRootAlarmGroups);
```

hsc_em_GetRootAssets

Gets the point numbers for root assets.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_em_GetRootAssets
(
    int*      pCount
    PNTNUM**  ppRootAssets
);
```

Arguments

Argument	Description
pCount	(out) number of root assets
ppRootAssets	(out) array of root assets

Description

This function returns the point numbers for all of the root assets.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned with `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumRootAssets = 0;
PNTNUM *pRootAssets = NULL
if (hsc_em_GetRootAssets (&iNumRootAssets,
&pRootAssets) ! = 0)
    return -1
.
```

```
.
.
hsc_em_FreePointList (pRootAssets);
```

hsc_em_GetRootEntities

Gets the point numbers for all root entities.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_em_GetRootEntities
(
    int*      pCount
    PNTNUM**  ppRootEntities
);
```

Arguments

Argument	Description
pCount	(out) number of root entities
ppRootEntities	(out) array of root entities

Description

This function returns the point numbers for all of the root entities in the enterprise model.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned with `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumRootEntities = 0;
PNTNUM *pRootEntities = NULL
if (hsc_em_GetRootEntities (&iNumRootEntities,
&pRootEntities) ! = 0)
    return -1
```

```
.
.
.
hsc_em_FreePointList (pRootEntities);
```

hsc_enumlist_destroy

Safely destroys an enumlist.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_enumlist_destroy
(
    enumlist**   list
);
```

Arguments

Argument	Description
List	(in) pointer to an enumeration list.

Description

This function deallocates all strings in an enumeration list along with the array itself.

Diagnostic

The return value will be 0 if successful, -1 with **errno** set otherwise.

Example

Retrieve the enumerated list of values for Pntana1's MD parameter and output this list.

```
#include <src\defs.h>
#include <src\points.h>
PNTNUM    point;
PRMNUM    param;
enumlist* list;
int       i,n;

point = hsc_point_number("Pntana1");
```

```
param = hsc_param_number(point,"MD");
n = hsc_param_enum_list_create(point,param, &list);
for(i=0;i<n;i++)
    c_logmsg("example","enum_listcall",
             "%10s\
t%d",list[i].text,list[i].value);
    /*process enumlist*/
  hsc_enumlist_destroy (&list);
```

hsc_GUIDFromString

Converts a GUID from string format to binary format.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_GUIDFromString
(
    char*   szGUID
    GUID*   pGUID
);
```

Arguments

Argument	Description
szGUID	(in) GUID in string format
pGUID	(out) GUID in binary format

Description

This function converts a GUID from string format to binary format.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned with `errno` set.

hsc_insert_attrib

Sets an attribute (identified by name) into a notification structure.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

int hsc_insert_attrib
(
    NOTIF_STRUCT*    notification,
    char*            attribute_name,
    PARvalue*        value,
    int2             type
);
```

Arguments

Argument	Description
notification	(in/out) A pointer to the notification structure.
attribute_name	(in) The name of the attribute to set. See “Attribute Names and Index Values” on page 198 for a list of attribute names.

Argument	Description

value	(in) A pointer to PARvalue that contains the attribute value. PARvalue is a union of data types and its definition is (definition from include\src\points.h):
	`typedef union`
	`{`
	`GDAVARIANT var;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`short int2;`
	`long int4;`
	`int8 int8;`
	`float real;`
	`double dble;`
	`struct {`
	`long ord;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`} en;`
	`struct {`
	`ULONG cSize; /* size of serialized variant */`
	`BYTE *pData; /* pointer to serialized variant */`
	`} servar;`
	`HSCTIME time;`
	`} PARvalue;`

type	(in) The value type being passed.

Description

This function sets an attribute in the notification structure that you provide.

The category attribute must be the first attribute set and can only be set once within a notification structure. If you do not set category as the first attribute, INV_CATEGORY is the return error and the specified attribute is not set. Once you have set the category attribute, you can set other attributes.

This function will attempt to convert the attribute value type from the specified type to the default type for that attribute. If this function cannot convert the specified type to the default type, VALUE_COULD_NOT_BE_CONVERTED is the return error. If this function does not know the specified type, ILLEGAL_TYPE is the return error.

This function validates the attribute values for asset and category. If the area attribute value is invalid, INV_AREA is the return error, and if the category value is invalid, INV_CATEGORY is the return error. This function also validates the attribute values for station and priority. If these attribute values are invalid, BAD_VALUE is the return error.

Diagnostics

If the function is successful, the return value is HSC_OK, otherwise the return value is HSC_ERROR and errno is set.

The possible errors returned are:

BAD_VALUE	The specified attribute value is not valid for this attribute.
BUFFER_TOO_SMALL	The pointer to the notification structure buffer is invalid, that is, null.
INV_ATTRIBUTE	The specified attribute name does not exist, or you do not have access to manipulate it.
ILLEGAL_TYPE	The specified type does not exist.
INV_AREA	The specified area attribute is not a valid asset.
VALUE_COULD_NOT_BE_CONVERTED	The type could not be converted from the specified type to the default type for that attribute.
ATTR_NOT_IN_CAT	The specified attribute does not belong to this category. For a list of valid attributes for a category, see “Valid Attributes for a Category” on page 201.
INV_CATEGORY	The category for this notification has not been set or the passed category value is not a valid category.
CAT_ALREADY_ASSIGNED	The category for this notification has already been set and cannot be reset.

Example

The following example creates a notification structure for a system alarm, setting the description to “Server API Alarm”, the priority to ALMMSG_LOW, the subpriority to 0, and the value to 4.

```
#include <src\defs.h>
#include "src\almmsg.h"

// declare and clear space for notification
NOTIF_STRUCT myNotification;
memset(&myNotification, 0, sizeof(myNotification));

// PARvalue Buffer
PARvalue pvTmp;

// (mandatory) first insert category Attribute (by name)
if (hsc_insert_attrib(&myNotification, "Category", StrtoPV("System Alarm",
&pvTmp), DT_CHAR)
     == HSC_ERROR)
```

```
    c_logmsg ("example","hsc_insert_attrib call",
                "Unable to insert category attribute [%s],errno=%x",
       pvTmp.text, errno);

// insert description attribute
if (hsc_insert_attrib(&myNotification, "Description", StrtoPV("Server API
Alarm", &pvTmp), DT_CHAR)
     == HSC_ERROR)
    c_logmsg ("example","hsc_insert_attrib call",
                "Unable to insert description attribute [%s],errno=%x",
       pvTmp.text, errno);

// insert priority of ALMMSG_LOW and subpriority 0
if (hsc_insert_attrib(&myNotification, "Priority", PritoPV(ALMMSG_LOW, 0,
&pvTmp), DT_INT2)
     == HSC_ERROR)
    c_logmsg ("example","hsc_insert_attrib call",
                "Unable to insert priority attribute [%hd],errno=%x",
       pvTmp.int2, errno);

// insert value attribute of 5 and specify type INT4
if (hsc_insert_attrib(&myNotification, "Value", Int4toPV(5, &pvTmp), DT_
INT4)
     == HSC_ERROR)
    c_logmsg ("example","hsc_insert_attrib call",
                "Unable to insert value attribute [%d],errno=%x",
       pvTmp.int4, errno);
```

See also

DbletoPV

hsc_insert_attrib_byindex

hsc_notif_send

Int2toPV

Int4toPV

PritoPV

RealtoPV

StrtoPV

TimetoPV

Attribute Names and Index Values

The following table lists the attribute names, the index value associated with the attribute name, and the default data type for the attribute.

Attribute Name	Index Value	Date Type	Description
Flexible attribute Attribute name, description, and number defined in the `SysCfgSum System Attributes` display.	ALMEVTFLEXBASEIDX + *<Flexible Attribute Number>* For example, ALMEVTFLEXBASE IDX+5	DT_VAR	Flexible values. As the data type is `DT_VAR`, the optional type argument must be set.
Action	ALMEVTACTIDX	DT_CHAR	The maximum size is `ALMACTUNT_SZ`.
Actor	ALMEVTACTORIDX	DT_CHAR	The actor, for example, an operator. The maximum size is `ALMEVTACTOR_SZ`.
Area code	ALMEVTACDIDX	DT_INT2 or DT_CHAR	If you specify `DT_CHAR`, you must specify the asset name. If you specify `DT_INT2`, you must specify the asset number. Must be a valid asset. If no area code attribute is created within the notification, the `hsc_notif_send` function assigns the system asset to the notification.
Category ID	ALMEVTCATIDX	DT_INT4 or DT_CHAR	If you specify `DT_CHAR`, you must specify the category name. If you specify `DT_INT4`, you must specify the category index.
Comment	ALMEVTCOMMENTIDX	DT_CHAR	The maximum size is `ALMEVTCOMMENT_SZ`.
Condition	ALMEVTCONIDX	DT_CHAR	The maximum size is `ALMEVTCON_SZ`.
Description	ALMEVTDESIDX	DT_CHAR	A description. The maximum size is `ALMEVTDES_SZ`.
Limit	ALMEVTLIMIDX	DT_DBLE	The alarm limit.

Attribute Name	Index Value	Date Type	Description
Link 1	ALMEVTLINK1IDX	DT_CHAR	A navigation link. The maximum size is `ALMEVTLINK_SZ`.
Link 1 Type	ALMEVTLINK1TYPEIDX	DT_INT2	Set to the default value when Link 1 is set. Link types are defined in the `almmsg.h` file.
Link 2	ALMEVTLINK2IDX	DT_CHAR	A navigation link. The maximum size is `ALMEVTLINK_SZ`.
Link 2 Type	ALMEVTLINK2TYPEIDX	DT_INT2	Set to the default value when Link 2 is set. Link types are defined in the `almmsg.h` file.
Link 3	ALMEVTLINK3IDX	DT_CHAR	A navigation link. The maximum size is `ALMEVTLINK_SZ`.
Link 3 Type	ALMEVTLINK3TYPEIDX	DT_INT2	Set to the default value when Link 3 is set. Link types are defined in the `almmsg.h` file.
Previous value	ALMEVTPREVVALIDX	DT_VAR	
Priority	ALMEVTPRIIDX	DT_INT2	Includes both the priority and subpriority value. Use the PritoPV function to set this attribute. Both the priority and subpriority values must be set.
Quality	ALMEVTQUALIDX	DT_INT2	OPC Quality value. Default value set to `c0` if not set.
Reason	ALMEVTREASONIDX	DT_CHAR	The signature reason. The maximum size is `ALMEVTREASON_SZ`. *Pharma license only.*
Severity	ALMEVTSEVIDX	DT_INT4	The OPC severity.
Signature 2 Level	ALMEVTSIG2LEVELIDX	DT_CHAR	*Pharma license only.*
Signature 2 Meaning	ALMEVTSIGNMEAN2IDX	DT_CHAR	The maximum size is ALMEVTSIGMEAN_SZ. *Pharma license only.*
Signature Meaning	ALMEVTSIGNMEANIDX	DT_CHAR	The maximum size is ALMEVTSIGMEAN_SZ. *Pharma license only.*

Attribute Name	Index Value	Date Type	Description
Source	ALMEVTSRCIDX	DT_CHAR	The point name. The maximum size is ALMEVTSRC_SZ.
Station	ALMEVTSTNIDX	DT_INT2 or DT_CHAR	If you specify DT_INT2, the string will be formatted. Otherwise, DT_CHAR is assumed. Must be a valid station.
Subcondition	ALMEVTSUBCONIDX	DT_CHAR	The maximum size is ALMEVTCON_SZ.
Units	ALMEVTUNTIDX	DT_CHAR	The maximum size is ALMEVTUNT_SZ.
Value	ALMEVTVALIDX	DT_VAR	

Valid Attributes for a Category

The following table shows default association of attributes available in categories. Only attribute names indicated with an X can be set for each category name.

You can view the categories, and the attributes available in that category, in the syscfgsumsystemcategories system display.

Attribute Name	Category Name (Category Index)									
	Process Alarm(1)	SystemAlarm(3)	InfoMessage (4)	Operator Change (7)	SystemChange(8)	SOE(9)	Delay(10)	ConfirmationMessage (11)	ProcessEvent (12)	SystemEvent (1)
Action				X	X					
Actor				X	X					
Area	X	X	X	X	X	X	X	X	X	X
Area code	X	X	X	X	X	X	X	X	X	X
Category ID	X	X	X	X	X	X	X	X	X	X
Comment	X					X			X	X
Condition	X	X	X	X	X	X	X	X	X	X
Description	X	X	X	X	X	X	X	X	X	X
Limit	X			X	X	X		X	X	X
Link 1	X	X	X	X	X	X		X	X	X
Link 1 Type	X	X	X	X	X	X		X	X	X
Link 2	X	X	X	X	X	X		X	X	X
Link 2 Type	X	X	X	X	X	X		X	X	X
Link 3	X	X	X	X	X	X		X	X	X
Link 3 Type	X	X	X	X	X	X		X	X	X
Previous value		X		X	X	X				
Priority	X	X	X					X	X	X
Quality	X	X	X	X	X	X	X	X	X	X
Reason								X		
Severity	X	X	X	X	X	X	X	X	X	X
Signature 2 Level								X		

Attribute Name	Category Name (Category Index)									
	Process Alarm(1)	SystemAlarm(3)	InfoMessage (4)	Operator Change (7)	SystemChange(8)	SOE(9)	Delay(10)	ConfirmationMessage (11)	ProcessEvent (12)	SystemEvent (1)
Signature 2 Meaning								X		
Signature Meaning								X		
Source	X	X	X	X	X	X	X	X	X	X
Station				X						
Subcondition	X	X	X			X	X	X		
Units	X	X	X	X	X	X	X	X	X	X
Value	X	X	X	X	X	X	X	X	X	X

hsc_insert_attrib_byindex

Sets an attribute (identified by its numeric index) into a notification structure.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

int hsc_insert_attrib_byindex
(
    NOTIF_STRUCT*    notification,
    int2             attribute_index,
    PARvalue*        value,
    int2             type
);
```

Arguments

Argument	Description
notification	(in/out) A pointer to the notification structure.
attribute_index	(in) The index value of the attribute to insert. See “Attribute Names and Index Values” on page 198 for a list of index values.

Argument	Description

value	(in) A pointer to PARvalue that contains the attribute value. PARvalue is a union of data types and its definition is (definition from include\src\points.h):
	`typedef union`
	`{`
	`GDAVARIANT var;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`short int2;`
	`long int4;`
	`int8 int8;`
	`float real;`
	`double dble;`
	`struct {`
	`long ord;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`} en;`
	`struct {`
	`ULONG cSize; /* size of serialized variant */`
	`BYTE *pData; /* pointer to serialized variant */`
	`} servar;`
	`HSCTIME time;`
	`} PARvalue;`

type	(in) The value type being passed.

Description

This function sets an attribute in the notification structure that you provide.

The ALMEVTCATIDX (category) attribute must be the first attribute set and can only be set once within a notification structure. If you do not set ALMEVTCATIDX as the first attribute, INV_CATEGORY is the return error and the specified attribute is not set. Once you have set the ALMEVTCATIDX attribute, you can set other attributes.

This function will attempt to convert the attribute value type from the specified type to the default type for that attribute. If this function cannot convert the specified type to the default type, VALUE_COULD_NOT_BE_CONVERTED is the return error. If this function does not know the specified type, ILLEGAL_TYPE is the return error.

This function validates the attribute values for asset and category. If the area attribute value is invalid, INV_AREA is the return error, and if the category value is invalid, INV_CATEGORY is the return error. This function also validates the attribute values for station and priority. If these attribute values are invalid, BAD_VALUE is the return error.

Diagnostics

If the function is successful, the return value is HSC_OK, otherwise the return value is HSC_ERROR and errno is set.

The possible errors returned are:

BAD_VALUE	The specified attribute value is not valid for this attribute.
BUFFER_TOO_SMALL	The pointer to the notification structure buffer is invalid, that is, null.
INV_ATTRIBUTE	The specified attribute name does not exist, or you do not have access to manipulate it.
ILLEGAL_TYPE	The specified type does not exist.
INV_AREA	The specified area attribute is not a valid asset.
VALUE_COULD_NOT_BE_CONVERTED	The type could not be converted from the specified type to the default type for that attribute.
ATTR_NOT_IN_CAT	The specified attribute does not belong to this category. For a list of valid attributes for a category, see “Valid Attributes for a Category” on page 201.
INV_CATEGORY	The category for this notification has not been set or the passed category value is not a valid category.
CAT_ALREADY_ASSIGNED	The category for this notification has already been set and cannot be reset.

Example

The following example creates a notification structure for a system alarm, setting the description to “Server API Alarm”, the priority to ALMMSG_LOW, the subpriority to 0, and the value to 4.

```
#include <src\defs.h>
#include "src\almmsg.h"

// declare and clear space for notification
NOTIF_STRUCT myNotification;
memset(&myNotification, 0, sizeof(myNotification));

// PARvalue Buffer
```

```
PARvalue pvTmp;

// (mandatory) first insert category Attribute (by name)
if (hsc_insert_attrib_byindex (&myNotification, ALMEVTCATIDX,
StrtoPV("System Alarm", &pvTmp), DT_CHAR)
     == HSC_ERROR)
    c_logmsg ("example","hsc_insert_attrib call",
                "Unable to insert category attribute [%s],errno=%x",
       pvTmp.text, errno);

// insert description attribute
if (hsc_insert_attrib_byindex(&myNotification, ALMEVTDESIDX,
StrtoPV("Server API Alarm", &pvTmp), DT_CHAR)
     == HSC_ERROR)
    c_logmsg ("example","hsc_insert_attrib call",
                "Unable to insert description attribute [%s],errno=%x",
       pvTmp.text, errno);

// insert priority of ALMMSG_LOW and subpriority 0
if (hsc_insert_attrib_byindex(&myNotification, ALMEVTPRIIDX,
PritoPV(ALMMSG_LOW, 0, &pvTmp), DT_INT2)
     == HSC_ERROR)
    c_logmsg ("example","hsc_insert_attrib call",
                "Unable to insert priority attribute [%hd],errno=%x",
       pvTmp.int2, errno);

// insert value attribute of 5 and specify type INT4
if (hsc_insert_attrib_byindex(&myNotification, ALMEVTVALIDX, Int4toPV(5,
&pvTmp), DT_INT4)
     == HSC_ERROR)
    c_logmsg ("example","hsc_insert_attrib call",
                "Unable to insert value attribute [%d],errno=%x",
       pvTmp.int4, errno);
```

See also

DbletoPV

hsc_insert_attrib

hsc_notif_send

Int2toPV

Int4toPV

PritoPV

RealtoPV

StrtoPV

TimetoPV

hsc_IsError

Determines whether a returned status value is an error.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err_def>

int hsc_IsError
(
    int    code
);
```

Arguments

Argument	Description
code	(in) The status code to check.

Description

This function determines whether a particular status code is an error. Most C functions indicate success by returning a 0 in the return value. If a function returns a non-zero value, the actual error code is normally set in the global value `errno`. This value can then be checked to see if it indicates an error or warning.

Status values can indicate an error, a warning, or success. Some functions return a GDAERR structure instead. Use the macro IsGDAerror to check this value for an error.

Diagnostics

This routine returns TRUE (-1) if `code` indicates an error condition, otherwise it returns FALSE (0).

See also

hsc_IsWarning

IsGDAerror

hsc_IsWarning

Determines whether a returned status value is a warning.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err_def>

int hsc_IsWarning
(
    int    code
);
```

Arguments

Argument	Description
code	(in) The status code to check.

Description

This function determines whether a particular status code is warning. Most C functions indicate success by returning a 0 in the return value. If a function returns a non-zero value, the actual error code is normally set in the global value `errno`. This value can then be checked to see if it indicates an error or warning.

Status values can indicate an error, a warning, or success. Some functions return a GDAERR structure instead. Use the macro `IsGDAerror` to check this value for an error.

Diagnostics

This routine returns TRUE (-1) `code` indicates an warning condition, otherwise it returns FALSE (0).

See also

hsc_IsError

IsGDAwarning

hsc_lock_file

Locks a database file.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int hsc_lock_file(file, delay)
(
    int file
    int delay
);
```

Arguments

Argument	Description
file	(in) server file number.
delay	(in) delay time in milliseconds before lock attempt will fail.

Description

This routine is used to perform advisory locking of database files. Advisory locking means that the tasks that use the file take responsibility for setting and removing locks as needed.

For more information regarding database locking see “Ensuring database consistency” on page 78.

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and **error** is set to one of the following error codes:

[FILLCK]	File locked to another task
[RECLCK]	Record locked to another task
[DIRLCK]	File’s directory locked to another task
[BADFIL]	Illegal file number specified

See also

hsc_lock_record

hsc_unlock_file

hsc_unlock_record

hsc_lock_record

Lock a record of a database file.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int hsc_lock_record(file, record, delay)
(
    int file
    int record
    int delay
);
```

Arguments

Argument	Description
file	(in) server file number.
record	(in) record number (see description).
delay	(in) delay time in milliseconds before lock attempt will fail.

Description

This routine is used to perform advisory locking of database file. Advisory locking means that the tasks that use the file take responsibility for setting and removing locks as needed.

For more information regarding database locking see “Ensuring database consistency” on page 78.

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and **error** is set to one of the following error codes:

[FILLCK]	File locked to another task
[RECLCK]	Record locked to another task
[DIRLCK]	Folder locked to another task

`[BADFIL]`	Illegal file number specified
`[BADRECD]`	Illegal record number specified

See also

hsc_lock_file

hsc_unlock_file

hsc_unlock_record

hsc_notif_send

Send notification structure.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

int hsc_notif_send
(
    NOTIF_STRUCT*    notification
    NOTIF_SEND_MODE  mode
);
```

Arguments

Argument	Description
notification	(in) A pointer to the notification structure.
mode	(in) The mode to send the notification. • RAISE sends the notification in the unacknowledged and off-normal state. • RAISE_NORMALIZED sends the notification in the unacknowledged and normal state. • NORMALIZE changes the state of a previous notification with identical source and condition, from off-normal to normal.

Description

This function sends a notification created using the hsc_insert_attrib and hsc_insert_attrib_byindex functions, for storing in the alarm and/or event file or message directory, and printing on printers, depending on the category set in the notification structure buffer.

This function validates the attribute values for asset, tagname, and Station. If these attributes are not explicitly set, this function sets them to their default values.

Diagnostics

If the function is successful, the return value is HSC_OK, otherwise the return value is HSC_ERROR and errno is set.

The possible errors returned are:

BUFFER_TOO_SMALL	The pointer to the notification is invalid, that is, null.
INV_CATEGORY	The notification does not have a valid category set.
M4_QEMPTY	The file could not be queued to the printer because the printer queue has no free records.

Example

The following example sends an unacknowledged and off-normal alarm and then returns that alarm to normal.

```
#include <src\defs.h>
#include <src\almmsg.h>

// declare and clear space for notification
NOTIF_STRUCT myNotification;
memset(&myNotification, 0, sizeof(myNotification));

// PARvalue Buffer
PARvalue pvTmp;

// (mandatory) first insert category Attribute (by name)
if (hsc_insert_attrib(&myNotification, "Category", StrtoPV("System Alarm",
&pvTmp), DT_CHAR)
     == HSC_ERROR)
   c_logmsg ("example","hsc_insert_attrib call",
              "Unable to insert category attribute [%s],errno=%x",
      pvTmp.text, errno);

// insert description attribute
if (hsc_insert_attrib(&myNotification, "Description", StrtoPV("Server API
Alarm", &pvTmp), DT_CHAR)
     == HSC_ERROR)
   c_logmsg ("example","hsc_insert_attrib call",
              "Unable to insert description attribute [%s],errno=%x",
      pvTmp.text, errno);

// insert priority of ALMMSG_HIGH and subpriority 0
if (hsc_insert_attrib(&myNotification, "Priority", PritoPV(ALMMSG_HIGH, 0,
&pvTmp), DT_INT2)
     == HSC_ERROR)
   c_logmsg ("example","hsc_insert_attrib call",
              "Unable to insert priority attribute [%hd],errno=%x",
```

```
       pvTmp.int2, errno);

// insert value attribute of 5 and specify type INT4
if (hsc_insert_attrib(&myNotification, "Value", Int4toPV(5, &pvTmp), DT_
INT4)
     == HSC_ERROR)
   c_logmsg ("example","hsc_insert_attrib call",
               "Unable to insert value attribute [%d],errno=%x",
       pvTmp.int4, errno);

// insert source of "API call"
if (hsc_insert_attrib(&myNotification, "Source", StrtoPV("API Call",
&pvTmp), DT_CHAR)
     == HSC_ERROR)
   c_logmsg ("example","hsc_insert_attrib call",
               "Unable to insert source attribute [%s],errno=%x",
       pvTmp.text, errno);

// insert condition of "APICALL"
if (hsc_insert_attrib(&myNotification, "Condition", StrtoPV("APICALL",
&pvTmp), DT_CHAR)
     == HSC_ERROR)
   c_logmsg ("example","hsc_insert_attrib call",
               "Unable to insert source attribute [%s],errno=%x",
       pvTmp.text, errno);

// send notification in unacked and off-normal state
if (hsc_notif_send(&myNotification, RAISE)
     == HSC_ERROR)
   c_logmsg ("example","hsc_notif_send call",
               "hsc_notif_send failed with errno=%x",
       errno);

// return this alarm to normal
if (hsc_notif_send(&myNotification, NORMALIZE)
     == HSC_ERROR)
   c_logmsg ("example","hsc_notif_send call",
               "hsc_notif_send failed with errno=%x",
       errno);
```

See also

DbletoPV

hsc_insert_attrib

hsc_insert_attrib_byindex

Int2toPV

Int4toPV

PritoPV

RealtoPV

StrtoPV

TimetoPV

hsc_param_enum_list_create

Get an enumerated list of parameter values.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_enum_list_create
(
    PNTNUM     point,
    PRMNUM     param,
    enumlist** list
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) point parameter number

list	(in/out) pointer to an enumeration list of parameters `enumlist` is defined as (definition from `include\src\dictionary.h`):
	`typedef struct`
	`{`
	`int value;`
	`char* text;`
	`} enumlist;`
	• `value` is the ordinal value of the enumeration
	• `text` is the null terminated string containing the enumeration text

Description

This routine will return a list of enumeration strings for the point parameter value, where applicable.

Diagnostics

The return value will be the number of entries in the list or -1 and `errno` set if an error was encountered.

In all cases the enumlist structure is created by **`hsc_param_enum_list_create`** with enough space for the text field in each enumlist element in the enumlist array. Because this memory is allocated by the function, your user code needs to free this space when you finish using the structure. As these functions always allocate the memory required for the text field, make sure that you free all memory before calling the routines a second time with the same enumlist** pointer, otherwise there will be a memory leak. To facilitate freeing this memory, **`hsc_enumlist_destroy`** has been added to the API.

Example

Retrieve the enumerated list of values for Pntana1's MD parameter and output this list.

```
#include <src\defs.h>
#include <src\points.h>
PNTNUM    point;
PRMNUM    param;
enumlist* list;
int       i,n;

point = hsc_point_number("Pntana1");
param = hsc_param_number(point,"MD");
n = hsc_param_enum_list_create(point,param, &list);
for(i=0;i<n;i++)
    c_logmsg("example","enum_listcall","%10s\
t%d",list[i].text,list[i].value);
    /*process enumlist*/
    hsc_enumlist_destroy (&list);
```

See also

hsc_param_enum_ordinal

hsc_enumlist_destroy

hsc_param_enum_ordinal

Get an enumeration's ordinal value.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_enum_ordinal
(
    PNTNUM   point,
    PRMNUM   param,
    char*    string
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) point parameter number
string	(in) enumeration string

Description

This routine will return the ordinal value that corresponds to the enumeration string for the point parameter.

Diagnostics

This routine will return the ordinal number on success and -1 with `errno` set if an error was encountered.

Example

Determine the ordinal number of the enumeration "AUTO" for "MD" parameter for point "Pntana1".

```
#include <src\defs.h>
#include <src\points.h>
PNTNUM    point;
PRMNUM    param;
```

```
int4      ordinal;

point = hsc_point_number("Pntana1");
param = hsc_param_number(point,"MD");
if((ordinal=hsc_param_enum_ordinal
  (point,param,"AUTO"))<0)
    c_logmsg("example","ord call",
             "call to hsc_param_enum_ordinal failed,
              error=%d", errno);
else
    c_logmsg("example","ord call",
             "Ordinal value for AUTO is %d.",ordinal);
```

hsc_param_enum_string

Gets an enumeration string.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

char* hsc_param_enum_string
(
    PNTNUM   point,
    PRMNUM   param,
    int4     ordinal
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) point parameter number
ordinal	(in) enumeration ordinal value

Description

This routine will return the enumeration string that corresponds to the ordinal value for the point parameter.

Diagnostic

This routine will return the enumeration string, or NULL with errno set.

The enumeration string must be freed by the caller using the system call free().

hsc_param_format

Get a parameter's format.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_format
(
    PNTNUM   point,
    PRMNUM   param
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) parameter number

Description

This routine will return the format of the specified point parameter, and will be one of the following, or negative if invalid:

```
DF_CHAR,       /* character           */
DF_NUM,        /* numeric             */
DF_POINT,      /* point name          */
DF_PARAM,      /* parameter name      */
DF_ENG,        /* engineering units   */
DF_PCT,        /* percent             */
DF_ENUM,       /* enumerated          */
DF_MODE,       /* enumerated mode     */
DF_BIT,        /* TRUE/FALSE          */
DF_STATE,      /* state descriptor    */
DF_PNTTYPE,    /* point type          */
DF_TIME,       /* time                */
```

```
DF_DATE,       /* date                */
DF_DATE_TIME, /* time stamp           */
DF_GETVAL      /* format as pnt-param */
```

Example

Determine what the data format of the parameter “PointDetailDisplayDefault” of point “pntana1”, and output this format’s value.

```
#include <src\defs.h>
#include <src\points.h>
PRMNUM param;
PNTNUM point;
int paramFormat;

point = hsc_point_number("pntana1");
param = hsc_param_number(point,
     "PointDetailDisplayDefault");
if((paramFormat = hsc_param_format(point, param)) < 0)
    c_logmsg ("example","param_format call",
              "Error getting param format for point %d, param %d", point,
param);
else
    c_logmsg ("example","param_format call",
              "Param format of point %d, parameter %d is %d", point,
param,
               paramFormat);
```

See also

hsc_param_type

hsc_param_limits

Get parameter data entry limits.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_limits
(
    PNTNUM   point,
    PRMNUM   param,
    double*  min,
    double*  max
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) parameter number
min	(out) minimum value
max	(out) maximum value

Description

This routine will return the minimum and maximum data entry limits of the specified point parameter.

Diagnostics

This function always returns 0. If an error occurs min will be set to 0.0 and max to 100.0.

Example

Find the parameter limits for point “pntana1” and parameter “SP” and output them.

```
#include <src\defs.h>
#include <src\points.h>
PRMNUM param;
PNTNUM point;
double limitMin, limitMax;

point = hsc_point_number("pntana1");
param = hsc_param_number(point, "SP");
if(hsc_param_limits(point, param, &limitMin,
   &limit Max) != 0)
    c_logmsg ("example","param_limits call",
              "Error getting param limits for point %d, param %d", point,
param);
else
    c_logmsg ("example","param_limits call",
              "Param limits of point %d, parameter %d are %f -> %f "
  , point, param, limitMin, limitMax);
```

See also

hsc_param_type

hsc_param_subscribe

Subscribe to a list of point parameters.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_subscribe
(
    int     number,
    PNTNUM* points,
    PRMNUM* param,
    int     period
);
```

Arguments

Argument	Description
number	(in) number of entries in lists
points	(in) list of point numbers
params	(in) list of parameter numbers
period	(in) subscription period (msecs)

Description

This routine will declare interest in point parameters so that data will be available in the point record, without the need to fetch it from the appropriate location.

Diagnostics

This function will return 0 if successful, otherwise the relevant status code will be returned.

See also

hsc_param_values

hsc_param_list_create

Get a list of parameters.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_list_create
(
    PNTNUM       point,
    enumlist**   list
);
```

Arguments

Argument	Description
point	(in) point number, specify 0 for all parameters of all point types

list	(in/out) pointer to an enumeration list of parameters `enumlist` is defined as (definition from `include\src\dictionary.h`):
	`typedef struct`
	`{`
	`int value;`
	`char* text;`
	`} enumlist;`
	• `value` is the parameter number if the parameter is currently stored in the server database. A zero value may indicate a parameter has not previously been accessed. To obtain the parameter number use hsc_param_number.
	• `text` is the null terminated string containing the parameter name

Description

This routine returns pointer to a list of names and numbers for the point's parameters.

Diagnostics

The return value of this function indicates the number of parameters stored in the list structure.

In all cases the enumlist structure is created by **`hsc_param_list_create`** with enough space for the text field in each enumlist element in the enumlist array. Because this memory is allocated by the function, your user code needs to free this space when you finish using the structure. As these functions always allocate the memory required for the text field, make sure that you free all memory before calling the routines a second time with the same enumlist** pointer, otherwise there will be a memory leak. To facilitate freeing this memory, **`hsc_enumlist_destroy`** is included in the API.

Example

Retrieves all the parameters for point “pntana1”, and print out the name.

```
#include <src\defs.h>
#include <src\points.h>
#define LISTSZ 1000
enumlist* list;
int n,i;
PNTNUM point;

point = hsc_point_number(“pntana1”);
n = hsc_param_list_create(point, &list);
for (i=0; i<n; i++)
    c_logmsg (“example”,“param_list call”,
              “parameter %20s is %5d”,
               list[i].text,list[i].value);
```

See also

hsc_enumlist_destroy

hsc_param_number

hsc_param_name

Get a parameter name.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_name
(
    PNTNUM   point,
    PRMNUM   param,
    char*    name,
    int      namelen
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) parameter number
name	(out) parameter name
namelen	(in) length of name string

Description

The parameter name is returned for the parameter number of the point specified. Note that the char buffer needs to be big enough to store the parameter name in it, and that this length (of the buffer) must be passed in the function.

Example

The parameter name for the parameter numbered 16 is returned for point “pntana1”, and prints it out.

```
#include <src\defs.h>
#include <src\points.h>
PNTNUM point;
PRMNUM param;
char paramName[20];
```

```
point = hsc_point_number("pntana1");
param = 16;
hsc_param_name(point,param,paramName,20);
c_logmsg ("example","param_list call",
          "Parameter %s is parameter number %d for point %s.", paramName,
param,
  point);
```

See also

hsc_param_number

hsc_param_number

Get a parameter number.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

PRMNUM hsc_param_number
(
    PNTNUM    point,
    char*     name
);
```

Arguments

Argument	Description
point	(in) point number
name	(in) parameter name

Description

This routine will return the number of the named point parameter. If the point number is zero, then ALL point types will be searched.

Diagnostics

If the parameter can not be found or an error occurs 0 will be returned with `errno` set.

If the point number is zero then all points are searched for the corresponding parameter name. This will then return the first match to any fixed parameters of points in the system. It will not, however, resolve a flexible parameter name to a number, as this parameter number is specific to a point not all points.

Example

The parameter number for the parameter “PointDetailDisplayDefault” is returned for point “pntana1”, and is output.

```
#include <src\defs.h>
#include <src\points.h>
PNTNUM point;
PRMNUM param;
char *paramName = "PointDetailDisplayDefault";

point = hsc_point_number("pntana1");
param = hsc_param_number(point, paramName);
c_logmsg ("example","param_number call",
          "Parameter %s is parameter number %d for point number %d.",
  paramName, param, point);
```

See also

hsc_param_name

hsc_param_range

Get parameter data range.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_range
(
    PNTNUM    point,
    PRMNUM    param,
    double*   min,
    double*   max
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) parameter number
min	(out) minimum value
max	(out) maximum value

Description

This routine will return the minimum and maximum range of the specified point parameter.

Diagnostics

This function always returns 0. If an error occurs, min will be set to 0.0 and max to 100.0.

Example

Find the parameter ranges for point “pntana1” and parameter “SP” and output them.

```
#include <src\defs.h>
#include <src\points.h>
PRMNUM param;
PNTNUM point;
double rangeMin, rangeMax;

point = hsc_point_number("pntana1");
param = hsc_param_number(point, "SP");
if(hsc_param_range(point, param, &rangeMin, &rangeMax) != 0)
    c_logmsg ("example","param_range call",
              "Error getting param range for point %d, param %d",point,
param);
else
    c_logmsg ("example","param_range call",
                "Param range of point %d, parameter %d is %f -> %f",
  point, param, rangeMin, rangeMax);
```

See also

hsc_param_limits

hsc_param_type

Get a parameter's data type.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_type
(
    PNTNUM    point,
    PRMNUM    param
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) parameter number

Description

This routine will return the data type of the specified point parameter, and will be one of the following, or negative if invalid:

```
DT_CHAR       /* character string                        */
DT_INT2       /* 1 to 16 bit short integer               */
DT_INT4       /* 1 to 32 bit long integer                */
DT_REAL       /* short float                             */
DT_DBLE       /* long float                              */
DT_HIST       /* history (-0 => large float)             */
DT_VAR        /* variant                                 */
DT_ENUM       /* enumeration `                           */
DT_DATE_TIME  /* timestamp (integer*2 day, double sec)   */
DT_TIME       /* date and time (HSCTIME format)          */
DT_INT8       /* 64-bit integer                          */
DT_SRCADDR    /* source address                          */
DT_DSTADDR    /* destination address                     */
```

Example

Determine the data type of the parameter “PointDetailDisplayDefault” of point “pntana1”, and output this type’s value.

```
#include <src\defs.h>
#include <src\points.h>
PRMNUM param;
PNTNUM point;
int paramType;

point = hsc_point_number("pntana1");
param = hsc_param_number(point, "PointDetailDisplayDefault");
if((paramType = hsc_param_type(point, param)) < 0)
    c_logmsg ("example","param_type call",
              "Error getting param type for point %d, param %d",point,
param);
else
     c_logmsg ("example","param_type call",
               "Parameter type of point %d, parameter %d is %d",
  point, param, paramType);
```

See also

hsc_param_format

hsc_param_value

Get a point parameter value.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_value
(
    PNTNUM      point,
    PRMNUM      param,
    int*        offset,
    PARvalue*   value,
    uint2*      type
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) parameter number
offset	(in) point parameter offset (for history parameters).

Argument	Description

value	(out) value union
	PARvalue is a union of data types and is defined as follows (definition from include\src\points.h):
	typedef union
	{
	short int2;
	long int4;
	float real;
	double dble;
	char text[PARAM_MAX_STRING_LEN+1];
	struct {
	long ord;
	char text[PARAM_MAX_STRING_LEN+1];
	} en;
	} PARvalue;

type	(out) value data type (defined in the parameters file)

Description

The parameter's definition is located and used to access the point record using a common routine which returns the pointer to the data. The top level routine then extracts the value by type.

It is recommended that hsc_param_values ( ) be used in preference to this function, as it allows the subscription period to be specified.

Diagnostics

0 will be returned if successful, otherwise -1 will be returned with errno set. The value returned in type will be one of the following constants defined in the parameter file:

```
DT_CHAR       /* character string                      */
DT_INT2       /* 1 to 16 bit short integer             */
DT_INT4       /* 1 to 32 bit long integer              */
DT_REAL       /* short float                           */
DT_DBLE       /* long float                            */
DT_HIST       /* history (-0 => large float)           */
DT_VAR        /* variant                               */
DT_ENUM       /* enumeration `                         */
DT_DATE_TIME  /* timestamp (integer*2 day, double sec) */
DT_TIME       /* date and time (HSCTIME format)        */
DT_INT8       /* 64-bit integer                        */
```

```
DT_SRCADDR    /* source address                    */
DT_DSTADDR    /* destination address       */
```

See also

hsc_param_values

hsc_param_number

hsc_point_number

hsc_param_values

Get multiple point parameter values.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_param_values
(
    int          count    //(in)  #point-parameters
    int          period   //(in)  subscription period
    PNTNUM*      points   //(in)  point numbers
    PRMNUM*      params   //(in)  point parameter numbers
    int*         offsets  //(in)  point parameter offset
    PARvalue*    values   //(out) values
    uint2*       types    //(out)  value types
    int*         statuses //(out) return statuses
);
```

Arguments

Argument	Description
count	(in) the number of point parameters in the list to get.
period	(in) subscription period in milliseconds for the point parameters. Use the constant HSC_READ_CACHE if subscription is not required. If the value is in the Experion PKS cache, then that value will be returned. Otherwise the controller will be polled for the latest value. Use the constant HSC_READ_DEVICE if you want to force Experion PKS to poll the controller again. The subscription period will not be applied to standard point types.
points	(in) the list of point numbers.
params	(in) the list of point parameter numbers.
offsets	(in) the list of point parameter offsets (for history parameters).

Argument	Description

values	(out) the list of values. PARvalue is a union of all possible value data types and is defined as follows (definition from include\src\points.h):
	`typedef union`
	`{`
	`short int2;`
	`long int4;`
	`float real;`
	`double dble;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`struct {`
	`long ord;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`} en;`
	`} PARvalue;`

types	the list of value types.
statuses	(out) a list containing the status of the get for each point parameter.

Description

Retrieves the values for a list of point parameters and stores the values in the values union array and returns the data types in types.

Diagnostics

0 will be returned from this function upon successful completion, otherwise -1 will be returned with errno set. The values returned in types will be one of the following constants defined in include\parameters:

```
DT_CHAR       /* character string                       */
DT_INT2       /* 1 to 16 bit short integer              */
DT_INT4       /* 1 to 32 bit long integer               */
DT_REAL       /* short float                            */
DT_DBLE       /* long float                             */
DT_HIST       /* history (-0 => large float)            */
DT_VAR        /* variant                                */
DT_ENUM       /* enumeration `                          */
DT_DATE_TIME  /* timestamp (integer*2 day, double sec) */
DT_TIME       /* date and time (HSCTIME format)         */
DT_INT8       /* 64-bit integer                         */
DT_SRCADDR    /* source address                         */
DT_DSTADDR    /* destination address                    */
```

Example

Find the values of the Description and PV of Pntana1, and output them.

```
#include <src\defs.h>
#include <src\points.h>
PNTNUM   points[2];
PRMNUM   params[2];
int      offsets[2];
PARvalue values[2];
uint2    types[2];
int      statuses[2];
int      n;

if( (points[0] = hsc_point_number("Pntana1")) == 0 )
{   printf("pntana1 could not be found!\n");
    return -1;
}

points[1]=points[0];

if( (params[0] = hsc_param_number(points[0],"DESC")) == 0 )
{   printf("could not find parameter DESC, errno=%x\n",
  errno);
    return -1;
}

if( (params[1] = hsc_param_number(points[1],"PV")) == 0 )
{   printf("could not find parameter PV, errno=%x\n", errno);
    return -1;
}

offsets[0] = offsets[1] = 0;

if( hsc_param_values(2, ONE_SHOT, points, params, offsets,
                     values, types, statuses) !=0 )
{   printf("Unable to retrieve parameter, errno=%x\n",
  errno);
}
else
{
    for(n=0;n<2;n++)
    {   if(types[n]==DT_CHAR)
        {   printf("Point %d param %d is DT_CHAR and the value   %s\n",
```

```
                points[n],params[n],values[n].text);
            }
            else if(types[n]==DT_REAL)
            {   printf("Point %d param %d is DT_REAL and has value   %d\n",
                points[n],params[n],values[n].real);
            }
            else
            {   printf("Unexpected return type %d \n", types[n]);
            }
        }
    }
```

See also

hsc_param_value

hsc_param_number

hsc_point_number

hsc_param_value_put

Control a point parameter value.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\points.h>

int hsc_param_value_put
(
    PNTNUM          point,
    PRMNUM          param,
    int             offset,
    PARvalue*       value,
    uint2*          type
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) point parameter number
offset	(in) point parameter offset (for history parameters)

Argument	Description

value	(in) value. PARvalue is a union of data types and defined as (definition from include\src\points.h):
	`typedef union`
	`{`
	`short int2;`
	`long int4;`
	`float real;`
	`double dble;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`struct {`
	`long ord;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`} en;`
	`} PARvalue;`

type	(in) value type

Description

Sets a value for a point parameter in the server database and performs any control required by setting/changing the parameter's value.

Diagnostics

On successful write 0 is returned, else an error code is returned. If CTLOK (0x8220) is returned this is not actually an error but an indication that some control was executed successfully as a result of setting the parameter value.

Example

Change Pntana1's SP value to 42.0 and perform any required control.

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\points.h>
PNTNUM   point;
PRMNUM   param;
PARvalue value;
uint2    type;

point = hsc_point_number("Pntana1");
param = hsc_param_number(point,"SP");
value.real = (float)42.0;
type = DT_REAL;
if (hsc_param_value_put(point,param,0,&value,&type) == 0)
```

```
    c_logmsg ("example","param_value_put call",
             "Pntana1.SP was written and controlled successfully");
else
    c_logmsg ("example","param_value_put call",
             "Unable to write and/or control Pntana1.SP, errno=%x",
errno);
```

See also

hsc_param_number

hsc_point_number

hsc_param_values_put

hsc_param_values_put

Control a list of point parameter values

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\points.h>

int   hsc_param_values_put
(
    int          count,    // (in) number of parameter requests
    PNTNUM*      points,   // (in) point numbers
    PRMNUM*      params,   // (in) point parameter numbers
    int*         offsets,  // (in) point parameter offsets
    PARvalue*    values,   // (in) values
    uint2*       types,    // (in) value types
    GDAERR*      statuses, // (out) return statuses
    GDASECURITY* security  // (in) security descriptor
);
```

Arguments

Argument	Description
count	(in) the number of point parameters in the list to control
points	(in) the list of point numbers
params	(in) the list of point parameter numbers
offsets	(in) the list of point parameter offsets (for history parameters)

Argument	Description

values	(in) the list of values. PARvalue is a union of data types and defined as (definition from include\src\points.h):
	`typedef union`
	`{`
	`short int2;`
	`long int4;`
	`float real;`
	`double dble;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`struct {`
	`long ord;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`} en;`
	`} PARvalue;`

types	(in) the list of value types.
statuses	(out) a list containing the status of the put for each point parameter. GDAERR is defined in <hsctypes.h>.
security	(in) GDASECURITY is defined in <hsctypes.h>. Use a null pointer for this argument.

Description

Sets a value for an array of point parameters in the server database and performs any control required by setting/changing the parameter's value.

Diagnostics

On successful write 0 is returned, else an error code is returned.

The status of each control will be contained in the respective GDAERR structure. If CTLOK (0x8220) is returned this is not actually an error but an indication that some control was executed successfully as a result of setting the parameter value.

See also

hsc_param_number

hsc_point_number

hsc_param_value_put

hsc_param_value_put_priority

Control a point parameter value using the command and residual priorities. Only applicable to points on BACnet, R7044, DeltaNet and FS90+ controllers.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\points.h>

int hsc_param_value_put_priority
(
    PNTNUM      point,
    PRMNUM      param,
    int         offset,
    PARvalue*   value,
    uint2*      type,
    int         command,
    int         residual
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) point parameter number
offset	(in) point parameter offset (for history parameters)

Argument	Description

value	(in) value. PARvalue is a union of data types and defined as (definition from include\src\points.h):
	`typedef union`
	`{`
	`short int2;`
	`long int4;`
	`float real;`
	`double dble;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`struct {`
	`long ord;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`} en;`
	`} PARvalue;`

type	(in) value type
command	(in) control command priority
residual	(in) control residual priority

Description

Sets a value for a point parameter in the server database and performs any control required by setting/changing the parameter's value.

Diagnostics

On successful write 0 is returned, else an error code is returned. If CTLOK (0x8220) is returned this is not actually an error but an indication that some control was executed successfully as a result of setting the parameter value.

Example

Change Pntana1's SP value to 42.0 and perform any required control with a command priority of 60 and a residual priority of 6.

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\points.h>
PNTNUM   point;
PRMNUM   param;
PARvalue value;
uint2    type;

point = hsc_point_number("Pntana1");
param = hsc_param_number(point,"SP");
```

```
value.real = (float)42.0;
type = DT_REAL;
if (hsc_param_value_put(point,param,0,&value,&type,60,6) == 0)
    c_logmsg ("example","param_value_put call",
              "Pntana1.SP was written and controlled successfully");
else
    c_logmsg ("example","param_value_put call",
              "Unable to write and/or control Pntana1.SP, errno=%x",
errno);
```

hsc_param_value_save

Save a point parameter value.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int   hsc_param_value_save
(
    PNTNUM          point,
    PRMNUM          param,
    int             offset,
    PARvalue*       value,
    uint2*          type
);
```

Arguments

Argument	Description
point	(in) point number
param	(in) point parameter number
offset	(in) point parameter offset (for history parameters)

Argument	Description

value	(in) value PARvalue is a union of data types and is defined as (definition from include\src\points.h):
	`typedef union`
	`{`
	`short int2;`
	`long int4;`
	`float real;`
	`double dble;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`struct {`
	`long ord;`
	`char text[PARAM_MAX_STRING_LEN+1];`
	`} en;`
	`} PARvalue;`

type	(in) value type

Description

Sets a value for a point parameter in the server database and does not perform any control which may be required by setting/changing the parameter's value.

Diagnostics

If the value was written to the parameter correctly then 0 is returned, else -1 is returned with errno set.

Example

Change Pntana1's SP value to 42.0.

```
#include <src\defs.h>
#include <src\points.h>
PNTNUM   point;
PRMNUM   param;
PARvalue value;
uint2    type;

point = hsc_point_number("Pntana1");
param = hsc_param_number(point,"SP");
value.real = (float)42.0;
type = DT_REAL;
if (hsc_param_value_save(point,param,0,&value,&type) == 0)
    c_logmsg ("example","param_value_save call",
                "Pntana1.SP was written to successfully");
```

```
else
     c_logmsg ("example","param_value_save call",
               "Unable to write to Pntana1.SP, errno=%x",errno);
```

See also

hsc_param_value_put

hsc_param_values_put

hsc_pnttyp_list_create

List all point types.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_pnttyp_list_create
(
    enumlist**       list
);
```

Arguments

Argument	Description

list	(in/out) pointer to an enumeration array for point types. `enumlist` is defined as (definition from `include\src\dictionary.h`):
	`typedef struct`
	`{`
	`int value;`
	`char* text;`
	`} enumlist;`

Description

This function sets `list` to contain the list of point types by name and number in the server.

Diagnostic

The return value of this function will be the number of values in `list` or -1 with `errno` set if an error occurred.

In all cases the enumlist structure is created with enough space for the text field in each enumlist element in the enumlist array. Because this memory has been allocated by the function, your user code needs to free this space when you finish using the structure. As this function always allocates the memory required for the text field, make sure that you free all memory before calling the routine a second time with the same enumlist** pointer, otherwise there will be a memory leak. To facilitate freeing this memory, **`hsc_enumlist_destroy`** is included in the API.

Example

This code segment uses a list size of 10 and retrieves all point types and outputs their names and numbers, or outputs an error message if the hsc_pnttyp_list call was unsuccessful.

```
#include <src\defs.h>
#include <src\points.h>
enumlist* list;
int       i;
int       n;

if((i=hsc_pnttyp_list_create (&list)) != -1)
{   c_logmsg ("example","pnttyp_list call",
              "The point types available are:");
    for(n=0;n<i;n++)
       c_logmsg ("example","pnttyp_list call",
                 "%d\t%s",list[n].value,list[n].text);
}
else
    c_logmsg ("example","pnttyp_list call",
              "An error occurred getting point type list. %x",errno);
```

See also

hsc_point_type

hsc_param_type

hsc_enumlist_destroy

hsc_pnttyp_name

Get a point type name.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_pnttyp_name
(
    int   number,
    char* name,
    int   namelen
);
```

Arguments

Argument	Description
number	(in) point type number
name	(out) point type name
namelen	(in) length of name string

Description

This function will return, in the name char buffer, the name of the specified point type.

Diagnostics

If the call is successful 0 is returned else -1 is returned with `errno` set.

Example

This code segment will retrieve all the point type names with each having their name and number output.

```
#include <src\defs.h>
#include <src\points.h>
int   pnttyp;
char  szPnttyp[10];
```

```
pnttyp=1;
while (hsc_pnttyp_name(pnttyp,szPnttyp,10)
}   c_logmsg ("example","pnttyp_name call",
              "the name of pnttyp %d is %s",
               pnttyp,szPnttyp);
    pnttypp++;
}
```

See also

hsc_pnttyp_number

hsc_pnttyp_number

Get a point type number.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_pnttyp_number
(
    char*    name
);
```

Arguments

Argument	Description
name	(in) point type name

Description

This routine will return the number of the named point type, or if the point type does not exist or an error occurs -1 will be returned with `errno` set.

Example

This code segment should return the point type number for the STA point type and output it, otherwise an error message is output.

```
#include <src\defs.h>
#include <src\points.h>
int    pnttyp;

if((pnttyp = hsc_pnttyp_number("STA")) != -1)
    c_logmsg ("example","pnttyp_number call",
              "STA is point type %d",pnttyp);
else
    c_logmsg ("example","pnttyp_number call",
              "An error occurred getting point type
STA. %x",errno);
```

See also

hsc_point_name

hsc_point_entityname

Returns the entity name of a point.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_entityname
(
    PNTNUM   point
    char*    name
    int      namelen
);
```

Arguments

Argument	Description
point	(in) point number
name	(out) entity name
namelen	(in) length of name string

Description

This function takes a point number and return the point's entity name in the char buffer provided.

Diagnostic

If successful, 0 is returned. If the point does not exist or some other error occurs, the char buffer is not set and -1 is returned with `errno` set.

hsc_point_fullname

Returns the full item name of the point.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_fullname
(
    PNTNUM   point
    char*    name
    int      namelen
);
```

Arguments

Argument	Description
point	(in) point number
name	(out) full item name
namelen	(in) length of name string

Description

This function takes a point number and return the point's full item name in the char buffer provided.

Diagnostic

If successful, 0 is returned. If the point does not exist or some other error occurs, the char buffer is not set and -1 is returned with `errno` set.

hsc_point_get_children

Returns all children.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_get_children
(
    PNTNUM   point
    int*     count
    PNTNUM** children
);
```

Arguments

Argument	Description
point	(in) point number
count	(out) number of children
children	(out) array of children

Description

This function returns all children, both containment and reference.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned and `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int count = 0;
PNTNUM *Children = NULL
if (hsc_point_get_children (point, &count,
&Children) ! = 0)
```

```
    return -1
.
.
.
hsc_em_FreePointList (Children);
```

hsc_point_get_containment_ancestors

Returns all containment ancestors above a specified point.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_get_containment_ancestors
(
    PNTNUM   point
    int*     piNumAncestors
    PNTNUM** ppAncestors
);
```

Arguments

Argument	Description
point	(in) point number
piNumAncestors	(out) number of ancestors
ppAncestors	(out) array of ancestors

Description

This function returns all of the containment ancestors in the tree above the specified point.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned and `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumAncestors = 0;
PNTNUM *pAncestors = NULL
```

```
if (hsc_point_get_containment_ancestors (point,
&iNumAncestors, &pAncestors) ! = 0)
    return -1
.
.
.
hsc_em_FreePointList (pAncestors);
```

hsc_point_get_containment_children

Returns all containment children for a specified point.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_get_containment_children
(
    PNTNUM   parent
    int*     piNumChildren
    PNTNUM** ppChildren
);
```

Arguments

Argument	Description
parent	(in) point number of the parent
piNumChildren	(out) number of children
ppChildren	(out) array of children

Description

This function returns a list of contained children for a specified point.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned and `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumChildren = 0;
PNTNUM *pChildren = NULL
if (hsc_point_get_containment_children (point,
&iNumChildren, &pChildren) ! = 0)
```

```
    return -1
.
.
.
hsc_em_FreePointList (pChildren);
```

hsc_point_get_containment_descendents

Returns all containment descendents below a specified point.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_get_containment_descendents
(
    PNTNUM   point
    int*     piNumDescendents
    PNTNUM** ppDescendents
);
```

Arguments

Argument	Description
point	(in) point number
piNumDescendents	(out) number of descendents
ppDescendents	(out) array of descendents

Description

This function returns a list of containment descendents in the tree below a specified point.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned and `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumDescendents = 0;
PNTNUM *pDescendents = NULL
```

```
if (hsc_point_get_containment_descendents (point,
&iNumDescendents, &pDescendents) ! = 0)
    return -1
.
.
.
hsc_em_FreePointList (pDescendents);
```

hsc_point_get_containment_parents

Returns all containment descendents below a specified point.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_get_containment_parents
(
    PNTNUM   child
    int*     piNumParents
    PNTNUM** ppParents
);
```

Arguments

Argument	Description
child	(in) point number of the child point
piNumParents	(out) number of parents
ppParents	(out) array of parents

Description

This function returns a list of containment parents for a specified point.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned and `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumParents = 0;
PNTNUM *pParents = NULL
if (hsc_point_get_containment_parents (point,
&iNumParents, &pParents) ! = 0)
```

```
    return -1
.
.
.
hsc_em_FreePointList (pParents);
```

hsc_point_get_parents

Returns all parents.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_get_parents
(
    PNTNUM   point
    int*     count
    PNTNUM** parents
);
```

Arguments

Argument	Description
point	(in) point number
count	(out) number of parents
parents	(out) array of parents

Description

Returns all parents, both containment and reference.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned and `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int count = 0;
PNTNUM *Parents = NULL
if (hsc_point_get_parents (point, &count, &Parents)
! = 0)
```

```
    return -1
.
.
.
hsc_em_FreePointList (Parents);
```

hsc_point_get_references

Returns a list of points to which the specified point refers.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_get_references
(
    PNTNUM   point
    int*     piNumRefItems
    PNTNUM** ppRefItems
);
```

Arguments

Argument	Description
point	(in) point number
piNumRefItems	(out) number of references
ppRefItems	(out) array of referenced items

Description

This function returns a list of points to which the specified point refers.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned and `errno` set.

```
#include <src\defs.h>
#include <src\points.h>
int iNumRefItems = 0;
PNTNUM *pRefItems = NULL
if (hsc_point_get_references (point, &iNumRefItems,
&pRefItems) ! = 0)
    return -1
```

```
.
.
.
hsc_em_FreePointList (pRefItems);
```

hsc_point_get_referers

Returns a list of points that refer to the specified point.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_get_referers
(
    PNTNUM   point
    int*     piNumRefItems
    PNTNUM** ppRefItems
);
```

Arguments

Argument	Description
point	(in) point number
piNumRefItems	(out) number of referers
ppRefItems	(out) array of referring points

Description

This function returns a list of points that refer to the specified point.

The array must be cleared by calling hsc_em_FreePointList.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned and `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
int iNumRefItems = 0;
PNTNUM *pRefItems = NULL
if (hsc_point_get_referers (point, &iNumRefItems,
&pRefItems) ! = 0)
```

```
    return -1
.
.
.
hsc_em_FreePointList (pRefItems);
```

hsc_point_guid

Returns the GUID for the specified point.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_guid
(
    PNTNUM   point
    GUID*    pGUID
);
```

Arguments

Argument	Description
point	(in) point number
gGUID	(out) GUID in binary format

Description

This function returns the GUID for the specified point in binary format.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned and `errno` set.

hsc_point_name

Get a point's name.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_point_name
(
    PNTNUM    point,
    char*     name,
    int       namelen
);
```

Arguments

Argument	Description
point	(in) point number
name	(out) parameter name
namelen	(in) length of name string

Description

This routine will take a point number and return the point's name in the char buffer provided and have a return value of 0.

Diagnostic

If the point does not exist or some other error occurs than the char buffer will not be set and -1 will be returned with `errno` set to the appropriate error number.

Example

Retrieves the point name for the point and outputs it. The char buffer is 41 characters long, which is bigger than the maximum length of a point name (40 characters).

```
#include <src\defs.h>
#include <src\points.h>
PNTNUM point;
char   szName[MAX_PNTNAME_SZ+1];
```

```
if(hsc_point_name(point,szName,MAX_PNTNAME_SZ+1) == 0)
    c_logmsg ("example","point_name call",
              "Point %d is named %s",point,szName);
else
    c_logmsg ("example","point_name call",
              "An error occurred getting point name. %x",errno);
```

See also

hsc_point_number

hsc_point_number

Get a point number.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

PNTNUM hsc_point_number
(
    char*    name
);
```

Arguments

Argument	Description
name	(in) point name

Description

This function returns the point number of the given point name if the point exists else 0 is returned.

Example

The point number is retrieved for the point and output, if the point exists then a message is output.

```
#include <src\defs.h>
#include <src\points.h>
PNTNUM point;

if((point = hsc_point_number("pntana1")) !=0)
    c_logmsg ("example","param_number call",
              "pntana1 is point number %d",point);
```

See also

hsc_point_name

hsc_point_type

Get a point's type.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

PNTTYP hsc_point_type
(
    PNTNUM    point
);
```

Argument

Argument	Description
point	(in) point number

Description

This routine returns the point type of the point and will be one of the following values (as defined in `include\parameters`) or -1 if invalid:

```
#define STA 1
#define ANA 2
#define ACC 3
#define ACS 4
#define CON 5
#define CDA 6
#define RDA 7
#define PSA 8
```

Example

This routine first calculates the point number from the point name and then uses this value to determine the point type. The point number and type are then output.

```
#include <src\defs.h>
#include <src\points.h>
PNTNUM point;
```

```
PNTTYP pnttyp;

point = hsc_point_number("PNTANA1");
if (point != 0)
{   pnttyp = hsc_point_type(point);
    c_logmsg ("example","point_type call",
              "PNTANA1 is point number %d has point type %d.",
               point,pnttyp);
}
```

hsc_StringFromGUID

Converts a GUID from binary format to string format.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

int hsc_StringFromGUID
(
    GUID*    pGUID
    char*    pszGUID
);
```

Arguments

Argument	Description
pGUID	(in) GUID in binary format
pszGUID	(out) GUID in string format

Description

This function converts a GUID from binary format to string format.

Diagnostics

If successful, 0 is returned, otherwise -1 is returned and `errno` set.

Example

```
#include <src\defs.h>
#include <src\points.h>
GUID guid;
char szGUID[MAX_GUID_STRING_SZ+1];
hsc_StringFromGUID (&guid, szGUID);
if (point == 0)
   return -1;
```

hsc_unlock_file

Unlock a database file.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int hsc_unlock_file(file)
(
    int file
);
```

Arguments

Argument	Description
file	(in) server file number.
delay	(in) delay time in milliseconds before lock attempt will fail.

Description

This routine is used to perform advisory unlocking of database files. Advisory locking means that the tasks that use the file take responsibility for setting and removing locks as needed.

For more information regarding database locking see “Ensuring database consistency” on page 78.

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and **error** is set to one of the following error codes:

[FILLCK]	File locked to another task
[RECLCK]	Record locked to another task
[DIRLCK]	File’s directory locked to another task
[BADFIL]	Illegal file number specified

See also

hsc_lock_record

hsc_unlock_file

hsc_unlock_record

hsc_unlock_record

Unlocks a record of a database file.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int hsc_unlock_record(file, record)
(
    int file
    int record
);
```

Arguments

Argument	Description
file	(in) server file number
record	(in) record number (see description)

Description

This routine is used to perform advisory unlocking of database files and records. Advisory locking means that the tasks that use the file take responsibility for setting and removing locks as needed.

For more information regarding database locking see “Ensuring database consistency” on page 78.

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and **error** is set to one of the following error codes.:

[FILLCK]	File locked to another task
[RECLCK]	Record locked to another task
[DIRLCK]	File’s directory locked to another task
[BADFIL]	Illegal file number specified
[BADRECD]	Illegal record number specified

See also

hsc_lock_file

hsc_unlock_file

hsc_unlock_record

HsctimeToDate

Converts date/time stored in HSCTIME format to VARIANT DATE format.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

void HsctimeToDate
(
    HSCTIME*,
    DATE*
);
```

Description

This function converts a date/time value stored in HSCTIME format to VARIANT DATE format.

HsctimeToFiletime

Converts date/time stored in HSCTIME format to FILETIME format.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\points.h>

void HsctimeToFiletime
(
    HSCTIME*,
    FILETIME*
);
```

Description

This function converts a date/time value stored in HSCTIME format to FILETIME format.

Int2toPV

Inserts an int2 value into a `PARvalue` union.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

PARvalue* Int2toPV(
    int2          int2_val,
    PARvalue*     pvvalue
);
```

Arguments

Argument	Description
pvvalue	(in) A pointer to a `PARvalue` structure.
int2_val	(in) The int2 value to insert into the `PARvalue` structure.

Description

This function inserts an int2 value into a `PARvalue`, and then returns a pointer to the `PARvalue` passed in. This function allows you to set attributes into a notification structure using calls to `hsc_insert_attrib` and `hsc_insert_attrib_byindex` functions in a single line of code.

Diagnostics

If this function is successful, the return value is a pointer back to the `PARvalue` passed in, otherwise, the return value is `NULL` and `errno` is set.

Possible errors returned are:

`BUFFER_TOO_SMALL`	The pointer to the `PARvalue` is invalid, that is, null.

Example

See the examples in `hsc_insert_attrib` and `hsc_insert_attrib_byindex`.

See also

DbletoPV

hsc_insert_attrib

hsc_insert_attrib_byindex

Int4toPV

PritoPV

RealtoPV

StrtoPV

TimetoPV

Int4toPV

Inserts an int4 value into a `PARvalue` union.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

PARvalue* Int4toPV(
    int4         int4_val,
    PARvalue*    pvvalue);
```

Arguments

Argument	Description
pvvalue	(in) A pointer to a `PARvalue` structure.
int4_val	(in) The int4 value to insert into the `PARvalue` structure.

Description

This function inserts an in4 value into a `PARvalue`, and then returns a pointer to the `PARvalue` passed in. This function allows you to set attributes into a notification structure using calls to `hsc_insert_attrib` and `hsc_insert_attrib_byindex` functions in a single line of code.

Diagnostics

If this function is successful, the return value is a pointer back to the `PARvalue` passed in, otherwise, the return value is `NULL` and `errno` is set.

Possible errors returned are:

`BUFFER_TOO_SMALL`	The pointer to the `PARvalue` is invalid, that is, null.

Example

See the examples in `hsc_insert_attrib` and `hsc_insert_attrib_byindex`.

See also

DbletoPV

hsc_insert_attrib

hsc_insert_attrib_byindex

Int2toPV

PritoPV

RealtoPV

StrtoPV

TimetoPV

INTCHR

Copy integer array to character string.

C/C++ synopsis

```
#include <src\defs.h>

void __stdcall c_intchr
(
    int2*    intbuf,
    int      intbuflen,
    char*    chrbuf,
    int      chrbuflen
);
```

Arguments

Argument	Description
intbuf	(in) source integer buffer containing ASCII.
intbuflen	(in) size of source integer buffer in bytes.
chrbuf	(out) destination character buffer.
chrbuflen	(in) size of character buffer in bytes (to allow non null-terminated character buffers).

Description

INTCHR copies characters from an integer buffer into a character buffer. It will either space fill or truncate so as to ensure that `chrbuflen` characters are copied into the character buffer. If the system stores words with the least significant byte first then byte swapping will be performed with the move.

See also

CHRINT

IsGDAerror

Determines whether a returned GDA status value is an error.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\gdamacro.h>

bool IsGDAerror
(
    GDAERR* pGdaError
);
```

Arguments

Argument	Description
pGdaError	(in) pointer to the DGAERR structure containing the status

Description

This macro determines whether a particular GDA status code is an error. Most C/C++ functions indicate success by returning a 0 in the return value. If a function returns a non zero value the actual error code is normally set in the global variable errno. This variable can then be checked to see if it indicates an error or a warning.

Diagnostics

This routine returns TRUE if pGdaError indicates an error condition, otherwise it returns FALSE.

See also

IsGDAwarning

IsGDAnoerror

hsc_IsError

GetGDAERRcode

IsGDAnoerror

Determines whether a returned GDA status value is neither an error or a warning.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\gdamacro.h>

bool IsGDAnoerror
(
    GDAERR* pGdaError
);
```

Arguments

Argument	Description
pGdaError	(in) pointer to the GDAERR structure containing the status

Description

This macro determines whether a particular GDA status code is an error. Most C/C++ functions indicate success by returning a 0 in the return value. If a function returns a non zero value the actual error code is normally set in the global variable errno. This variable can then be checked to see if it indicates an error or a warning.

Diagnostics

This routine returns TRUE if pGdaError indicates neither an error condition nor a warning condition, otherwise it returns FALSE.

See also

IsGDAwarning

IsGDAerror

GetGDAERRcode

IsGDAwarning

Determines whether a returned GDA status value is a warning.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\gdamacro.h>

bool IsGDAwarning
(
    GDAERR* pGdaError
);
```

Arguments

Argument	Description
pGdaError	(in) pointer to the GDAERR structure containing the status

Description

This macro determines whether a particular GDA status code is an error. Most C/C++ functions indicate success by returning a 0 in the return value. If a function returns a non zero value, the actual error code is normally set in the global variable errno. This variable can then be checked to see if it indicates an error or a warning.

Diagnostics

This routine returns TRUE if pGdaError indicates a warning condition, otherwise it returns FALSE.

See also

IsGDAerror

IsGDAnoerror

hsc_IsWarning

GetGDAERRcode

JULIAN

Convert between Julian days and Gregorian date.

C/C++ synopsis

```
#include <src\defs.h>

int __stdcall c_gtoj
(
    int    year,
    int    month,
    int    day
);
void __stdcall c_jtog
(
    int    julian,
    int*   year,
    int*   month,
    int*   day
);
```

Arguments

Argument	Description
year	(in/out) number of years since 0AD (for example, 1989).
month	(in/out) month (1 -12).
day	(in/out) day (1 - 31).
julian	(in) number of Julian days.

Description

JULIAN is used to convert between Julian days (used by the History subsystem) and a Gregorian date (day, month, year format).

`c_gtoj`	converts from a Gregorian date to Julian days.
`c_jtog`	converts from Julian days to a Gregorian date.

Diagnostics

Upon successful completion `c_gtoj` returns the number of Julian days. `c_jtog` returns the values in the addresses pointed to by the year, month and day parameters.

See also

GETHSTPAR

LOGMSG

Write a message to the log file.

C/C++ synopsis

```
#include <src\defs.h>

void __stdcall c_logmsg
(
    char*    progname,
    char*    lineno,
    char*    format,
  …
);
```

Arguments

Argument	Description
progname	(in) name of program module
lineno	(in) line number in program module
format	(in) printf type format of message

Description

c_logmsg should be used instead of printf to write messages to the log file. This is typically used for debugging purposes.

This routine writes the message to standard error. If the application is a task (with its own LRN) then the message will be captured and written to the log file.

If the program is a utility then the message will appear in the command prompt window.

Diagnostics

This routine has no return value. If it is called incorrectly it will write its own message to standard error indicating the source of the problem.

Example

```
c_logmsg("abproc.c","134" "Point ABSTAT001 PV out of normal range (%d)",
abpv);
```

c_logmsg handles all carriage control. There is no need to put a line feed characters in calls to c_logmsg.

MZERO

Test a real value for -0.0.

C/C++ synopsis

```
#include <src\defs.h>

int __stdcall c_mzero
(
    float*   value
);
```

Arguments

Argument	Description
value	(in) real value to be tested.

Description

MZERO returns TRUE if the specified value is equal to minus zero. Otherwise FALSE is returned. Minus zero is used to represent bad data in history data.

See also

BADPAR

OPRSTR

Send message to a Station.

C/C++ synopsis

```
#include <system>
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\trbtbl_def>

int   __stdcall c_oprstr_info
(
    int          crt,
    char*        message
);
int   __stdcall c_oprstr_message
(
    int          crt,
    char*        message
);
int   __stdcall c_oprstr_prompt
(
    int          crt,
    char*        message,
    int          param1
);
char *__stdcall c_oprstr_response
(
    int          crt,
    struct prm*  prmblk
);
```

Arguments

Argument	Description
crt	(in) Station number.
message	(in) pointer to null-terminated string to be sent to the Station.
param1	(in) value of parameter 1 required to identify response task request.
prmblk	(out) task request parameter block which was received from GETREQ when the task began executing.

Description

OPRSTR outputs a specified message to the Operator zone of a Station.

`c_oprstr_info`	outputs information only messages.
`c_oprstr_message`	outputs an invalid request message that is cleared after a TIME_RQUEST seconds. This constant is defined in "server/src/system".
`c_oprstr_prompt`	outputs an operator prompt and sets the ENTER key to notify the calling task with the specified parameter 1. After calling this routine the task should branch back to its GETREQ call to service its next request, and if none exists, the terminate with a TRM04. When the operator types a response and presses ENTER, the task is requested with the specified parameter 1, and should branch to code that calls c_oprstr_response to fetch the response.
`c_oprstr_response`	reads the entered data and clears the prompt.

Diagnostics

Upon successful completion `c_oprstr_response` will return a pointer to a null-terminated string containing the response from the operator. Upon successful completion `c_oprstr_info`, `c_oprstr_message` and `c_oprstr_prompt` will return zero. Otherwise, a NULL pointer or -1 will be returned, and **errno** is set to the following error code:

`[M4_INVALID_CRT]`	An invalid CRT was specified.

Warnings

`c_oprstr_prompt` requires that the calling task TRM04 until the ENTER key is pressed. This means that the calling task must be a server task and not a utility task.

If the operator changes displays or presses ESC after a `c_oprstr_prompt()` call, no operator input will be saved, and the task will not be requested. If you do not wish the operator to avoid entering data, you will need to set a flag internal to your program that indicates whether a response has been received and start a task timer with the TMSTRT function. If a response has not been received from the operator after an interval (specified by you in the TMSTRT function), you will need to repeat the `c_oprstr_prompt()` call. If a response from the operator is received you will need to stop the timer using TMSTOP.

Example

```
#include <errno.h>  /* for external errno */
#include <stdio.h>  /* for NULL */
#include "src\defs.h"
#include "src\M4_err.h"
#include "src\trbtbl_def"
static progname="%M%"
main ()
{
  struct prm prmblk;
  int   crt=1;
  char  *reply;
  uint2 point;
   ...
   ...
   ...
  if (c_getreq(&prmblk) == 0)
  {
  switch (prmblk.param1)
  {
  case 1:
  /* request a point name from the operator */
  if (c_oprstr_prompt(crt,"ENTER POINT NAME?",2))
  c_logmsg (progname,"123","c_oprstr_prompt %x",errno);
  break;
  case 2:
     reply=c_oprstr_response(crt,&prmblk);
     if (reply==NULL)
  c_logmsg(progname,"132",
  "c_oprstr_response   error %x",errno);
     else
  {
     if (c_getpnt(reply,point) == -1)
     c_oprstr_message(crt,"ILLEGAL POINT NAME");
```

```
  else
  {
  /* we have a valid point type/number */
  }
  }
  break;
  } /* end switch */
  }
}
```

PPS

Process point special.

C/C++ synopsis

```
#include <src\defs.h>
#include <scr\M4_err.h>

int __stdcall c_pps
(
    uint2    point,
    int      param,
    int*     status
);
```

Arguments

Argument	Description
point	(in) Point type/number to be processed.
param	(in) Point parameter to be processed. -1 for all parameters.
status	(out) return error code.

Description

PPS is used to request a demand scan of the specified point.

The point is always processed.

This function is not applicable to Honeywell Process Controller points, Remote points, Container points or System Interface Points (PSA).

Diagnostics

Upon successful completion, a value of 0 is returned in status. Otherwise, one of the following error codes is returned:

[M4_INV_POINT]	Invalid point specified
[MR_INV_PARAMETER]	Invalid point parameter specified
[M4_DEVICE_TIMEOUT]	Scan was not performed before a 10 second timeout interval

See also

PPSW

PPSW

Process point special and wait for completion.

C/C++ synopsis

```
#include <src\defs.h>
#include <scr\M4_err.h>

int __stdcall c_ppsw
(
    uint2    point,
    int      param,
    int*     status
);
```

Arguments

Argument	Description
point	(in) point type/number to be processed.
param	(in) point parameter to be processed. -1 for all parameters.
status	(out) return error code.

Description

PPSW is used to request a demand scan of the specified point and wait for the scan to complete. I, after 10 seconds, the scan has not replied, a timeout will be indicated.

The point is always processed.

This function is not applicable to Honeywell Process Controller points, Remote points, Container points or System Interface Points (PSA).

Diagnostics

Upon successful completion, a value of 0 is returned in status. Otherwise, one of the following error codes is returned:

`[M4_INV_POINT}`	Invalid point specified.
`[M4_INV_PARAMETER]`	Invalid point parameter specified.
`[M4_DEVICE_TIMEOUT]`	Scan was not performed before a 10 second timeout interval.

See also

PPS

PPV

Process point value.

C/C++ synopsis

```
#include <src\defs.h>
#include <scr\M4_err.h>

int __stdcall c_ppv
(
    uint    point,
    int     param,
    float   value
);
```

Arguments

Argument	Description
point	(in) Point type/number to be processed.
param	(in) Point parameter to be processed. -1 for all parameters.
value	(in) Value to be stored into the point parameter.

Description

PPV is used to request a Demand scan of the specified Point.

The point is always processed.

This function is not applicable to Honeywell Process Controller points, Remote points, Container points or System Interface Points (PSA).

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and **errno** is set to one of the following error codes:

[M4_INV_POINT]	Invalid Point specified.
[M4_INV_PARAMETER]	Invalid Point parameter specified.

`[M4_ILLEGAL_RTU]`	There are no Controllers implemented that can process this request.
`[M4_DEVICE_TIMEOUT]`	Scan was not performed before a 10 second timeout interval.

See also

PPVW

PPVW

Process point value and wait for completion.

C/C++ synopsis

```
#include <src\defs.h>
#include <scr\M4_err.h>

int __stdcall c_ppvw
(
    uint2    point,
    int      param,
    float    value
);
```

Arguments

Argument	Description
point	(in) Point type/number to be processed.
param	(in) Point parameter to be processed. -1 for all parameters.
value	(in) Value to be stored into the point parameter.

Description

PPVW is used to request a Demand scan of the specified Point and wait for the scan to complete. If after 10 seconds the scan has not replied, then a timeout will be indicated. The point is always processed.

This function is not applicable to Honeywell Process Controller points, Remote points, Container points or System Interface Points (PSA).

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and errno is set to one of the following error codes:

[M4_INV_POINT]	Invalid Point specified.
[M4_INV_PARAMETER]	Invalid Point parameter specified.

`[M4_ILLEGAL_RTU]`	There are no Controllers implemented that can process this request.
`[M4_DEVICE_TIMEOUT]`	Scan was not performed 10 second timeout interval.

See also

PPV

PritoPV

Inserts a priority and sub-priority value into a PARvalue union.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

PARvalue* PritoPV(
    int2            priority,
    int2            subpriority,
    PARvalue*       pvvalue
);
```

Arguments

Argument	Description
pvvalue	(in) A pointer to a PARvalue structure.
priority	(in) The priority value to insert into the PARvalue structure.
sub-priority	(in) The sub-priority value to insert into the PARvalue structure.

Description

This function inserts a priority and sub-priority value into a PARvalue, and then returns a pointer to the PARvalue passed in. This function allows you to set attributes into a notification structure using calls to hsc_insert_attrib and hsc_insert_attrib_byindex functions in a single line of code.

Diagnostics

If this function is successful, the return value is a pointer back to the PARvalue passed in, otherwise, the return value is NULL and errno is set.

Possible errors returned are:

BUFFER_TOO_SMALL	The pointer to the PARvalue is invalid, that is, null.

Example

See the examples in hsc_insert_attrib and hsc_insert_attrib_byindex.

See also

DbletoPV

hsc_insert_attrib

hsc_insert_attrib_byindex

Int2toPV

Int4toPV

RealtoPV

StrtoPV

TimetoPV

PRSEND

Queue file to print system for printing.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int __stdcall c_prsend_crt
(
    int    crt,
    char*  filename
);
int __stdcall c_prsend_printer
(
    int    printer,
    char*  filename
);
```

Arguments

Argument	Description
crt	(in) CRT number.
printer	(in) printer number.
filename	(in) pointer to null-terminated string containing the pathname (maximum 60 characters) of the file to be printed.

Description

PRSEND is used to request the print system to print the specified file.

c_prsend_crt

will send the file to the demand report printer that is associated with the specified CRT.

c_prsend_printer

will send the file to the specified printer.

Diagnostics

Upon successful completion, a value of 0 is returned. Otherwise, -1 is returned and **errno** is set to the following error code:

[M4_QEMPTY] The file could not be queued to the printer because the printer queue had no free records.

Example

```
#include <errno.h>
. . .
. . .
. . .
#define PRINTER_NO 1
#define SAMPLE_FILENAME ". .\user\sample.dat"
static char *progname="sample.c";
/* send the sample file to the printer */
if (c_prsend_printer(PRINTER_NO, SAMPLE_FILENAME)
== -1)
 {
c_logmsg(progname, "123", "c_prsend_printer error
%x", errno);
exit(ierr);
 }
```

RealtoPV

Inserts a real value into a PARvalue union.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

PARvalue* RealtoPV(
    float            real_val,
    PARvalue*        pvvalue
);
```

Arguments

Argument	Description
pvvalue	(in) A pointer to a PARvalue structure.
real_val	(in) The real value to insert into the PARvalue structure.

Description

This function inserts a real value into a PARvalue, and then returns a pointer to the PARvalue passed in. This function allows you to set attributes into a notification structure using calls to hsc_insert_attrib and hsc_insert_attrib_byindex functions in a single line of code.

Diagnostics

If this function is successful, the return value is a pointer back to the PARvalue passed in, otherwise, the return value is NULL and errno is set.

Possible errors returned are:

BUFFER_TOO_SMALL	The pointer to the PARvalue is invalid, that is, null.

Example

See the examples in hsc_insert_attrib and hsc_insert_attrib_byindex.

See also

DbletoPV

hsc_insert_attrib

hsc_insert_attrib_byindex

Int2toPV

Int4toPV

PritoPV

StrtoPV

TimetoPV

RQTSKB

Request a task if inactive.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\sn90_err.h>
#include <src\trbtbl_def>

int2 c_rqtskb
(
    int          lrn
);
int2 c_rqtskb_prm
(
    int         lrn,
    int2*       prmblk
);
```

Arguments

Argument	Description
lrn	(in) Logical resource number of the task to be requested.
prmblk	(in) pointer to parameter block to be passed to the task.

Description

RQTSKB is used to request a task to restart execution after it has terminated.

`c_rqtskb` requests the specified task without any parameters.

`c_rqtskb_prm` requests the specified task and passes a parameter block. If the task is not executing, or the parameter block is zero, then the request is passed to the task. If the task is already executing and the parameter block is not zero, then the task is considered busy and an error code is returned.

Most of the system's tasks take in parameters in the form of the prm structure. Note that the prm structure is defined in the file trbtbl_def in the src folder. It is recommended that developers make use of this parameter block structure. To do so, first instantiate and initialize the structure with relevant data, then cast a pointer to it to an int2* in order to call this function:

```
prm my_pblk;
int myLrn;
…

return_val = c_rqtskb_prm(myLrn,
(int2*) &my_pblk);
```

Note that the some LRNs listed in the `def/src/lrns` file (for example, the Keyboard Service program (LRN 1) and Server Display program (LRN 21)), actually use multiple LRNs. The most important example of this is the Server Display program. Each Station is associated with its own Server Display and Keyboard Service programs. Each of these tasks use its own LRN. The Server Display programs of the first 20 Stations are assigned LRNs 21 through to 40. For example, to request the Server Display program for Station 3, you would request LRN 23.

Stations 21-40, if assigned, use other LRNs. These can be displayed using the utility `usrlrn` with the options `-p -a`.

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and **errno** is set to one of the following error codes:

`[M4_ILLEGAL_LRN]`	An illegal LRN has been specified or the task does not exist.
`[M4_BUSY_TRB]`	The requested tasks request block is busy, could not pass parameters.
`[INVALID_SEMVAL]`	The requested task has too many outstanding requests.

See also

GETREQ

TSTSKB

WTTSKB

SPS

Scan point special.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int __stdcall c_sps
(
    uint    point,
    int     param
);
```

Arguments

Argument	Description
point	(in) Point type/number to be processed.
param	(in) Point parameter to be processed. -1 for all parameters.

Description

SPS is used to request a Demand scan of the specified Point.

The point is only processed if the scanned value has changed.

This function is not applicable to Honeywell Process Controller points, Remote points, Container points or System Interface Points (PSA).

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and **errno** is set to one of the following error codes:

[M4_INV_POINT]	Invalid Point specified.
[M4_INV_PARAMETER]	Invalid Point parameter specified.
[M4_DEVICE_TIMEOUT]	Scan was not performed before a 10 second timeout interval.

See also

SPSW

SPSW

Scan point special and wait for completion.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int __stdcall c_spsw
(
    uint2    point,
    int      param
);
```

Arguments

Argument	Description
point	(in) Point type/number to be processed.
param	(in) Point parameter to be processed. -1 for all parameters.

Description

SPSW is used to request a Demand scan of the specified Point and wait for the Scan to complete. If after 10 seconds the Scan has not replied, then a timeout will be indicated. The point is only processed if the scanned value has changed.

This function is not applicable to Honeywell Process Controller points, Remote points, Container points or System Interface Points (PSA).

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and errno is set to one of the following error codes:

[M4_INV_POINT]	Invalid Point specified.
[M4_INV_PARAMETER]	Invalid Point parameter specified.
[M4_DEVICE_TIMEOUT]	Scan was not performed 10 second timeout interval.

See also

SPS

SPV

Scan point value.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int __stdcall c_spv
(
    uint2    point,
    int      param,
    float    value
);
```

Arguments

Argument	Description
point	(in) point type and/or number to be processed
param	(in) point parameter to be processed. PV=0 through A4=7
value	(in) value to be stored into the point parameter

Description

SPV is used to pass the value to the point processor for storage into the point parameter.

The point is processed only if the scanned value has changed.

This function is not applicable to Honeywell Process Controller points, Remote points, Container points or System Interface Points (PSA).

Diagnostics

Upon successful completion, a value of 0 is returned. Otherwise, one of the following error codes is returned:

[M4_INV_POINT]	Invalid point specified.
[M4_INV_PARAMETER]	Invalid point parameter specified.

`[M4_ILLEGAL_RTU]`	There are no controllers implemented that can process this request.
`[M4_DEVICE_TIMEOUT]`	Scan was not performed before a 10 second timeout interval.

See also

SPVW

SPVW

Scan point value and wait for completion.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int __stdcall c_spvw
(
    uint2    point,
    int      param,
    float    value
);
```

Arguments

Argument	Description
point	(in) point type and/or number to be processed.
param	(in) point parameter to be processed. PV=0 through A4=7.
value	(in) value to be stored into the point parameter.

Description

SPVW is used to pass the value to the point processor for storage into the point parameter.

The point is processed only if the scanned value has changed.

This function is not applicable to Honeywell Process Controller points, Remote points, Container points or System Interface Points (PSA).

Diagnostics

Upon successful completion, a value of 0 is returned. Otherwise, one of the following error codes is returned:

[M4_INV_POINT]	Invalid point specified.
[M4_INV_PARAMETER]	Invalid point parameter specified.

`[M4_ILLEGAL_RTU]`	There are no controllers implemented that can process this request.
`[M4_DEVICE_TIMEOUT]`	Scan was not performed before a 10 second timeout interval.

See also

SPV

STCUPD

Update Controllers sample time counter.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int __stdcall c_stcupd
(
    int    rtu,
    int    seconds
);
```

Arguments

Argument	Description
rtu	(in) the controller number to be updated
seconds	(in) the number of seconds

Description

STCUPD is used to set the sample time counter of an Controller. The scan task counts down this counter, and if it reaches zero the controller will be failed. A time of greater than 60 seconds must be used if automatic recovery via the diagnostic scan is required.

Diagnostics

Upon successful completion a value of 0 is returned. Otherwise, -1 is returned and errno is set to one of the following error codes:

[M4_ILLEGAL_RTU]	The Controller number is not legal.
[M4_ILLEGAL_CHN]	The channel number is not legal.

stn_num

Finds out the Station number of a display task given the task's lrn.

C/C++ synopsis

```
#include <src\defs.h>

int2 stn_num
(
    int2* pLrn// (in) A pointer to the lrn
);
```

Arguments

Argument	Description
pLrn	(in) pointer to the lrn that will be used to find the Station number

Description

This function quickly determines the Station number of a particular Station's display task given its lrn.

Diagnostics

This function returns the Station number (>0) if successful. Otherwise it returns -1.

See also

dsply_lrn

StrtoPV

Inserts a character string into a PARvalue union.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

PARvalue* StrtoPV(
    const char*        string_val,
    PARvalue*          pvvalue
);
```

Arguments

Argument	Description
pvvalue	(in) A pointer to a PARvalue structure
string_val	(in) The character string to insert into the PARvalue structure

Description

This function inserts a character string into a PARvalue, and then returns a pointer to the PARvalue passed in. This function allows you to set attributes into a notification structure using calls to hsc_insert_attrib and hsc_insert_attrib_byindex functions in a single line of code.

Diagnostics

If this function is successful, the return value is a pointer back to the PARvalue passed in, otherwise, the return value is NULL and errno is set.

Possible errors returned are:

BUFFER_TOO_SMALL	The pointer to the PARvalue is invalid, that is, null.

Example

See the examples in hsc_insert_attrib and hsc_insert_attrib_byindex.

See also

DbletoPV

hsc_insert_attrib

hsc_insert_attrib_byindex

Int2toPV

Int4toPV

PritoPV

RealtoPV

TimetoPV

TimetoPV

Inserts a time value into a PARvalue union.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\almmsg.h>

PARvalue* TimetoPV(
    HSCTIME          time_val,
    PARvalue*        pvvalue
);
```

Arguments

Argument	Description
pvvalue	(in) A pointer to a PARvalue structure
time_val	(in) The time value to insert into the PARvalue structure

Description

This function insert a time value into a PARvalue, and then returns a pointer to the PARvalue passed in. This function allows you to set attributes into a notification structure using calls to hsc_insert_attrib and hsc_insert_attrib_byindex functions in a single line of code.

Diagnostics

If this function is successful, the return value is a pointer back to the PARvalue passed in, otherwise, the return value is NULL and errno is set.

Possible errors returned are:

BUFFER_TOO_SMALL	The pointer to the PARvalue is invalid, that is, null.

Example

See the examples in hsc_insert_attrib and hsc_insert_attrib_byindex.

See also

DbletoPV

hsc_insert_attrib

hsc_insert_attrib_byindex

Int2toPV

Int4toPV

PritoPV

RealtoPV

StrtoPV

TMSTOP

Stop timer for the calling task.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

void __stdcall c_tmstop
(
   int    tmridx
);
```

Arguments

Argument	Description
tmridx	(in) index of the timer entry to stop.

Description

TMSTOP stops the timer specified by the argument `tmridx`. This index corresponds to the return value of TMSTRT.

See also

TRMTSK

TMSTRT

Start timer for the calling task.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

void __stdcall c_tmstrt_single
(
    int    cycle,
    int    param1,
    int    param2
);
int __stdcall c_tmstrt_cycle
(
    int    cycle,
    int    param1,
    int    param2
);
```

Arguments

Argument	Description
cycle	(in) time interval between executions in seconds.
param1	(in) parameter passed to task as parameter 1.
param2	(in) parameter passed to task as parameter 2.

Description

TMSTRT starts a timer to request the calling task every `cycle` seconds. This is equivalent to calling RQTSKB every interval.

The arguments `param1` and `param2` are passed as words 2 and 3 of the ten word parameter block, to the task each interval. These parameters can be accessed by calling GETREQ.

`c_tmstrt_single`	requests the specified task only once.
`c_tmstrt_cycle`	requests the specified task continuously every cycle.

Diagnostics

Upon successful completion the timer index is returned. Otherwise, -1 is returned and **errno** is set to the following error code:

`[M4_QEMPTY]`	Too many timers active.

See also

TMSTOP

GETREQ

TRM04

Terminate task with error status and modify restart address.

C/C++ synopsis

```
#include <src\defs.h>

void __stdcall c_trm04
(
    int2    status
);
```

Arguments

Argument	Description
status	(in) termination error status

Description

TRM04 is used to terminate the calling task and change the restart address to the address immediately following the call to TRM04. The task is not terminated if it was requested while it was active. The termination error status is posted in the task request block for any WTTSKB calls.

If the task has been marked for deletion via a DELTSK call then the task will be removed from the system.

See also

RQTSKB

TSTSKB

WTTSKB

DELTSK

TRMTSK

Terminate task with error status.

C/C++ synopsis

```
#include <src\defs.h>

void __stdcall c_trmtsk
(
    int2    status
);
```

Arguments

Argument	Description
status	(in) termination error status

Description

TRMTSK is used to terminate the calling task and change the restart address to the program start address. The termination error status is posted in the task request block for any WTTSKB calls.

If the task has been marked for deletion via a DELTSK call then the task will be removed from the system.

See also

TRM04

DELTSK

TSTSKB

Test task status.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

void __stdcall c_tstskb
(
    int    lrn
);
```

Arguments

Argument	Description
lrn	(in) logical resource number of the task to be tested.

Description

TSTSKB tests the completion status of a specified task.

Diagnostics

Upon successful completion a value of 0 is returned indicating that the specified task is dormant. Otherwise, -1 is returned and **errno** is set to one of the following error codes:

[M4_ILLEGAL_LRN]	An illegal lrn has been specified.
[M4_BUSY_TRB]	The specified task is active.

Example

```
#include "src\lrns" /* for user tasks lrn */
 ...
 ...
 ...
/* test to see if the first user task is dormant */
```

```
if (c_tstskb(USR1LRN) == 0)
c_logmsg(progname,"123","user task 1 is dormant");
```

See also

WTTSKB

RQTSKB

TRM04

TRMTSK

UPPER

Convert character string to upper case.

C/C++ synopsis

```
#include <src\defs.h>

void __stdcall c_upper
(
    char*    chrstr
);
```

Arguments

Argument	Description
string	(in/out) pointer to null-terminated character string to convert.

Description

UPPER converts a character string to upper case (7 bit ASCII). Control characters are converted to a “.” character.

See also

CHRINT

INTCHR

WDON

Pulse watchdog timer for task.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

void __stdcall c_wdon
(
    int    wdtidx
);
```

Arguments

Argument	Description
wdtidx	(in) index of the watch dog timer entry to pulse.

Description

WDON is used to prevent the watch dog timer from timing out the calling task.

WDON should only be called with a valid watch dog timer index returned from WDSTRT.

For more information regarding watchdog timers, see “Monitoring the activity of a task” on page 64.

Diagnostics

WDON does not return a value and no diagnostic errors are returned if **wdtidx** is invalid.

See also

WDSTRT

WDSTRT

Start watchdog timer for calling task.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>
#include <src\wdstrt.h>

int __stdcall c_wdstrt
(
    int    timeout,
    int    mode
);
```

Arguments

Argument	Description
timeout	(in) time interval before watch dog timer takes action indicated by mode.
mode	(in) mode of action to be taken by the watchdog timer: • WDT_MONITOR monitor timer entry only. • WDT_ALARM_ONCE generate an alarm on first failure only. • WDT_ALARM generate an alarm on each failure. • WDT_RESTART_TASK restart task on first failure, reboot the server system on second failure. • WDT_RESTART_SYS restart the server system on failure.

Description

WDSTRT enables a watch dog timer for the calling task.

Calling this routine allocates an entry in the WDTTBL. Each second, WDT decrements the timer entry. If the timer becomes zero then the action defined by the mode will be taken. The modes available are the following:

To prevent this timeout occurring, the calling task should periodically call WDON to reset the timer.

For more information, see “Monitoring the activity of a task” on page 64.

Diagnostics

Upon successful completion the watch dog timer index is returned. If **c_wdstrt()** is unable to create a timer, it returns a 0.

See also

WDON

WTTSKB

Wait for a task to become dormant.

C/C++ synopsis

```
#include <src\defs.h>
#include <src\M4_err.h>

int2 __stdcall c_wttskb
(
    int    lrn
);
```

Arguments

Argument	Description
lrn	(in) Logical resource number of the task to be waited on.

Description

WTTSKB waits for the specified task to complete processing.

Diagnostics

Upon successful completion the specified tasks termination error status is returned. Otherwise, the following error code is returned:

`[M4_ILLEGAL_LRN]` An illegal LRN has been specified.

See also

TSTSKB

RQTSKB

TRM04

TRMTSK

Examples

There are several examples located under the server install folder in `users\examples\src`. These can be used as a basis for your own programs.

The examples are:

Example	Description
`test1.c`	a very simple task which prints “Hello World” every time it is requested.
`test2.c`	a simple task that generates 3 alarms when requested.
`test3.c`	a task that demonstrates dealing with points.
`test4.c`	a simple task that demonstrates the use of user tables.
`test5.c`	a more completed task that demonstrates the use of user tables.
`test6.c`	a utility that demonstrates dealing with points.
`test7.c`	a complicated task demonstrating the use of watch dog timers, scan point special, getvals and putvals.
`test8.c`	a simple task that shows the information passed on the prmblk when the task is requested.

Network API reference

11

This section describes how to write applications for Experion PKS using the Network API.

For:	Go to:
Prerequisites	page 354
An introduction to network application environment	page 355
Network API function reference	page 381

Prerequisites

Before writing network applications for Experion PKS, you need to:

- Install Experion PKS and third-party software as described in the *Installation Guide*.
- Be familiar with user access and file management as described in the *Configuration Guide*.

Prerequisite skills

This guide assumes that you are an experienced programmer with a good understanding of either C, C++ or Visual Basic.

It also assumes that you are familiar with the Microsoft Windows development environment and know how to edit, compile and link applications.

Network application programming

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For:	Go to:
An introduction to Network API	page 356
A summary of Network API functions	page 358
Notes about using Network API	page 360
Information about compiling and linking network application programs	page 378

About Network API

Network API has two components:

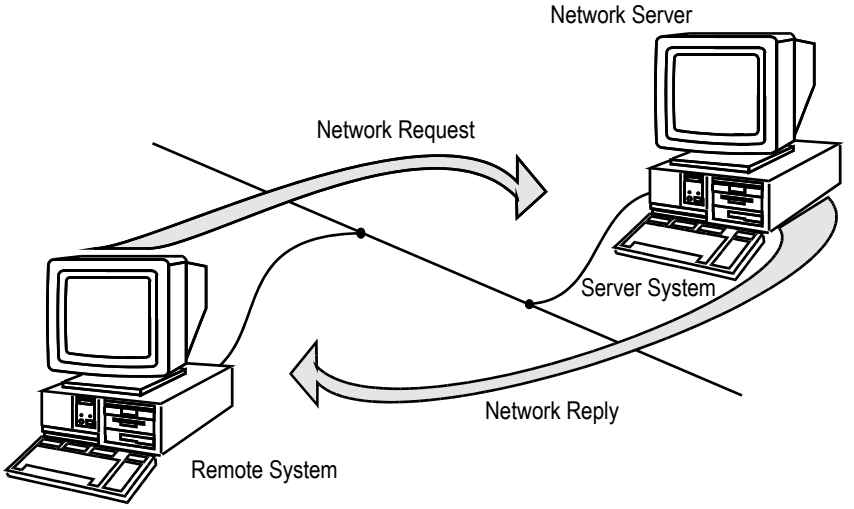
- **Network Server Option**. Enables remote computers to read and write information stored in the Experion PKS server database. The Network Server Option runs on the server and is required for any of the networked options to work (for example, Network API, Network Scan Task, and Microsoft Excel Data Exchange).

  After the Network Server Option software is installed, it listens for any requests from other computers. The Network Server Option processes these requests on the behalf of the remote computer whether it be a request for a function to be performed or information to be returned from the database.

- **Files**. Allow your program to interact with the Network Server Option. These files are comprised of C/C++ libraries, header files, VB files, Dynamic Link Libraries, documentation, and sample source programs which are all designed to help you easily create a network application.

  The network applications you develop can only run on 32-bit Windows environments. Network applications act as clients to the Network Server Option and can read and write values in the Experion PKS server database via the network.

Figure 8 Network server



Specifying a network server in a redundant system

When specifying the name of the server in your Network API application, use only the base server name for a redundant/dual-network system.

For example, you would refer only to `hsserv` when creating an application and never to a specific computer such as `hsserva`. In this way, redundancy is handled transparently whenever there is a server or network failure.

Do not use IP addresses where redundancy is required. Transparent failover cannot operate if you use IP addresses. You should only consider using IP addresses only on a single-network, single-server system.

Ensure that you correctly configure the `%systemroot%\system32\drivers\etc\Hosts` file on your client computer properly. This file provides a mapping from host names to their internet addresses.

In a single-server, single-network system you can use just the basename. The following configurations, however, require that you use more than just the basename:

System architecture	Host names in hosts file
Redundant server, single network	Basename appended with a or b (*hsserva*, *hsservb*)
Single server, dual network	Basename appended with 0 or 1 (*hsserv0*, *hsserv1*)
Redundant server, dual network	Basename appended with a or b and 0 or 1 (*servera0*, *servera1*, *serverb0*, *serverb1*)

On any of the redundant/dual-network configurations above do not add the basename (server) to the hosts file.

See the *Installation Guide* for more information on setting up hosts files on client computers.

Support for redundancy with the Network API is limited to Windows.

Network API summary

The Network API includes functions that allow you to get and put various values into the server database.

Function	Description
Generate Alarms and Events	
rhsc_notifications	Use to remotely generate alarms and events. The various text fields are formatted into a standard event log line on the server. The nPriority field defines the behavior on the server.
Point Parameter Access	
rhsc_point_numbers	Convert a point name into an internal point number that is used in other calls such as rhsc_param_numbers and rhsc_param_values.
rhsc_param_numbers	Convert a parameter name into an internal parameter number that is used in other calls such as rhsc_param_values or rhsc_param_value_puts.
rhsc_param_values	Read a list of point parameter values from the database.
rhsc_param_value_bynames	Similar to rhsc_param_values but provides a simpler calling interface but is less efficient.
rhsc_param_value_puts	Write a list of point parameter values to the database.
rhsc_param_value_put_bynames	Similar to rhsc_param_value_puts but provides a simpler calling interface but is less efficient. **rgetpnt**, **rgetval** and **rputval** have been included for backwards compatibility.
Historical Information Access	
rhsc_param_hist_dates	Read a block of history data from the database starting from a specified date and time.
rhsc_param_hist_offsets	Read a block of history data from the database starting from a specified offset in the history database.
rhsc_param_hist_date_bynames	Read a block of history data from the database using point and parameter names starting from a specified date and time. Similar to rhsc_param_hist_dates but provides a simpler calling interface but is less efficient.

Function	Description
rhsc_param_hist_offset_bynames	Read a block of history data from the database using point and parameter names starting from a specified offset in the history database. Similar to rhsc_param_hist_offsets but provides a simpler calling interface but is less efficient.
User File Information Access	
rgetdat	Read a list of fields from the user files of the database.
rputdat	Write a list of fields to the user files of the database.
Error String Lookup	
hsc_napierrstr2	Visual Basics only. Look up the error string for an error number. (Preferred command in place of hsc_napierrstr which has been retained only for backward compatibility.)
hsc_napierrstr	Look up the error string for an error number.

Using the Network API

To:	Go to:
Determine the point numbers	page 361
Determine the parameter numbers	page 362
Access point parameters	page 363
Access historical information	page 365
Access user tables	page 367
Look up error strings	page 373
Access parameter values by name	page 374
Learn about Visual Basic’s migration requirements	page 376

Determining point numbers

Generally, Network API functions use the point number that is used by the server in order to identify the point, rather than the point name. This internal number is stored in the server database. The point number is specific to each computer and cannot be used interchangeably on different servers.

To resolve the point name to the point number, use the function rhsc_point_ numbers for all the points you wish to access. It is best to call this function in the initialization code of your application.

rhsc_point_numbers is called with the name of the server, the number of point IDs to convert, and a data structure containing the list of point IDs. The corresponding point numbers are then returned inside this data structure by the call. Note that you should check the function return value. If any individual request for a point number failed, the return value will be a warning that indicates a partial function fail has occurred. To find out which request failed and why, check the **fStatus** field of the data structure for each point number returned.

Example

An example of using **rhsc_point_numbers** for C is located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\C\Napitst` project.

An example of using **rhsc_point_numbers** for C++ is located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\C\Mfcnetapitest\Mfcnetapitest` project.

An example of using **rhsc_point_numbers** for VB can be located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\Vb\Vbnetapitst` project.

Functions that do not require a point name to number resolution

The following functions do not require you to resolve point names to point numbers before being called:

- rhsc_param_value_bynames
- rhsc_param_value_put_bynames
- rhsc_param_hist_date_bynames
- rhsc_param_hist_offset_bynames

Determining parameter numbers

Just as most Network API functions require point names to be resolved into point numbers, most parameters used by Network API functions need to have their parameter names resolved into parameter numbers. The parameter number is an internal number used in the server database to represent a parameter of a single point. Note that this parameter number is only valid for a specific point on a given server and cannot be used interchangeably between points on other servers even for identical parameter names.

To resolve a parameter name to a parameter number, use the function rhsc_ param_numbers. It is best to call this function in the initialization code of your application for each parameter of every point you wish to access.

rhsc_param_numbers is called with the name of the server, the number of parameter names to convert, and a data structure containing the list of point number and parameter name pairs. The corresponding parameter numbers are returned inside this data structure by the call. Check the return value for any warning that a partial function fail has occurred. To find out which request failed and why, check the **fStatus** field of the data structure for each parameter number returned.

Example

An example of using **rhsc_param_numbers** for C is located in the `\ Program Files\Honeywell\Experion PKS\Client\Netapi\ Samples\C\Napitst` project.

An example of using **rhsc_param_numbers** for C++ is located in the `\ Program Files\Honeywell\Experion PKS\Client\Netapi\ Samples\C\Mfcnetapitest\Mfcnetapitest` project.

An example of using **rhsc_param_numbers** for VB can be located in the `\ Program Files\Honeywell\Experion PKS\Client\Netapi\ Samples\Vb\Vbnetapitst` project.

Functions that do not require parameter name to number resolution

The following functions do not require resolution of parameter names to parameter numbers before being called:

- rhsc_param_value_bynames
- rhsc_param_value_put_bynames
- rhsc_param_hist_date_bynames
- rhsc_param_hist_offset_bynames

Accessing point parameters

When you have resolved the point and parameter numbers for all the parameters you are interested in, values for these parameters can be retrieved using the function rhsc_param_values. This function is called with the name of the server, a subscription period, the number of point parameter values to retrieve, and a data structure containing the list of point number/parameter number/offset tuples. The value of the parameter is returned in this data structure by the call, together with the type of the value. Check the return value for a partial function fail in case any of the requests for a parameter value failed.

The **rhsc_param_values** function can acquire a list of parameter values with a mix of data types. For each parameter value requested, the parameter value data type is returned with the parameter value so that the user can determine how to handle the value. The data types supported are: DT_CHAR, DT_INT2, DT_ INT4, DT_REAL, DT_DBLE and DT_ENUM.

rhsc_param_value_puts is a function for setting parameter values on the server. This function is called with the name of the server, the number of point parameters to write to the server, and a data structure (identical to that used by rhsc_param_values) containing a list of point number/parameter number/offset/parameter value/parameter type tuples. The status of each write is returned in this data structure by the call. Check the return value for a partial function fail in case an individual write failed on the server.

Although **rhsc_param_value_puts** is a list based function, there is no implication that it should be used as a sequential write function. If any individual put fails, the function will not prevent the remaining writes from occurring. The function will instead continue to write values to the remaining point parameters in the list.

Both of these point access functions, **rhsc_param_values** and **rhsc_param_ value_puts**, require the user to be aware of memory management. The user is responsible for allocating space in the data structure used by these functions and for freeing this space before exiting the network application.

For the **rhsc_param_values** call, the subscription period field is used to indicate the frequency at which your code will request the data. This allows the server to optimize its scanning strategies for the data you are interested in. If you are only using this routine occasionally, use the constant **NADS_READ_CACHE** so the server does not proceed with the optimization process.

The functions rhsc_param_value_bynames and rhsc_param_value_put_bynames are alternative functions that perform the same tasks as rhsc_param_values and rhsc_param_value_puts. There are performance costs associated with using these functions and it is preferable, where possible and when performance is a priority, to use the rhsc_param_values and rhsc_param_value_puts functions instead.

Example

Examples of using **rhsc_param_values** and **rhsc_param_value_puts** for C are located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\C\Napitst` project.

An example of using **rhsc_param_values** and **rhsc_param_value_puts** for C++ is located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\C\Mfcnetapitest\Mfcnetapitest` project.

An example of using **rhsc_param_values** and **rhsc_param_value_puts** for VB can be located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\Vb\Vbnetapitst` project.

Accessing historical information

The point and parameter numbers returned by the rhsc_point_numbers and rhsc_param_numbers calls can be used to identify the points for which you wish to retrieve historical data as well. The functions provided to do this (in the Network API) are: rhsc_param_hist_dates and rhsc_param_hist_offsets.

The function **rhsc_param_hist_offsets** is used when you know the sample offset from which you wish to retrieve history. It is called with the name of the server system, and a data structure containing the history type, offset, number of samples, and a list of points you wish to obtain history from.

The allowable **hist_type** values are defined in the header files **nads_def.h** and **nif_typ.bas** which are found in the `netapi\include` folder. Note that it is the responsibility of the calling function to allocate space for the history value structure.

The function **rhsc_param_hist_dates** is used when you know the date and time for which you wish to retrieve history. It is similar to **rhsc_param_hist_offsets** but uses the date and time rather than the sample offset.

The function is called with the name of the server and a data structure containing: the history type, date, time, number of samples, and a list of points you wish to obtain history from.

Attention

The maximum number of points that can be processed with one call to rhsc_param_hist_xxxx is 20.

The functions **rhsc_param_hist_date_bynames** and **rhsc_param_hist_offset_bynames** are the functional equivalents of **rhsc_param_hist_dates** and **rhsc_param_hist_offsets** except that point and parameter names are used instead of point and parameter numbers. All point and parameter name resolutions are performed by the server.

There are performance costs associated with using the **rhsc_param_hist_date_bynames** and **rhsc_param_hist_offset_bynames** functions because of the extra work required of the server and the extra network traffic caused by passing names instead of numbers to the server across the network.

Example

An example of using **rhsc_param_hist_xxxx** for C can be located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\C\Napitst` project.

An example of using **rhsc_param_hist_xxxx** for C++ is located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\C\Mfcnetapitest\Mfcnetapitest` project.

An example of using **rhsc_param_hist_xxxx** for VB can be located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\Vb\Vbnetapitst` project.

Accessing user table data

A user table is a convenient way of storing application-specific data in the server database. Many of the server functions are able to read and write information from the user tables, thereby enabling you to extend the capabilities of the Server.

Defining the user table layout

After the user table has been configured, you will need to layout the individual fields in the records. This layout information is to be used by the Network API so that it can determine how to interpret the user table.

Think of a single record as a series of individual fields lined up against one another. The server supports the following types of data fields:

Data field	Description
INT2 (VB equivalent Integer)	A two byte signed integer
INT4 (VB equivalent Long)	A four byte signed integer
REAL4 (VB equivalent Single)	A four byte IEEE floating point number
REAL8 (VB equivalent Double)	An eight byte IEEE floating point number
STR (VB equivalent String)	An ASCII string of fixed maximum length
(one byte per character)	
BITS (VB equivalent Integer)	A one to sixteen bit partial word integer

When defining the record layout of a user table, list the fields in consecutive order with their data type, description and calculate their word offset from the beginning of the record.

Accessing one field at a time

The function **rgetdat** is used to read a series of fields from the user tables in a remote Server database. It is called with the name of the Server, the number of fields to read and an array of data structures defining the fields to retrieve. The fields listed in the array may be from any table or any record within a table.

The function **rputdat** is used to write a series of fields into the user tables in a remote Server database. This function is called with the same arguments as the **rputdat** function.

Example

An example of using **rgetdat** and **rputdat** for C can be located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\C\Napitst` project.

An example of using **rgetdat_xxxx** and **rputdat_xxxx** for VB can be located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\Vb\Vbnetapitst` project.

Accessing a whole record

It is often the case that you will need to read an entire record. It is a good idea to write a function in order to do this so that your main program can deal with the record data in a structure rather than as single fields. The following example shows how to write such a function.

First you must define a structure that closely matches the user table. The record read function returns the record data in this format. It is called with: the name of the server, the record number, and the address of the structure to fill out. Note that the table number is not passed as it is implied by the function name.

Within the record read function, a static structure is initialized to match the layout of the user table record. This is the easiest way to set up the array of structures that need to be passed to the **rgetdat** call. It is also good practice to isolate this structure to this function by defining it as a static variable.

When the record read function is called, some minor parameter checking is performed then all the record numbers in the array are set to the required record. A call to **rgetdat** is made to read the individual fields. After this is checked, the individual field values are copied into the structure and passed back to the calling function.

A call to **rgetdat/rputdat** is not limited to retrieving only a handful of fields. For example a single call to **rgetdat** could retrieve up to 180 real8 fields. The actual limit to the number of fields can be determined by using:

```
(22 x number of fields) + sum all string lengths
<4000
```

Therefore, one **rgetdat** call could retrieve multiple records which could improve efficiency and program execution time. The function above could be easily changed to do this.

Example

Sample record read function for C

```
/* C structure of user table 07 */
typedef struct tagUSTBL07
    {
    int2        ipack;
    float       tmout;
    float       dout;
    float       bmax;
    float       cmin;
    float       bav;
    float       cav;
    float       idq;
    } USTBL07;

/* retrieve a single record from user table 07 */
int rget_ustbl07(host,recno,rec)
char *host;     /* (in) host name of the system  */
int recno;      /* (in) number of the record to retrieve */
USTBL07 *rec;   /* (out) record contents returned */
{
/* rgetdat structure of user table 07 */
static rgetdat_data ustbl07_def[]=
    {
    /* type              file    rec  word  start len */
    {RGETDAT_TYPE_INT2,  UTBL07_F, 1,    1,    0,    0},
    {RGETDAT_TYPE_REAL4, UTBL07_F, 1,    2,    0,    0},
    {RGETDAT_TYPE_REAL4, UTBL07_F, 1,    4,    0,    0},
    {RGETDAT_TYPE_REAL4, UTBL07_F, 1,    6,    0,    0},
    {RGETDAT_TYPE_REAL4, UTBL07_F, 1,    8,    0,    0},
    {RGETDAT_TYPE_REAL4, UTBL07_F, 1,   10,    0,    0},
    {RGETDAT_TYPE_REAL4, UTBL07_F, 1,   12,    0,    0},
    {RGETDAT_TYPE_BITS,  UTBL07_F, 1,   14,    0,    8}
    };

#define USTBL07_FLDS sizeof(ustbl07_def)/
                     sizeof(rgetdat_data)

int ierr;
int i;
```

```
    /* validate the host name */
    if (host==NULL)
        return 1;

    /* validate the rec pointer */
    if (rec==NULL)
        return 2;

    /* set the record number to retrieve */
    for (i=0; i<USTBL07_FLDS; i++)
        ustbl07_def[i].rec=recno;
     /* retrieve the actual record */
    if ((ierr=rgetdat(host,USTBL07_FLDS,ustbl07_def))!=0)
       return ierr;

    /* check the return status of each getdat call */
    for (i=0; i<USTBL07_FLDS; i++)
       {
        if (ustbl07_def[i].status!=0)
            return ustbl07_def[i].status;
        }

    /* copy the values retrieved into the structure */
    rec->ipack=ustbl07_def[0].value.int2;
    rec->tmout=ustbl07_def[1].value.real4;
    rec->dout=ustbl07_def[2].value.real4;
    rec->bmax=ustbl07_def[3].value.real4;
    rec->bav=ustbl07_def[4].value.real4;
    rec->cav=ustbl07_def[5].value.real4;
    rec->idq=ustbl07_def[6].value.bits;

    return 0;
}
```

Sample record read function for VB

In this example user table 7 records contain 8 floating point values.

```
'VB structure for user table 07
Private Type USTBL07
    ipack As Single
    tmout As Single
    dout As Single
    bmax As Single
```

```
    cmin As Single
    bav As Single
    cav As Single
    idq As Single
End Type

'file number for user table 07
Const UTBL07_F = 257


Private Function rget_ustbl07(ByVal host As String, ByVal recno As
Integer, rec As USTBL07) As Integer

    'declare data
    Dim ustbl07_def(7) As rgetdat_float_data_str

    'setup data
    For cnt = 0 To 7
        ustbl07_def(cnt).file = UTBL07_F
        ustbl07_def(cnt).rec = recno
        ustbl07_def(cnt).word = (cnt * 2) + 1
    Next

    'retrieve the actual record
    rget_ustbl07 = RGetDat_Float(host, 8, ustbl07_def)

    'check the return status
    If rget_ustbl07 <> 0 Then
        Exit Function
    End If

    'check the status on each value
    For cnt = 0 To 7
        If ustbl07_def(cnt).status <> 0 Then
            rget_ustbl07 = ustbl07_def(cnt).status
            Exit Function
        End If
    Next

    'copy the values retrieved into the structure
    rec.ipack = ustbl07_def(0).value
    rec.tmout = ustbl07_def(1).value
    rec.dout = ustbl07_def(2).value
```

```
        rec.bmax = ustbl07_def(3).value
        rec.cmin = ustbl07_def(4).value
        rec.bav = ustbl07_def(5).value
        rec.cav = ustbl07_def(6).value
        rec.idq = ustbl07_def(7).value

    End Function
```

This method could quite easily be applied for writing a whole record of a user table as well by using the **rputdat** function.

Looking up error strings

All of the Network API for Windows functions return a non-zero value when they encounter a problem performing an operation. The value returned can be used to lookup an error string which describes the type of error that occurred. The function **hsc_napierrstr** is used to lookup the error string from the error number.

Attention

The hexidecimal return value “839A” (NADS_PARTIAL_FUNC_FAIL) indicates that a partial function fail has occurred and is only a warning. This warning indicates that at least one request, and possibly all requests, made to a list-based function has failed. If this value is received, the `fstatus` Field of the data structure for each request should be checked for errors.

Example

An example of using **hsc_napierrstr** for C can be located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\C\Napitst` project.

You should use **hsc_napierrstr2** for VB. **hsc_napierrstr** is provided for backward compatibility only.

An example of using **hsc_napierrstr2** for VB can be located in the `\Program Files\Honeywell\Experion PKS\Client\Netapi\Samples\Vb\Vbnetapitst` project.

There is a special condition for error numbers. If the lower four digits of the hexadecimal error number is “8150”, then the top four digits gives a Experion PKS Process Controller error. In this case, hsc_napierrstr cannot be called to resolve the error number. Instead, you can look at the file `M4_err_def` in the include folder for the error string corresponding to the top four-digit Experion PKS Process Controller error code.

Example

Consider the return value: 0x01068150. The lower four digits (8150) indicates that this is an Experion PKS Process Control Software error. The entry for 0106 in `M4_err_def` indicates that the error is due to a “timeout waiting for response”.

Functions for accessing parameter values by name

Access to parameter values by using point and parameter names is provided by the functions:

- **rhsc_param_value_bynames**
- **rhsc_param_value_put_bynames**
- **rhsc_param_hist_offset_bynames**
- **rhsc_param_hist_date_bynames**

By using these functions in your interface, you are able to make requests using point names and parameter names. The resolution of these names is handled by the server. Data is manipulated via a single Network API call.

Be aware, however, that these functions produce significantly lower system performance than manually storing the results of the **rhsc_point_numbers** and **rhsc_param_numbers** functions locally. This is for two reasons:

- First, the server needs to resolve point and parameter names to numbers every time the functions are called, rather than just once at the start of the application.
- Second, point and parameter names are generally significantly longer than point and parameter numbers so there is greater network traffic.

The function **rhsc_param_value_bynames** is equivalent to:

rhsc_point_numbers + **rhsc_param_numbers** + **rhsc_param_values**

The function **rhsc_param_value_put_bynames** is equivalent to:

rhsc_point_numbers + **rhsc_param_numbers** + **rhsc_param_value_puts**

The function **rhsc_param_hist_offset_bynames** is equivalent to:

rhsc_point_numbers + **rhsc_param_numbers** + **rhc_param_hist_offsets**

The function **rhsc_param_hist_date_bynames** is equivalent to:

rhsc_point_numbers + **rhsc_param_numbers**+ **rhsc_param_hist_dates**

Attention

Optimum performance can only be achieved by using the functions **rhsc_point_numbers** and **rhsc_param_numbers** to resolve point names and parameter names.The names are resolved just once, at the start of the program. The equivalent point numbers and parameters numbers are returned by these functions and should be stored locally so that all subsequent requests to parameter and history values use the locally stored numbers.

Although **rhsc_param_value_put_byname** is a list based function, there is no implication that it should be used as a sequential write function. If any individual put fails, the function will not prevent the remaining writes from occurring. The function will instead continue to write values to the remaining point parameters in the list.

Be careful when using rhsc_param_value_put_bynames() with more than one point/parameter pair. Each put causes a control to be executed on the server and each control takes a small amount of time. If more than one pair is put, the total time for each of these controls may exceed the default TCP/IP timeout. This will cause the Network API to report the error RCV_TIMEOUT, even though all puts may have been successful. In addition, the Network API will be unavailable until the list of puts has been processed. This could cause subsequent calls to the network API to fail until the list is processed.

If maximum performance from the Network API is not a major consideration for your network application, then use the **rhsc_param_value_bynames**, **rhsc_param_value_put_bynames**, **rhsc_param_hist_offset_bynames** and **rhsc_param_hist_date_bynames** functions.

Visual Basic migration requirements

When upgrading your Network API from a release version that is earlier than PlantScape R500, all projects that use constants defined in the enumeration “ParamEnum” will need to include the reference “ParamEnum as a prefix of the constant.

Example

The constant PV, will become:

ParamEnum.PV

The following is a list of constants that are defined in the ParamEnum enumeration:

A1	AL4	DESC	PRIV
A1EROR	AL4PRI	EUHI	PV
A2	AL4SUB	EULO	PVALG
A2EROR	AL5PRI	GROUP	PVBLK
A3	AL5SUB	H1H	PVEROR
A3EROR	AL6PRI	H1HE	RAWPV
A4	AL6SUB	H1M	ROLOVR
A4EROR	AL7PRI	H24H	SCNSTS
AAIDSP	AL7SUB	H24HE	SF
ACALG	AL8PRI	H5SF	SP
ACBLK	AL8SUB	H6M	SPEROR
ACODE	ALMINH	H8H 4	SPHI
ACSACS	ALMPRI	H8HE	SPLO
ACSLV1	ALMSTS	HBASE	TRACE
ACSLV2	ALMSUB	LMTACS	UNITS
ADDRS	ASSDSP	LSTACS	UNITS1
AL1	AT	MD	UNITS2
AL1PRI	AT2	MDEROR	UNITS
AL1SUB	AT	MF	UNITS4
AL2	AT4	NAME	UNITS5
AL2PRI	CNTLEV	NOACS	UNITS6
AL2SUB	CNTPRI	OP	UNITS7
AL3	CNTSUB	OPEROR	

AL3PRI 9	COMENT	OPHI	
AL3SUB	CURACS	OPLO	

Compiling and linking programs

To compile and link Network Application programs make sure the compiler/linker you are using knows about the location of the Network API header and library files. This can be either done through environment variables or development environment settings. Consult your development environment documentation on how to do this.

Using Microsoft Visual Studio V6.0

You need to customize the Microsoft development environment so that the Network API include and library files are known to the compiler and linker.

To modify the include and library paths in Microsoft Visual Studio V6.0:

1. In the Microsoft Visual Studio application, choose **Tools > Options**.
2. Click the Directories tab.
3. From the **Show Directories for** select **Include files**.
4. Add `C:\Program Files\Honeywell\Experion PKS\Client\Netapi\Include`.
5. From the **Show Directories for** select **Include files**.
6. Add `C:\Program Files\Honeywell\Experion PKS\Client\Netapi\Lib`.

When creating new projects, make sure the appropriate library is included at the link stage.

To set Microsoft Visual Studio V6.0 to use the appropriate library:

1. Choose **Project > Settings**.
2. Click the **Link** tab.
3. From the **Category** list, select **General**.
4. In the **Object/library** modules box add hscnetapi.lib.

Modules that call Network API functions should have the header file `hscnapi.h` included after any standard header files.

Using Microsoft Visual Studio V7.1

You need to customize the Microsoft development environment so that the Network API include and library files are known to the compiler and linker.

Considerations

- If Experion PKS is not installed in C:\Program Files\Honeywell\Experion PKS\server, change the paths in steps 4 and 6 to reflect where you have installed Experion PKS.

To modify the include and library paths in Microsoft Visual Studio V7.1:

1. In the Microsoft Visual Studio application, choose **Tools > Options**.
2. In the tree view expand the **Projects** folder and click **VC++ Directories**.
3. From the **Show Directories** for list select **Include files**.
4. Add `C:\Program Files\Honeywell\Experion PKS\Client\Include`.
5. From the **Show Directories** for list select **Include files**.
6. Add `C:\Program Files\Honeywell\Experion PKS\Client\Netapi\Lib`.

When creating new projects, make sure the appropriate library is included at the link stage.

To set Microsoft Visual Studio V7.1 to use the appropriate library:

1. Choose **Project > *Projectname* Properties** to open the Property Page dialog box, where ***Projectname*** is the name of your project.
2. In the tree view click the **Linker** folder to display the Link properties.
3. From the **Linker** list, select **Input**.
4. In the **Additional Dependencies** box add **hscnetapi.lib**.

Modules that call Network API functions should have the header file `hscnapi.h` included after any standard header files.

Using the Visual Basic development environment

Visual Basic programs that need to call the Network API will need to add a reference to the Network API dll in the project reference.

To do this, select the **Project References**.

1. When the list of available references is displayed, scroll down to **Honeywell Network API Type Library 1.0**.
2. Check the box to include this reference into the project.
3. Click **OK** to save the information.

Network API Function Reference

13

The Network API provides the ability to remotely interrogate and change values in the server database through a set of library routines.

Functions that enable access to remote point history data and user tables are available as well as remote point control via a TCP/IP network.

There is one significant difference between Network API remote server functions and local server functions. The Network API functions, where sensible, allow multiple invocations of the API function remotely using a single request. This enables network bandwidth and processing resources to be used more sparingly. In other respects, the functions closely follow the functionality of their standard API equivalents.

The following sections describe:

- Functions
- Backward-compatibility Functions
- Diagnostics for Network API functions

Functions

hsc_bad_value

hsc_napierrstr

rgetdat

rhsc_notifications

rhsc_param_hist_date_bynames

rhsc_param_hist_offset_bynames

rhsc_param_hist_dates

rhsc_param_hist_offsets

rhsc_param_numbers

rhsc_param_value_bynames

rhsc_param_value_put_bynames

rhsc_param_value_put_sec_bynames

rhsc_param_value_puts

rhsc_param_value_puts_sec

rhsc_param_values

rhsc_point_numbers

rputdat

See also

“Backward-compatibility Functions” on page 440

“Diagnostics for Network API functions” on page 463

hsc_bad_value

Checks whether the parameter value is bad.

C/C++ Synopsis

```
int hsc_bad_value (float nValue)
```

VB Synopsis

```
hsc_bad_value (ByVal nValue as Single) As Boolean
```

Arguments

Argument	Description
nValue	(in) The parameter value

Description

This function is really only useful for the history functions, which do return bad values.

Returns TRUE (-1) if the parameter value is BAD; otherwise FALSE (0).

hsc_napierrstr

Lookup an error string from an error number.

C/C++ Synopsis

```
void hsc_napierrstr(UINT err,
                    LPSTR texterr);
```

VB Synopsis

```
hsc_napierrstr2(ByVal err As Long) As String
```

Arguments

Argument	Description
param	(in) The error number to lookup
texterr	(out) The error string returned

Diagnostics

This function will always return a usable string value.

rgetdat

Retrieve a list of fields from a user file.

C/C++ Synopsis

```
int rgetdat(char *server,
            int num_points,
            rgetdat_data* getdat_data);
```

VB Synopsis

```
rgetdat_int(ByVal server As String,
            ByVal num_points As Integer,
            getdat_int_data() As rgetdat_int_data_
str)
            As Integer
rgetdat_bits(ByVal server As String,
            ByVal num_points As Integer,
            getdat_bits_data() As rgetdat_bits_
data_str)
            As Integer
rgetdat_long(ByVal server As String,
             ByVal num_points As Integer,
             getdat_long_data() As rgetdat_long_
data_str)
             As Integer
rgetdat_float(ByVal server As String,
              ByVal num_points As Integer,
              getdat_float_data() As rgetdat_float_
data_str)
              As Integer
rgetdat_double(ByVal server As String,
               ByVal num_points As Integer,
               getdat_double_data()
               As rgetdat_double_data_str) As
Integer
rgetdat_str(ByVal server As String,
```

```
                ByVal num_points As Integer,
                getdat_str_data()
                As rgetdat_str_data_str) As Integer
```

Arguments

Argument	Description
server	(in) Name of server that the database resides on.
num_points	(in) The number of points passed to rgetdat_xxxx in the getdat_xxxx_data argument.
getdat_xxxx_data	(in/out) Pointer to a series of rgetdat_xxxx_data structures (one for each point).

Description

This function call enables fields from a user table to be accessed. The fields to be accessed are referenced by the members of the rgetdat_data structure (see below). The function accepts an array of rgetdat_data structures thus providing the flexibility to obtain multiple fields with one call. Note that for the C interface only (not the VB interface), the fields can be of different types and from different user tables.

Note that a successful return status from the rgetdat call indicates that no network errors were encountered (that is, the request was received, processed and responded to). The status field in each call structure needs to be verified on return to determine the result of the individual remote calls.

The program using this function call must ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network. To meet this requirement, adhere to the following guideline:

```
(22 * number of fields) + sum of all string value
lengths in bytes <4000
```

The structure of the rgetdat_data structure is defined in nif_types.h. This structure and its members are defined as follows:

`int2  type`	(in) Defines the type of data to be retrieved/stored, this will be one of the standard server data types. Namely using one of the following defines: RGETDAT_TYPE_INT2, RGETDAT_TYPE_INT4, RGETDAT_TYPE_REAL4, RGETDAT_TYPE_REAL8, RGETDAT_TYPE_STR, RGETDAT_TYPE_BITS
`int2  file`	(in) Absolute database file number to retrieve/store field.

`int2 rec`	(in) Record number in above file to retrieve/store field.
`int2 word`	(in) Word offset in above record to retrieve/store field.
`int2 start_bit`	(in) Start bit offset into the above word for the first bit of a bit sequence to be retrieved/stored. (That is, the bit sequence starts at: word + start_bit, where start_ bit=0 is the first bit in the field.). Ignored if type is not a bit sequence.
`int2 length`	(in) Length of bit sequence or string to retrieve/store, in characters for a string, in bits for a bit sequence. Ignored if type is not a string or bit sequence.
`int2 flags`	(in) Specifies the direction to read/write for circular files. (0: newest record, 1: oldest record)
`rgetdat_value value`	(in/out) Value of field retrieved or value to be stored. When storing strings they must be of the length given above. When strings are retrieved, they become NULL terminated, hence the length allocated to receive the string must be one more than the length specified above. Bit sequences will start at bit zero and be length bits long. See below a description of the union types.
`int2 status`	(out) return value of actual remote getdat/putdat call.
	The union structure of the value member used in the rgetdat_data structure is defined in nif_types.h. This structure, and its members, are defined as follows:
`short int2`	Two byte signed integer.
`long int4`	Four byte signed integer.
`float real4`	Four byte IEEE floating point number.
`double real`	Eight byte (double precision) IEEE floating point number.
`char* str`	Pointer to string. (Note allocation of space for retrieving a string is the responsibility of the program calling rgetdat, see rgetdat_data structure description above).
`unsigned short bits`	Two byte unsigned integer to be used for bit sequences (partial integer). Note the maximum length of a bit sequence is limited to 16.

Diagnostics

See “Diagnostics for Network API functions” on page 463.

rhsc_notifications

Insert an alarm or event into the event log.

C/C++ Synopsis

```
int rhsc_notifications(char            *szHostname,
                       int             cjrnd,
                       NOTIFICATION_DATA* notd);
```

VB Synopsis

```
RHSC_notifications(ByVal hostname As String,
                   ByVal num_requests As Long,
                   notification_data_array()
                   As notification_data) As Long
```

Arguments

Argument	Description
szHostname	(in) Name of server that the data resides on (that is, server hostname)
cprmbd	(in) Number of notifications requested
notd	(in/out) Pointer to an array of NOTIFICATION_DATA structures (one array element for each request)

Description

The structure of the NOTIFICATION_DATA structure is defined in netapi_types.h. This structure and its members are defined as follows:

`struct timeb timebuf`	(in) reserved for future use
`n_long nPriority`	(in) priority
`n_long nSubPriority`	(in) sub priority
`n_char* szName`	(in) name (usually pnt name)
`n_char* szEvent`	(in) event (eg. RCHANGE)
`n_char* szAction`	(in) action (eg. OK, ACK, CNF)
`n_char* szLevel`	(in) level (eg. CB, MsEDE, NAPI)
`n_char* szDesc`	(in) description (usually param name)
`n_char* szValue`	(in) alarm value

`n_char*`	`szUnits`	(in) alarm units
`n_long`	`fStatus`	(out) unused at the moment

RHSC_NOTIFICATIONS can be used to remotely generate alarms and events. The various text fields are the raw data that can be specified. Not all the fields are applicable to every type of notification. The data in these fields are formatted for you into a standard event log line on the server. The **nPriority** field is used to define the behavior on the server. The following constants are defined in **nads_def.h**:

`NTFN_ALARM_URGENT`	`generates an urgent level alarm`
`NTFN_ALARM_HIGH`	`generates a high level alarm`
`NTFN_ALARM_LOW`	`generates a low level alarm`
`NTFN_ALARM_JNL`	`generates a journal level alarm`
`NTFN_EVENT`	`only generates an event (nothing will be logged to the alarm list)`

A number of predefined strings have been provided for use in the **szEvent**, **szAction** and **szLevel** fields. Although there is no requirement to use these strings, their use will promote consistency. They can be found in **nads_def.h**.

```
static char* EventStrings[] =
        {
            // should be an alarm type, an event type from
            // one of the following strings, blank or user
            // defined.
            "CHANGE",    // local operator change
            "ACHANGE",   // application (non-Station) change
            "LOGIN",     // operator login
            "ALOGIN",    // application (non-Station) login
            "WDT",       // watch dog timer event
            "FAILED"     // operation failed
        };
static char* ActionStrings[] =
        {
            // should be blank (new alarm), an event type from
            // one of the following strings or user defined
            "OK",         // alarm returned to normal
            "ACK",        // alarm acknowledged
            "CNF"         // message confirmed
        };
static char* LevelStrings[] =
```

```
{
    // should be an alarm level, one of the
    // following strings indicating where the event
    // was generated from, blank or user defined
    “CB”,          // Control Builder
    “MSEDE”,       // Microsoft Excel Data Exchange
    “NAPI”,        // Network API application
    “API”          // API application
};
```

A successful return status from the rhsc_notifications call indicates that no network errors were encountered (that is, the request was received, processed, and responded to). If the returned value is NADS_PARTIAL_FUNC_FAIL, then at least one request (and possibly all requests) failed. The status field of each array element should be checked to find which request failed.

It is the responsibility of the program using this function call to ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network. To meet this requirement, adhere to the following guideline:

- For ALL request packets:

  ```
  (15 * number of notifications) + sum of all string
  lengths < 4000
  ```

Note that the sum of the string lengths does not include nulls, which is the convention for C/C++.

Example

Create an event log entry indicating that a remote control has just occurred.

```
#include <sys/timeb.h>
int status;
int i;
/* Set the point names, parameter names and parameter offsets to
appropriate
values */
PARAM_DATA rgprmbd[] = {{“pntana1”,”DESC”, 1}};
#define cprmbd (sizeof(rgprmbd)/sizeof(PARAM_DATA))
/* Setup parameters for the call to rhsc_notifications */
NOTIFICATION_DATA rgnotd[cprmbd];

/* Allocate space and set the value and type to control pntana1.SP to 42.0
*/
rgprmbd[0].pupvValue = (PARvalue *)malloc(sizeof (PARvalue));
strcpy(rgprmbd[0].pupvValue->text, “FunkyDescription”);
rgprmbd[0].nType = DT_CHAR;
```

```
/* Set up the rest of the parameters for the notification */
ftime(&rgnotd[0].timebuf);                        /* Set the time */
rgnotd[0].nPriority = NTFN_EVENT;                 /* Event only */
rgnotd[0].nSubPriority = 0;                       /* Subpriority */
rgnotd[0].szName = rgprmbd[0].szPntName;          /* Set the point name */
rgnotd[0].szEvent = EventStrings[0];               /* Assign event to be
"RCHANGE" */
rgnotd[0].szAction = ActionStrings0];             /* Action is "OK" */
rgnotd[0].szLevel = LevelStrings[2];              /* Notification from
"NAPI" */
rgnotd[0].szDesc = rgprmbd[0].szPrmName;          /* Parameter name */
rgnotd[0].szValue = rgprmbd[0].pupvValue->text; /* Value to control "SP"
to */
rgnotd[0].szUnits = "";                           /* No units */

status = rhsc_param_value_put_bynames("server1", cprmbd, rgprmbd);

/* The notification is created here! */
status = rhsc_notifications("server1", cprmbd, rgnotd);
```

Diagnostics

See "Diagnostics for Network API functions" on page 463.

See also

hsc_notif_send

rhsc_param_hist_date_bynames

Retrieve history values for Parameters referenced by name from a start date.

This function's synopsis and description is identical to that of "rhsc_param_hist_offset_bynames" on page 393.

rhsc_param_hist_offset_bynames

Retrieve history values for parameters referenced by name from an offset.

C Synopsis

```
int rhsc_param_hist_date_bynames(char  *szHostName,
                     int               cHstRequests,
                     HIST_BYNAME_DATA* rghstbd);

int rhsc_param_hist_offset_bynames(char  *szHostName,
                       int               cHstRequests,
                       HIST_BYNAME_DATA* rghstbd);
```

VB Synopsis

```
RHSC_param_hst_date_bynames(ByVal Server As String,
                            ByVal num_requests As Long,
                            hist_byname_data_array()
                            As hist_byname_data) As Long

RHSC_param_hst_offset_bynames(ByVal Server As String,
                              ByVal num_requests As Long,
                              hist_byname_data_array()
                              As hist_byname_data) As Long
```

Arguments

Argument	Description
szHostName	(in) Name of server on which the data resides
cHstRequests	(in) Number of rghstbd elements
rghstbd	(in / out) Pointer to an array of HIST_BYNAME_DATA structures. One array element for each request.

Description

The structure of the HIST_BYNAMES_DATA structure is defined in netapi_types.h. This structure and its members are defined as follows:

`n_long dtStartDate`	(in) The start date of history to retrieve in Julian days (number of days since 1 Jan 1981). If the function called is rhsc_param_hist_offset_bynames then this value is ignored.
`n_float tmStartTime,`	(in) The start time of history to retrieve in seconds since midnight. If the function called is rhsc_param_hist_offset_bynames then this value is ignored.
`n_long nHstOffset,`	(in) Offset from latest history value in history intervals (where offset=1 is the most recent history value). If the function called is rhsc_param_hist_date_bynames then this value is ignored.
`n_long fGetHstParStatus,`	(out) The status returned by the gethstpar function.
`n_short nHstType,`	(in) The type of history to retrieve (See Description).
`n_ushort cPntPrmNames,`	(in) The number of point / parameter pairs requested.
`n_ushort cHstValues`	(in) The number of history values to be returned per point / parameter pair. This value must not be negative: the error message “Message being built too large” is returned if it is.
`n_char* szArchivePath,`	(in) Pointer to a null-terminated string containing the pathname of the archive files relative to the current folder. A NULL pointer implies that the system will use current history and any archive files which correspond to the value of the date and time parameters. The archive files are usually located in `<server folder>\archive\`. For information about archive folders, see the *Configuration Guide*. To access the files in `<server folder>\archive\ay1996m09d26h11r008`, the archive argument is “ay1996m09d26h11r008”.
`n_char** rgszPointNames,`	(in) An array of point names to process.
`n_char** rgszParamNames`	(in) An array of parameter names to process. Each parameter is associated with the corresponding entry in the rgszPointNames array.

`n_long*`	`rgfPntPrmStatus`	(out) The status returned by the Server when calling `hsc_point_number` and `hsc_param_number` for each point parameter pair.
`n_float*`	`rgnHstValues`	(out) A pointer to a the list of returned history values. The history values are stored in rHstValuessized blocks for each point parameter pair. If there is no history for the requested time or if the data was bad, then the value -0.0 is stored in the array.

These functions request a number of blocks of history data from a remote server. For each block, a history type is specified using one of the following values:

Value	Description
`HST_1MIN`	One minute Standard history
`HST_6MIN`	Six minute Standard history
`HST_1HOUR`	One hour Standard history
`HST_8HOUR`	Eight hour Standard history
`HST_24HOUR`	Twenty four hour Standard history
`HST_5SECF`	Fast history
`HST_1HOURE`	One hour Extended history
`HST_8HOURE`	Eight hour Extended history
`HST_24HOURE`	Twenty four hour Extended history

Depending upon which function is called, history will be retrieved from a specified date and time or offset going backwards in time. The number of history values to be retrieved per point is specified by `cHstValues`. `cHstValues` must not be negative. Point parameters are specified by name only and all name to number resolutions are performed by the server.

Before making a request you must allocate sufficient memory for each list pointed to by `rgnHstValues`. You must also free this memory before exiting your network application. The number of bytes required for each request is `4*cHstValues*cPntPrmNames`.

A successful return status from the `rhsc_param_hist_xxxx_bynames` call indicates that no network errors were encountered (that is, the request was received, processed, and responded to). If the returned value is NADS_PARTIAL_FUNC_FAIL, then at least one request (and possibly all requests) failed. The status fields of each array element should be checked to find which request failed.

The program using this function call must ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network.

To meet the program requirement not to exceed the maximum packet size permitted, adhere to the following guidelines:

- For request packets for rhsc_param_hist_date_bynames:

  ```
  (15 * number of history requests) + (2 * number of
  point parameter pairs) + sum of string lengths of
  point names, parameter names and archive paths in
  bytes < 4000
  ```

- For request packets for rhsc_param_hist_offset_bynames:

  ```
  (11 * number of history requests) + (2 * number of
  point parameter pairs) + sum of string lengths of
  point names, parameter names and archive paths in
  bytes < 4000
  ```

- For response packets:

  ```
  (4 * number of history requests)+ (4 * (For each
  history request the sum of (cPntPrmNames +
  cPntPrmNames * cHstValues))) < 4000
  ```

Diagnostics

See “Diagnostics for Network API functions” on page 463.

Example

For rhsc_param_hist_date_bynames

```
int status;.
int i;
n_long ConvertToDays(n_long year, n_long month, n_long day)
{
    n_long nConvertedDays = 0;
    n_long leap = 0;
    nConvertedDays = (year - 1981) * 365 + (year - 1981) / 4 + day - 1;
    leap = ((year % 400) == 0) || (((year % 100) != 0) && ((year % 4) ==
0));
    switch(month)
    {
    case 12:
        nConvertedDays += 30;
    case 11:
        nConvertedDays += 31;
    case 10:
```

```
        nConvertedDays += 30;
    case 9:
        nConvertedDays += 31;
    case 8:
        nConvertedDays += 31;
    case 7:
        nConvertedDays += 30;
    case 6:
        nConvertedDays += 31;
    case 5:
        nConvertedDays += 30;
    case 4:
        nConvertedDays += 31;
    case 3:
        nConvertedDays += 28 + leap;
    case 2:
        nConvertedDays += 31;
    case 1:
        break;
    default:
        printf("Invalid month\n");
        return 0;
    }
    return nConvertedDays;
}

n_float ConvertToSeconds(int hour, int minute, int second)
{
    return (n_float)(second + (minute * 60) + (hour * 3600));
}

int main()
{
    HIST_BYNAME_DATA rghstbd[2];
    int chstbd = 2;
    /* Set up date and time for 7 November 2001 at 1:00 pm */
    n_long year = 2001;
    n_long month = 11;
    n_long day = 7;
    int hour = 13;
    int minute = 0;
    int second = 0;
```

```
    /* Allocate memory and set up rghstbd */
    for (i=0; i<chstbd; i++)
    {
        rghstbd[i].dtStartDate = ConvertToDays(year,month,day);
        rghstbd[i].tmStartTime = ConvertToSeconds(hour,minute,second);
        rghstbd[i].nHstType = HST_5SECF;
        rghstbd[i].cPntPrmNames = 3;    /* Two point parameter pairs */
        rghstbd[i].cHstValues = 10;     /* Ten history values each */
        rghstbd[i].szArchivePath = "ay2001m11d01h13r001";
        rghstbd[i].rgszPointNames = (char **)malloc(sizeof(char *) * 3);
        rghstbd[i].rgszPointNames[0]="AnalogPoint";
        rghstbd[i].rgszPointNames[1]="AnalogPoint";
        rghstbd[i].rgszPointNames[2]="AnalogPoint";
        rghstbd[i].rgszParamNames = (char **)malloc(sizeof(char *) * 3);
        rghstbd[i].rgszParamNames[0]="pv";
        rghstbd[i].rgszParamNames[1]="sp";
        rghstbd[i].rgszParamNames[2]="op";
        rghstbd[i].rgfPntPrmStatus = (n_long *)malloc(sizeof(n_long) * 3);
        rghstbd[i].rgnHstValues = (n_float *)malloc(sizeof(n_float) * 30);
    }

    status = rhsc_param_hist_date_bynames("Server1", chstbd, rghstbd);

    switch (status)
    {
    case 0:
        printf("rhsc_param_hist_date_bynames successful\n");
        /* Now print the 4th history value returned for AnalogPoint's op
*/
        printf("Value = %f\n",
            rghstbd[0].rgnHstValues[3 + rghstbd[0].cHstValues * 2]);
        break;
    case NADS_PARTIAL_FUNC_FAIL:
        printf("rhsc_param_hist_date_bynames partially failed");
        /* Check fStatus flags to find out which one(s) failed. */
        break;
    default:
        printf("rhsc_param_hist_date_bynames failed (errno=0x%x)",
status);
        break;
    }

    for (i=0; i<chstbd; i++)
```

```
    {
        free(rghstbd[i].rgszPointNames);
        free(rghstbd[i].rgszParamNames);
        free(rghstbd[i].rgfPntPrmStatus);
        free(rghstbd[i].rgnHstValues);
    }
    return 0;
}
```

For rhsc_param_hist_offset_bynames

```
int status;
int i;
int main()
{
    HIST_BYNAME_DATA rghstbd[2];
    int chstbd = 2;
    n_long nOffset = 1;     /* Most recent history value */
    /* Allocate memory and set up rghstbd */
    for (i=0; i<chstbd; i++)
    {
        rghstbd[i].nHstOffset = nOffset;
        rghstbd[i].nHstType = HST_5SECF;
        rghstbd[i].cPntPrmNames = 3;    /* Two point parameter pairs */
        rghstbd[i].cHstValues = 10;     /* Ten history values each */
        rghstbd[i].szArchivePath = "ay2001m11d01h13r001";
        rghstbd[i].rgszPointNames = (char **)malloc(sizeof(char *) * 3);
        rghstbd[i].rgszPointNames[0]="AnalogPoint";
        rghstbd[i].rgszPointNames[1]="AnalogPoint";
        rghstbd[i].rgszPointNames[2]="AnalogPoint";
        rghstbd[i].rgszParamNames = (char **)malloc(sizeof(char *) * 3);
        rghstbd[i].rgszParamNames[0]="pv";
        rghstbd[i].rgszParamNames[1]="sp";
        rghstbd[i].rgszParamNames[2]="op";
        rghstbd[i].rgfPntPrmStatus = (n_long *)malloc(sizeof(n_long) * 3);
        rghstbd[i].rgnHstValues = (n_float *)malloc(sizeof(n_float) * 30);
    }

    status = rhsc_param_hist_offset_bynames("Server1", chstbd, rghstbd);

    switch (status)
    {
    case 0:
        printf("rhsc_param_hist_offset_bynames successful\n");
```

```
        /* Now print the 4th history value returned for AnalogPoint's op
*/
        printf("Value = %f\n",
            rghstbd[0].rgnHstValues[3 + rghstbd[0].cHstValues * 2]);
        break;
    case NADS_PARTIAL_FUNC_FAIL:
        printf("rhsc_param_hist_offset_bynames partially failed");
        /* Check fStatus flags to find out which one(s) failed. */
        break;
    default:
        printf("rhsc_param_hist_offset_bynames failed (errno=0x%x)",
status);
        break;
    }

    for (i=0; i<chstbd; i++)
    {
        free(rghstbd[i].rgszPointNames);
        free(rghstbd[i].rgszParamNames);
        free(rghstbd[i].rgfPntPrmStatus);
        free(rghstbd[i].rgnHstValues);
    }
    return 0;
}
```

rhsc_param_hist_dates

Retrieve history values for a point based on date.

This function's synopsis and description are identical to that of "rhsc_param_hist_offsets" on page 402.

rhsc_param_hist_offsets

Retrieve history values for a point based on offset.

C/C++ Synopsis

```
int rhsc_param_hist_dates
(
  char*                     server,
  int                       num_gethsts,
  rgethstpar_date_data*     gethstpar_date_data
);
int rhsc_param_hist_offsets
(
  char*                     server,
  int                       num_gethsts,
  rgethstpar_ofst_data*     gethstpar_ofst_data
);
```

VB Synopsis

```
rhsc_param_hist_dates(ByVal server As String,
                      num_requests As Long,
                      gethstpar_date_data_array()
                      As gethstpar_date_data) As
Long
rhsc_param_hist_offsets(ByVal server As String,
                        num_requests As Long,
                        gethstpar_ofst_data_array()
                        As gethstpar_ofst_data) As
Long
```

Arguments

Argument	Description
server	(in) Name of server that the database resides on
num_requests	(in) The number of history requests
gethstpar_xxxx_data	(in/out) Pointer to an array of rgethstpar_xxxx_data structures (one array element for each request)

Description

Use this function to retrieve history values for points. The two types of history (based on time or offset) are retrieved using the corresponding function variation. History will be retrieved from a specified time or offset going backwards in time. The history values to be accessed are referenced by the rgethst_date_data and rgethst_ofst_data structures (see below). The functions accept an array of these structures, thus providing access to multiple point history values with one function call.

Note that a successful return status from the rgethst call indicates that no network errors were encountered (that is, the request was received, processed and responded to). The status field in each call structure needs to be verified on return to determine the result of the individual remote calls.

The structure of the rgethst_date_data structure is defined in nif_types.h. This structure and its members are defined as follows:

`uint2 hist_type`	(in) Defines the type of history to retrieve, this will be one of the standard server history types. Namely using one of the following: HST_1MIN, HST_6MIN, HST_1HOUR, HST_8HOUR, HST_24HOUR, HST_5SECF, HST_1HOURE, HST_8HOURE, HST_24HOURE
`uint4 hist_start_date`	(in) Start date of history to receive in Julian days (number of days since 1st January 1981).
`ureal4 hist_start_time`	(in) Start time of history to retrieve in seconds since midnight.
`uint2 num_hist`	(in) Number of history values per point to be retrieved.
`uint2 num_points`	(in) Number of points to be processed. MAXIMUM value allowed is 20.
`uint2* point_type_nums`	(in) Array (of dimension num_points) containing the point type/numbers of the point history values to retrieve.
`uint2* point_params`	(in) Array of (dimension num_points) containing the parameter numbers of the history values to retrive.
`uchar* archive path`	(in) Pointer to the NULL terminated string containing the archive path name of the archive file. A NULL pointer implies that the system will use current history and any archive files which correspond to the value of the date and time parameters.
`real4* hist_values`	(out) Array (of dimension num_points * num_hist) to provide storage for the returned history values.
`uint2 gethst_status`	(out) Return value of the actual remote gethst_date call.

The structure of the rgethst_ofst_data structure is defined in nif_types.h. This structure and its members are defined as follows:

`uint2 hist_type`	(in) Defines the type of history to retrieve, this will be one of the standard server history types. Namely using one of the following defines: HST_1MIN, HST_6MIN, HST_1HOUR, HST_8HOUR, HST_24HOUR, HST_5SECF, HST_1HOURE, HST_8HOURE, HST_24HOURE
`uint4 hist_offset`	(in) Offset from latest history value in history intervals where offset=1 is the most recent history value).
`uint2 num_hist`	(in) Number of history values per point to be retrieved.
`uint2 num_points`	(in) Number of points to be processed. MAXIMUM value allowed is 20.
`uint2* point_type_nums`	(in) Array (of dimension num_points) containing the point type/numbers of the point history values to retrieve.
`uint2* point_params`	(in) Array of (dimension num_points) containing the parameter numbers of the history values to retrieve.
`uchar* archive path`	(in) Pointer to the NULL terminated string containing the archive path name of the archive file. A NULL pointer implies that the system will use current history and any archive files which correspond to the value of the date and time parameters.
`real4* hist_values`	(out) Array (of dimension num_points * num_hist) to provide storage for the returned history values.
`uint2 gethst_status`	(out) Return value of the actual remote gethst_date call.

The program using this function call must ensure that the size of the network packets generated does not exceed the maximum packet size permitted on the network. To meet this requirement, adhere to the following guideline:

- For request packets for rhsc_param_hist_dates:

  `(15 * number of history requests) + (2 * number of points requested) + string lengths of archive paths < 4000.`

- For request packets for rhsc_param_hist_offsets:

  `(11 * number of history requests) + (2 * number of points requested) + string lengths of archive paths <4000.`

- For response packets:

  ```
  (4 * number of history requests) + (4 * (For each
  history request the sum of (num_hist * num_
  points)))
  ```

Diagnostics

See “Diagnostics for Network API functions” on page 463.

rhsc_param_numbers

Resolve a list of parameter names to numbers.

C Synopsis

```
int rhsc_param_numbers(char*            szHostname,
                       int                cprmnd,
                       PARAM_NUMBER_DATA* rgprmnd);
```

VB Synopsis

```
rhsc_param_numbers(ByVal hostname As String,
                   ByVal num_requests As Long,
                   param_number_data_array() As
                   param_number_data) As Long
```

Arguments

Argument	Description
szHostname	(in) Name of server on which the database resides
cprmnd	(in) The number of parameter name resolutions requested
rgprmnd	(in/out) Pointer to an array of PARAM_NUMBER_DATA structures (one for each point parameter)

Description

The structure of the PARAM_NUMBER_DATA structure is defined in nif_types.h. This structure and its members are defined as follows:

`n_ushort  nPnt`	(in) point number
`n_char*  szPrmName`	(in) parameter name to resolve
`n_ushort  nPrm`	(out) parameter number returned
`n_long  fStatus`	(out) status of each request

RHSC_PARAM_NUMBERS converts a list of point parameter names to their equivalent parameter numbers for a specified remote server.

A successful return status from the rhsc_param_numbers call indicates that no network errors were encountered (that is, the request was received, processed, and responded to). If the returned value is NADS_PARTIAL_FUNC_FAIL, then at least one request (and possibly all requests) failed. The status field of each array element should be checked to find which request failed.

The program using this function call must ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network. To meet this requirement, adhere to the following guidelines:

- For request packets:

  ```
  (4 * number of points) + sum of string lengths of
  point names in bytes < 4000
  ```

- For response packets:

  ```
  (6 * number of points) < 4000
  ```

Example

Resolve the parameter names “pntana1.SP” and “pntana1.DESC”.

```
int               status;
int               i;
POINT_NUMBER_DATA rgpntnd[] = {{“pntana1”}};
PARAM_NUMBER_DATA rgprmnd[] = {{0, “SP”},{0, “DESC”}};

#define cpntnd sizeof(rgpntnd)/sizeof(POINT_NUMBER_DATA)
#define cprmnd sizeof(rgprmnd)/sizeof(PARAM_NUMBER_DATA)

status = rhsc_point_numbers(“server1”, cpntnd, rgpntnd);
/* Check for error status. */

/* Grab the point numbers from the rgpntnd array. */
rgprmnd[0].nPnt = rgpntnd[0].nPnt;
rgprmnd[1].nPnt = rgpntnd[0].nPnt;

status = rhsc_param_numbers(“server1”, cprmnd, rgprmnd);
switch (status)
{
    case 0:
        printf(“rhsc_param_numbers successful\n”);
        for (i=0; i<cprmnd; i++)
        {
            printf(“%s.%s has the parameter number %d\n”,
                   rgpntnd[0].szPntName,
                   rgprmnd[i].szPrmName,
```

```
                    rgprmnd[i].nPrm);
            }
        case NADS_PARTIAL_FUNC_FAIL:
            printf("rhsc_param_numbers partially failed\n");
            /* Check fStatus flags to find out which ones failed. */
            break;
        default:
            printf("rhsc_param_numbers failed (errno=0x%x)\n",
                   status);
            break;
    }
```

Diagnostics

See "Diagnostics for Network API functions" on page 463.

See also

rhsc_point_numbers

rhsc_param_value_bynames

Reads a list of point parameter values referenced by name.

C/C++ Synopsis

```
int rhsc_param_value_bynames
(
  char*                 szHostname,
  int                   nPeriod,
  int                   cprmbd,
  PARAM_BYNAME_DATA*    rgprmbd
);
```

VB Synopsis

```
RHSC_param_value_bynames(ByVal hostname As String,
                         ByVal period As Long,
                         ByVal num_requests As
Long,
                         param_byname_data_array()
As
                         param_byname_data) As Long
```

Arguments

Argument	Description
szHostname	(in) Name of server that the data resides on.
nPeriod	(in) subscription period in milliseconds for the point parameters. Use the constant NADS_READ_CACHE if subscription is not required. If the value is in the Experion PKS cache, then that value will be returned. Otherwise the controller will be polled for the latest value. Use the constant NADS_READ_DEVICE if you wish to force Experion PKS to re-poll the controller. The subscription period will not be applied to standard point types.
cprmbd	(in) Number of parameter values requested.
rgprmbd	(in/out) Pointer to an array of PARAM_BYNAME_ DATA structures (one array element for each request).

Description

The structure of the PARAM_BYNAME_DATA structure is defined in nif_types.h. This structure and its members are defined as follows:

`n_char* szPntName`	in) point name
`n_char* szPrmName`	(in) parameter name
`n_long nPrmOffset`	(in) parameter offset
`PARvalue* pupvValue`	(out) parameter value union
`n_ushort nType`	(out) value type
`n_long fStatus`	(out) status of each value access

RHSC_PARAM_VALUE_BYNAMES requests a list of point parameter values from the specified remote server. Point parameters are requested by name only, and all name to number resolutions are performed by the server.

You can read a list of parameter values with different types using a single request. Each point parameter value is placed into a union (of type PARvalue). Before making the request, you must allocate sufficient memory for each value union. You must free this memory before exiting your network application.

A successful return status from the `rhsc_param_value_bynames` call indicates that no network errors were encountered (that is, the request was received, processed, and responded to). If the returned value is NADS_PARTIAL_FUNC_FAIL, then at least one request (and possibly all requests) failed. The status field of each array element should be checked to find which request failed.

The program using this function call must ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network.

Due to the ability to acquire a list of parameters of mixed data type, it is difficult to give generic limits. To meet the program requirement not to exceed the maximum packet size permitted, adhere to the following guidelines given for a number of specific cases:

- For all request packets:

  ```
  (6 * number of point parameters) + sum of string
  lengths of point names + sum of string lengths of
  parameter names < 4000
  ```

- For response packets when reading DT_INT2 data only:

  ```
  (8 * number of points parameters) < 4000
  ```

- For response packets when reading DT_INT4 data only:

  ```
  (10 * number of points parameters) < 4000
  ```

- For response packets when reading DT_REAL data only:

  `(14 * number of points parameters) < 4000`

- For response packets when reading DT_ DBLE data only:

  `(14 * number of points parameters) < 4000`

- For response packets when reading DT_CHAR data only:

  `(7 * number of points parameters) + sum of string lengths of value character strings in bytes < 4000`

- For response packets when reading DT_ENUM data only:

  `(11 * number of points parameters) + sum of string lengths of value enumeration strings in bytes < 4000`

Example

Read the value of pntana1.SP and pntana1.DESC.

```
int status;
int i;
PARAM_BYNAME_DATA rgprmbd[] = {{“pntana1”,”SP”, 1},{“pntana1”, ”DESC”,
1}};
#define cprmbd (sizeof(rgprmbd)/sizeof(PARAM_BYNAME_DATA))

/* Allocate sufficient memory for each value union. See sample code for
rhsc_param_values for more details */
for (i=0; i<cprmbd; i++)
{
    rgprmbd[i].pupvValue = (PARvalue *)malloc(sizeof(PARvalue);
}

status = rhsc_param_value_bynames(“server1”, NADS_READ_CACHE, cprmbd,
rgprmbd);

switch (status)
{
    case 0:
        printf(“rhsc_param_value_bynames successful\n”);
        for (i=0; i<cprmbd; i++)
        {
            switch (rgprmbd[i].nType)
            {
                case DT_CHAR:
                    printf(“%s.%s has the value %s\n”,
                           rgprmbd[i].szPntName,
```

```
                                rgprmbd[i].szPrmName,
                                rgprmbd[i].pupvValue->text);
                            break;
                        case DT_INT2:
                            printf("%s.%s has the value %d\n",
                                rgprmbd[i].szPntName,
                                rgprmbd[i].szPrmName,
                                rgprmbd[i].pupvValue->int2);
                            break;
                        case DT_INT4:
                            printf("%s.%s has the value %d\n",
                                rgprmbd[i].szPntName,
                                rgprmbd[i].szPrmName,
                                rgprmbd[i].pupvValue->int4);
                            break;
                        case DT_REAL:
                            printf("%s.%s has the value %f\n",
                                rgprmbd[i].szPntName,
                                rgprmbd[i].szPrmName,
                                rgprmbd[i].pupvValue->real);
                            break;
                        case DT_DBLE:
                            printf("%s.%s has the value %f\n",
                                rgprmbd[].szPntName,
                                rgprmbd[i].szPrmName,
                                rgprmbd[i].pupvValue->dble);
                            break;
                        case DT_ENUM:
                               printf("%s.%s has the ordinal value %d and enum
string %s\n",
                                rgprmbd[0].szPntName,
                                rgprmbd[i].szPrmName,
                                rgprmbd[i].pupvValue->en.ord,
                                rgprmbd[i].pupvValue->en.text);
                            break;
                        default:
                            printf("Illegal type found\n");
                            break;
                    }
                }
            case NADS_PARTIAL_FUNC_FAIL:
                printf("rhsc_param_value_bynames partially failed");
                /* Check fStatus flags to find out which one(s) failed. */
```

```
            break;
        default:
            printf("rhsc_param_value_bynames failed (errno=0x%x)", status);
            break;
    }

    for (i=0; i<cprmbd; i++)
    {
        free(rgprmbd[i].pupvValue);
    }
```

Diagnostics

See "Diagnostics for Network API functions" on page 463.

See also

rhsc_param_value_puts

rhsc_param_value_put_bynames

rhsc_param_value_put_bynames

Control a list of point parameter values referenced by name.

C/C++ Synopsis

```
int rhsc_param_put_bynames
(
  char*                szHostname,
  int                  cprmbd,
  PARAM_BYNAME_DATA*   rgprmbd
);
```

VB Synopsis

```
RHSC_param_value_put_bynames(ByVal hostname As String,
                             ByVal num_requests As Long,
                             param_byname_data_array()
                             As param_byname_data) As Long
```

Arguments

Argument	Description
szHostname	(in) Name of server that the data resides on
cprmbd	(in) Number of controls to parameters values requested
rgprmbd	(in/out) Pointer to an array of PARAM_BYNAME_ DATA structures (one array element for each request)

Description

The structure of the PARAM_BYNAME_DATA structure is defined in nif_ types.h. This structure and its members are defined as follows:

`n_char*  szPntName`	in) point name
`n_char* szPrmName`	(in) parameter name
`n_long  nPrmOffset`	(in) parameter offset
`PARvalue*  pupvValue`	(out) parameter value union
`n_ushort  nType`	(out) value type
`n_long  fStatus`	(out) status of each value access

RHSC_PARAM_VALUE_PUT_BYNAMES writes a list of point parameter values to the specified remote server and performs the necessary control. The control to point parameters are requested by name only and all name to number resolutions are performed by the server.

You can write a list of parameter values with different types using a single request. The value is placed into a union (of type PARvalue). Before storing the value to be written to a point parameter in the PARAM_VALUE_DATA structure, you must allocate sufficient memory for the union. You must free this memory before exiting your network application.

Although this is a list based function, there is no implication that it should be used as a sequential write function. If any individual put fails, the function will not prevent the remaining writes from occurring. The function will instead continue to write values to the remaining point parameters in the list.

Be careful when using rhsc_param_value_puts() and rhsc_param_value_put_bynames() with more than one point/parameter pair. Each put causes a control to be executed on the server and each control takes a small amount of time. If more than one pair is put, the total time for each of these controls may exceed the default TCP/IP timeout. This will cause the Network API to report the error RCV_TIMEOUT, even though all puts may have been successful. In addition, the Network API will be unavailable until the list of puts has been processed. This could cause subsequent calls to the network API to fail until the list is processed.

To simplify the handling of enumerations, two data types have been included for use with this function only. The data types are DT_ENUM_ORD, and DT_ENUM_STR. When writing a value to an enumeration point parameter, supply the ordinal part of the enumeration only and use the DT_ENUM_ORD data type. Alternatively, if you don't know the ordinal value, supply only the text component of the enumeration and use the DT_ENUM_STR data type. If the DT_ENUM data type is specified, only the ordinal value is used by this function (similar to DT_ENUM_ORD).

A successful return status from the `rhsc_param_value_put_bynames` call indicates that no network errors were encountered (that is, the request was received, processed, and responded to).

If the returned value is NADS_PARTIAL_FUNC_FAIL, then at least one request (and possibly all requests) failed. The status field of each array element should be checked to find which request failed. For each array element, a value of CTLOK (See "Diagnostics for Network API functions" on page 463) or 0 in the status field indicates that the control was successful.

The program using this function must ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network.

Due to the ability to acquire a list of parameters of mixed data type, it is difficult to give generic limits. To meet the program requirement not to exceed the maximum packet size permitted, adhere to the following guidelines given for a number of specific cases:

- For request packets when writing DT_INT2 data only:

  ```
  (10 * number of points parameters) + sum of string
  lengths of point names + sum of string lengths of
  parameter names < 4000
  ```

- For request packets when writing DT_INT4 data only:

  ```
  (12 * number of points parameters) + sum of string
  lengths of point names + sum of string lengths of
  parameter names < 4000
  ```

- For request packets when writing DT_REAL data only:

  ```
  (12 * number of points parameters) + sum of string
  lengths of point names + sum of string lengths of
  parameter names < 4000
  ```

- For request packets when writing DT_DBLE data only:

  ```
  (16 * number of points parameters) + sum of string
  lengths of point names + sum of string lengths of
  parameter names < 4000
  ```

- For request packets when writing DT_CHAR data only:

  ```
  (9 * number of points parameters) + sum of string
  lengths of point names + sum of string lengths of
  parameter names + sum of parameter value string
  lengths < 4000
  ```

- For request packets when writing DT_ENUM_ORD data only:

  ```
  (12 * number of points parameters) + sum of string
  lengths of point names + sum of string lengths of
  parameter names < 4000
  ```

- For request packets when writing DT_ENUM_STR data only:

  ```
  (9 * number of points parameters) + sum of string
  lengths of point names + sum of string lengths of
  parameter names + sum of parameter value
  enumeration string lengths < 4000
  ```

- For ALL reply packets:

  ```
  (4 * number of point parameters) < 4000
  ```

Example

Control the SP value of **pntana1** to 42.0 and change its DESC to say "FunkyDescription".

```
int status;
int i;

/* Set the point names, parameter names and parameter offsets to
appropriate
values */
PARAM_BYNAME_DATA rgprmbd[] = {{"pntana1","SP", 1},{"pntana1", "DESC",
1}};
#define cprmbd (sizeof(rgprmbd)/sizeof(PARAM_BYNAME_DATA))

/* Allocate space and set the value and type to control pntana1.SP to 42.0
*/
rgprmbd[0].pupvValue = (PARvalue *)malloc(sizeof(DT_REAL));
rgprmbd[0].pupvValue->real = (float)42.0;
rgprmbd[0].nType = DT_REAL;

/* Allocate space and set the value and type to control pntana1.DESC to
"FunkyDescription" */
rgprmbd[1].pupvValue = (PARvalue *)malloc(strlen("FunkyDescription")+1);
strcpy(rgprmbd[1].pupvValue->text, "FunkyDescription");
rgprmbd[1].nType = DT_CHAR;

status = rhsc_param_value_put_bynames("server1", cprmbd, rgprmbd);

switch (status)
{
case 0:
       printf("rhsc_param_value_put_bynames successful\n");
       break;
case NADS_PARTIAL_FUNC_FAIL:
       printf("rhsc_param_value_put_bynames partially failed");
       /* Check fStatus flags to find out which one(s) failed. */
       break;
default:
       printf("rhsc_param_value_bynames failed (errno=0x%x)", status);
       break;
}

for (i=0; i<cprmbd; i++)
{
```

```
        free(rgprmbd[i].pupvValue);
}
```

Diagnostic

See “Diagnostics for Network API functions” on page 463.

See also

rhsc_param_values

rhsc_param_value_put_bynames

rhsc_param_value_put_sec_bynames

This function acts similarly to rhsc_param_value_put_bynames, except that it has an extra Station-related argument.

C/C++ Synopsis

```
int rhsc_param_put_sec_bynames
(
  char*              szHostname,
  int                cprmbd,
  PARAM_BYNAME_DATA* rgprmbd,
  unsigned short     nStn
);
```

VB Synopsis

```
RHSC_param_value_put_sec_bynames(ByVal hostname As String,
                                 ByVal num_requests As Long,
                                 param_byname_data_array() As
                                 param_byname_data,
                                 Station As short) As Long
```

Arguments

Argument	Description
szHostname	(in) Name of server that the data resides on
cprmbd	(in) Number of controls to parameters values requested
rgprmbd	(in/out) Pointer to an array of PARAM_BYNAME_ DATA structures (one array element for each request)
nStn	(in) Station number, which the Network Server uses in the associated CHANGE event for this call. If operator-based security is used, the operator's the name/ID will also be captured. Note that even if the Station is not connected to the server, events raised by this function will still be logged against it.

Description

Unlike most Network API functions, events raised by this function are associated with the specified Station. (Events raised by other functions are associated with "Network Server".) If you want to control what events are logged by an application, see "Controlling what events are logged by an external application" on page 420.

Diagnostic

See "Diagnostics for Network API functions" on page 463.

Controlling what events are logged by an external application

The following two bits in `sysflg` (file 8, record 1, word 566) control what events external application (such as Network API) can raise.

For example, to only log events raised by rhsc_param_value_puts_sec or rhsc_param_value_put_sec_bynames, set bit 15 to `Off` and bit 14 to `On`.

Bit 15	Bit 14	Generate all events from an external application	Only generate events with security information
0	0	No	No
0	1	No	Yes
1	0	Yes	Yes
1	1	Yes	Yes

rhsc_param_value_puts

Control a list of point parameter values.

C Synopsis

```
int rhsc_param_value_puts
(
  char*               szHostname,
  int                 cprmvd,
  PARAM_VALUE_DATA*   rgprmvd
);
```

VB Synopsis

```
rhsc_param_value_puts (ByVal hostname As String,
                       ByVal num_requests As Long,
                       Param_value_data_array ()
                       As param_value_data) As Long
```

Arguments

Argument	Description
szHostname	(in) Name of server that the database resides on
cprmvd	(in) The number of controls to parameters requested
rgprmvd	(in/out) Pointer to a series of PARAM_VALUE_DATA structures (one array element for each point)

Description

The structure of the PARAM_VALUE_DATA structure is defined in nif_types.h. This structure and its members are defined as follows:

`n_ushort  nPnt`	(in) point number
`n_ushort  nPrm`	(in) parameter number
`n_long  nPrmOffset`	(in) point parameter offset
`PARvalue*  pupvValue`	(out) parameter value union
`n_ushort  nType`	(out) value type
`n_long  fStatus`	(out) status of each request

RHSC_PARM_VALUE_PUTS writes a list of point parameter values to the specified remote server and performs the necessary control. A function return of 0 is given if the point parameter values are successfully controlled, otherwise, an error code is returned.

You can write a list of parameter values with different types using a single request. The value is placed into a union (of type PARvalue). Before storing the value to be written to a point parameter in the PARAM_VALUE_DATA structure, you must allocate sufficient memory for the union. You must free this memory before exiting your network application.

Although this is a list based function, there is no implication that it should be used as a sequential write function. If any individual put fails, the function will not prevent the remaining writes from occurring. The function will instead continue to write values to the remaining point parameters in the list.

Be careful when using rhsc_param_value_puts() and rhsc_param_value_put_bynames() with more than one point/parameter pair. Each put causes a control to be executed on the server and each control takes a small amount of time. If more than one pair is put, the total time for each of these controls may exceed the default TCP/IP timeout. This will cause the Network API to report the error RCV_TIMEOUT, even though all puts may have been successful. In addition, the Network API will be unavailable until the list of puts has been processed. This could cause subsequent calls to the network API to fail until the list is processed.

To simplify the handling of enumerations, two data types have been included for use with this function only. The data types are DT_ENUM_ORD, and DT_ENUM_STR. When writing a value to an enumeration point parameter, supply the ordinal part of the enumeration only and use the DT_ENUM_ORD data type. Alternatively, if you don't know the ordinal value, supply only the text component of the enumeration and use the DT_ENUM_STR data type. If the DT_ENUM data type is specified, only the ordinal value is used by this function (similar to DT_ENUM_ORD).

A successful return status from the `rhsc_param_value_puts` call indicates that no network errors were encountered (that is, the request was received, processed, and responded to).

If the returned value is NADS_PARTIAL_FUNC_FAIL, then at least one request (and possibly all requests) failed. The status field of each array element should be checked to find which request failed. For each array element, a value of CTLOK (See "Diagnostics for Network API functions" on page 463) or 0 in the status field indicates that the control was successful.

The program using this function call must ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network.

Due to the ability to control a list of parameters of mixed data type, it is difficult to give generic limits. To meet the program requirement not to exceed the maximum packet size permitted, adhere to the following guidelines given for a number of specific cases:

- For request packets when writing DT_INT2 data only:

  ```
  (12 * number of points parameters) < 4000
  ```

- For request packets when writing DT_INT4 data only:

  ```
  (14 * number of points parameters) < 4000
  ```

- For request packets when writing DT_REAL data only:

  ```
  (14 * number of points parameters) < 4000
  ```

- For request packets when writing DT_DBLE data only:

  ```
  (18 * number of points parameters) < 4000
  ```

- For request packets when writing DT_CHAR data only:

  ```
  (11 * number of points parameters) + sum of string
  lengths of value character strings in bytes < 4000
  ```

- For request packets when writing DT_ENUM_ORD data only:

  ```
  (11 * number of points parameters) < 4000
  ```

- For request packets when writing DT_ENUM_STR data only:

  ```
  (11 * number of points parameters) + sum of string
  lengths of value enumeration strings in bytes <
  4000
  ```

- For ALL reply packets:

  ```
  (4 * number of point parameters) < 4000
  ```

Example

Control pntana1's SP value to 42.0 and change its DESC to say "Funky description".

```
int                 status;
int                 i;
POINT_NUMBER_DATA   rgpntnd[] = {{"pntana1"}};
PARAM_NUMBER_DATA   rgprmnd[] = {{0, "SP"},{0, "DESC"}};

#define cpntnd sizeof(rgpntnd)/sizeof(POINT_NUMBER_DATA)
#define cprmnd sizeof(rgprmnd)/sizeof(PARAM_NUMBER_DATA)
/* There are the same number of PARAM_VALUE_DATA entries as cprmnd. */
#define cprmvd sizeof(rgprmnd)/sizeof(PARAM_NUMBER_DATA)

PARAM_VALUE_DATA    rgprmvd[cprmvd];
```

```
status = rhsc_point_numbers("Server1", cpntnd, rgpntnd);

rgprmnd[0].nPnt = rgpntnd[0].nPnt;
rgprmnd[1].nPnt = rgpntnd[0].nPnt;
status = rhsc_param_numbers("Server1", cprmnd, rgprmnd);

/* Set the point number, parameter number and offset for the point
parameter. Allocate space, assign a value, and set the type for pntana1.PV
*/
rgprmvd[0].nPnt = rgprmnd[0].nPnt;
rgprmvd[0].nPrm = rgprmnd[0].nPrm;
rgprmvd[0].nPrmoffset = 1  /* Set parameter offset to default value*/
rgprmvd[0].pupvValue = (PARvalue *)malloc(sizeof(DT_REAL));
rgprmvd[0].pupvValue->real = (float)42.0;
rgprmvd[0].nType = DT_REAL;

/* Set the point number, parameter number and offset for the point
parameter. Allocate space, assign a value, and set the type for
pntana1.DESC */
rgprmvd[1].nPnt = rgprmnd[1].nPnt;
rgprmvd[1].nPrm = rgprmnd[1].nPrm;
rgprmvd[1].nPrmoffset = 1  /* Set parameter offset to default value*/
rgprmvd[1].pupvValue =
    (PARvalue *)malloc(strlen("Funky description") + 1);
strcpy(rgprmvd[1].pupvValue->text, "Funky description");
rgprmvd[1].nType = DT_CHAR;

status = rhsc_param_value_puts("Server1", cprmvd, rgprmvd);
switch (status)
{
     case 0:
         printf("rhsc_param_value_puts successful\n");
         break;
     case NADS_PARTIAL_FUNC_FAIL:
         printf("rhsc_param_value_puts partially failed\n");
         /* Check fStatus flags to find out which ones failed. */
         break;
     default:
         printf("rhsc_param_value_puts failed(errno=0x%x)\n",status);
         break;
}
```

```
for (i=0; i<cprmvd; i++)
{
     free(rgprmvd[i].pupvValue);
}
```

Diagnostics

See “Diagnostics for Network API functions” on page 463.

See also

rhsc_param_values

rhsc_param_value_put_bynames

rhsc_param_value_puts_sec

This function acts similarly to rhsc_param_value_puts, except that it has an extra Station-related argument.

C/C++ Synopsis

```
int rhsc_param_value_puts_sec
(
  char*             szHostname,
  int               cprmvd,
  PARAM_VALUE_DATA* rgprmvd,
  unsigned short    nStn
);
```

VB Synopsis

```
rhsc_param_value_puts (ByVal hostname As String,
                       ByVal num_requests As Long,
                       Param_value_data_array () As param_value_data,
                       Station As Short) As Long
```

Arguments

Argument	Description
szHostname	(in) Name of server that the database resides on
cprmvd	(in) The number of controls to parameters requested
rgprmvd	(in/out) Pointer to a series of PARAM_VALUE_DATA structures (one array element for each point)
nStn	(in) Station number, which the Network Server uses in the associated CHANGE event for this call. If operator-based security is used, the operator's the name/ID will also be captured. Note that even if the Station is not connected to the server, events raised by this function will still be logged against it.

Description

Unlike most Network API functions, events raised by this function are associated with the specified Station. (Events raised by other functions are associated with "Network Server".) If you want to control what events are logged by an application, see "Controlling what events are logged by an external application" on page 420.

Diagnostic

See "Diagnostics for Network API functions" on page 463.

rhsc_param_values

Read a list of point parameter values.

C Synopsis

```
int rhsc_param_values
(
  char*              szHostname,
  int                nPeriod,
  int                cprmvd,
  PARAM_VALUE_DATA*  rgprmvd
);
```

VB Synopsis

```
rhsc_param_values (ByVal hostname As String,
                   ByVal period as Long,
                   ByVal num_requests as Long,
                   param_value_data_array()
                   As param_value_data) As Long
```

Arguments

Argument	Description
szHostname	(in) Name of server that the database resides on.
nPeriod	(in) subscription period in milliseconds for the point parameters. Use the constant NADS_READ_CACHE if subscription is not required. If the value is in the Experion PKS cache, then that value will be returned. Otherwise the controller will be polled for the latest value. Use the constant NADS_READ_DEVICE if you wish to force Experion PKS to re-poll the controller. The subscription period will not be applied to standard point types.
cprmvd	(in) The number of parameter values requested.
rgprmvd	(in/out) Pointer to an array of PARAM_VALUE_DATA structures (one array element for each request).

Description

The structure of the PARAM_VALUE_DATA structure is defined in nif_types.h. This structure and its members are defined as follows:

`n_ushort nPnt`	(in) point number
`n_ushort nPrm`	(in) parameter number
`n_long nPrmOffset`	(in) point parameter offset
`PARvalue* pupvValue`	(out) parameter value union
`n_ushort nType`	(out) value type
`n_long fStatus`	(out) status of each request

RHSC_PARM_VALUES requests a list of point parameter values from the specified remote server. A function return of 0 is given if the parameter values were successfully read else an error code is returned.

You can read a list of parameter values with different types using a single request. Each point parameter value is placed into a union (of type PARvalue). Before making the request, you must allocate sufficient memory for each value union. You must free this memory before exiting your Network application.

A successful return status from the `rhsc_param_values` call indicates that no network errors were encountered (that is, the request was received, processed, and responded to). If the returned value is NADS_PARTIAL_FUNC_FAIL, then at least one request (and possibly all requests) failed. The status field of each array element should be checked to find which request failed.

The program using this function call must ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network.

Due to the ability to acquire a list of parameters of mixed data type, it is difficult to give generic limits. To meet the program requirement not to exceed the maximum packet size permitted, adhere to the following guidelines given for a number of specific cases:

- For ALL request packets:

  `(8 * number of point parameters) < 4000`
- For response packets when reading DT_INT2 data only:

  `(8 * number of points parameters) < 4000`
- For response packets when reading DT_INT4 data only:

  `(10 * number of points parameters) < 4000`
- For response packets when reading DT_REAL data only:

  `(10 * number of points parameters) < 4000`

- For response packets when reading DT_DBLE data only:

  ```
  (14 * number of points parameters) < 4000
  ```

- For response packets when reading DT_CHAR data only:

  ```
  (7 * number of points parameters) + sum of string
  lengths of value character strings in bytes < 4000
  ```

- For response packets when reading DT_ENUM data only:

  ```
  (11 * number of points parameters) + sum of string
  lengths of value enumeration strings in bytes <
  4000
  ```

Example

Read the value of pntana1.SP and pntana1.DESC.

```
int               status;
int               i;
POINT_NUMBER_DATA rgpntnd[] = {{"pntana1"}};
PARAM_NUMBER_DATA rgprmnd[] = {{0, "SP"}, {0, "DESC"}};

#define cpntnd sizeof(rgpntnd)/sizeof(POINT_NUMBER_DATA)
#define cprmnd sizeof(rgprmnd)/sizeof(PARAM_NUMBER_DATA)
/* There are the same number of PARAM_VALUE_DATA entries as cprmnd. */
#define cprmvd sizeof(rgprmnd)/sizeof(PARAM_NUMBER_DATA)

PARAM_VALUE_DATA  rgprmvd[cprmvd];


status = rhsc_point_numbers("server1", cpntnd, rgpntnd);
rgprmnd[0].nPnt = rgpntnd[0].nPnt;
rgprmnd[1].nPnt = rgpntnd[0].nPnt;
status = rhsc_param_numbers("server1", cprmnd, rgprmnd);

for (i=0; i<cprmvd; i++)
{
    rgprmvd[i].nPnt = rgprmnd[i].nPnt;
    rgprmvd[i].nPrm = rgprmnd[i].nPrm;
    /*Use of the parameter offset is currently unsupported.
    Set offset to the default value 1. */
    rgprmvd[i].nPrmOffset = 1;
}

/*
ALLOCATING MEMORY:
```

```
Sufficient memory must be allocated for each value union. If the value
type is not known, allocate memory for the largest possible size of a
PARvalue union.  See below for an example of how to allocate this memory.
If the data type is known, then allocate the exact amount of memory to
save space.
For example for DT_REAL values:
      rgprmvd[0].pupvValue = (PARvalue *) malloc(sizeof(DT_REAL));
*/
for (i=0; i<cprmvd; i++)
{
    rgprmvd[i].pupvValue = (PARvalue *)malloc(sizeof(PARvalue);
}

status = rhsc_param_values("server1", NADS_READ_CACHE, cprmvd, rgprmvd);

switch (status)
{
    case 0:
        printf("rhsc_param_values successful\n");
        for (i=0; i<cprmvd; i++)
        {
            switch (rgprmvd[i].nType)
            {
                case DT_CHAR:
                    printf("%s.%s has the value %s\n",
                           rgpntnd[0].szPntName,
                           rgprmnd[i].szPrmName,
                           rgprmvd[i].pupvValue->text);
                    break;
                case DT_INT2:
                    printf("%s.%s has the value %d\n",
                           rgpntnd[0].szPntName,
                           rgprmnd[i].szPrmName,
                           rgprmvd[i].pupvValue->int2);
                    break;
                case DT_INT4:
                    printf("%s.%s has the value %d\n",
                           rgpntnd[0].szPntName,
                           rgprmnd[i].szPrmName,
                           rgprmvd[i].pupvValue->int4);
                    break;
                case DT_REAL:
                    printf("%s.%s has the value %f\n",
```

```
                                rgpntnd[0].szPntName,
                                rgprmnd[i].szPrmName,
                                rgprmvd[i].pupvValue->real);
                        break;
                    case DT_DBLE:
                        printf("%s.%s has the value %f\n",
                                rgpntnd[0].szPntName,
                                rgprmnd[i].szPrmName,
                                rgprmvd[i].pupvValue->dble);
                        break;
                    case DT_ENUM:
                              printf("%s.%s has the ordinal value %d and enum
string %s\n",
                             rgpntnd[0].szPntName,
                             rgprmnd[i].szPrmName,
                             rgprmvd[i].pupvValue->en.ord,
                             rgprmvd[i].pupvValue->en.text);
                        break;
                    default:
                        printf("Illegal type found\n");
                        break;
                }
            }
            break;
        case NADS_PARTIAL_FUNC_FAIL:
            printf("rhsc_param_values partially failed\n");
            /* Check fStatus flags to find out which ones failed. */
            break;
        default:
            printf("rhsc_param_values failed (errno=0x%x)\n", status);
            break;
    }

    for (i=0; i<cprmvd; i++)
    {
        free(rgprmvd[i].pupvValue);
    }
```

Diagnostics

See "Diagnostics for Network API functions" on page 463.

See also

rhsc_param_value_puts

rhsc_param_value_put_bynames

rhsc_point_numbers

Resolve a list of point names to numbers.

C/C++ Synopsis

```
int rhsc_point_numbers
(
  char*               szHostname,
  int                 cpntnd,
  POINT_NUMBER_DATA*  rgpntnd
);
```

VB Synopsis

```
rhsc_point_numbers(ByVal hostname As String,
                   ByVal num_requests As Long,
                   point_number_data_array()
                   As point_number_data) As Long
```

Arguments

Argument	Description
szHostname	(in) Name of server that the database resides on
cpntnd	(in) The number of point name resolutions requested
rgpntnd	(in/out) Pointer to a series of POINT_NUMBER_DATA structures (one array element for each request)

Description

The structure of the POINT_NUMBER_DATA structure is defined in nif_types.h. This structure and its members are defined as follows:

`n_char*  szPntName`	(in) point name to resolve
`n_ushort  nPnt`	(out) point number
`n_long  fStatus`	(out) status of each request

RHSC_POINT_NUMBERS converts a list of point names to their equivalent point numbers for a specified remote server.

A successful return status from the `rhsc_point_numbers` call indicates that no network errors were encountered (that is, the request was received, processed, and responded to). If the returned value is NADS_PARTIAL_FUNC_FAIL, then at least one request (and possibly all requests) failed. The status field of each array element should be checked to find which request failed.

The program using this function call must ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network. To meet this program requirement, adhere to the following guidelines:

- For request packets:

  `(2 * number of points) + sum of string lengths of point names in bytes < 4000`

- For response packets:

  `(6 * number of points) < 4000`

Example

Resolve the point names “pntana1” and “pntana2”.

```
int                status;
int                i;
POINT_NUMBER_DATA  rgpntnd[] = {{“pntana1”},{“pntana2”}};
#define cpntnd sizeof(rgpntnd)/sizeof(POINT_NUMBER_DATA)

status = rhsc_point_numbers(“Server1”, cpntnd, rgpntnd);

switch (status)
{
    case 0:
        printf(“rhsc_point_numbers successful\n”);
        for (i=0; i<cpntnd; i++)
        {
            printf(“%s has the point number %d\n”,
                   rgpntnd[i].szPntName,
                   rgpntnd[i].nPnt);
        }
        break;
    case NADS_PARTIAL_FUNC_FAIL:
        printf(“rhsc_point_numbers partially failed\n”);
        /* Check fStatus flags to find out which ones failed. */
        break;
    default:
        printf(“rhsc_point_numbers failed (errno=0x%x)\n”,
               status);
```

```
            break;
    }
```

Diagnostics

See “Diagnostics for Network API functions” on page 463.

rputdat

Store a list of fields to a user file.

C Synopsis

```
int rputdat(char *server,
            int num_points,
            rgetdat_data getdat_data[])
```

VB Synopsis

```
rputdat_int(ByVal server As String,
            ByVal num_points As Integer,
            getdat_int_data() As rgetdat_int_data_str)
            As Integer
rputdat_bits(ByVal server As String,
            ByVal num_points As Integer,
            putdat_bits_data() As rgetdat_bits_data_str)
            As Integer
rputdat_long(ByVal server As String,
             ByVal num_points As Integer,
             getdat_long_data() As rgetdat_long_data_str)
             As Integer
rputdat_float(ByVal server As String,
              ByVal num_points As Integer,
              getdat_float_data()
              As rgetdat_float_data_str) As Integer
rputdat_double(ByVal server As String,
               ByVal num_points As Integer,
               getdat_double_data()
               As rgetdat_double_data_str) As Integer
rputdat_str(ByVal server As String,
            ByVal num_points As Integer,
            getdat_str_data()
            As rgetdat_str_data_str) As Integer
```

Arguments

Argument	Description
server	(in) Name of server that the database resides on
num_points	(in) The number of points passed to rgetdat_xxxx in the getdat_xxxx_data argument
getdat_xxxx_data	(in/out) Pointer to a series of rgetdat_xxxx_data structures (one for each point)

Description

This function call enables fields from a user table to be changed. The fields to be accessed are referenced by the members of the rgetdat_data structure (see below). The function accepts an array of rgetdat_data structures thus providing the flexibility to set multiple fields with one call. Note that the fields can be of different types and from different database files.

A successful return status from the **rputdat** call indicates that no network error were encountered (that is, the request was received, processed and responded to). The status field in each call structure must still be checked on return to determine the result of the individual remote calls.

The structure of the rgetdat_data structure is defined in nif_types.h. This structure and its members are defined as follows:

`int2 type`	(in) Defines the type of data to be retrieved/stored, this will be one of the standard server data types. Namely using one of the following defines: RGETDAT_TYPE_INT2, RGETDAT_TYPE_INT4, RGETDAT_TYPE_REAL4, RGETDAT_TYPE_REAL8, RGETDAT_TYPE_STR, RGETDAT_TYPE_BITS
`int2 file`	(in) Absolute database file number to retrieve/store field.
`int2 rec`	(in) Record number in above file to retrieve/store field.
`int2 word`	(in) Word offset in above record to retrieve/store field.
`int2 start_bit`	(in) Start bit offset into the above word for the first bit of a bit sequence to be retrieved/stored. (that is, The bit sequence starts at: word + start_bit, start_bit=0 is the first bit in the field.). Ignored if type not a bit sequence.
`int2 length`	(in) Length of bit sequence or string to retrieve/store, in characters for a string, in bits for a bit sequence. Ignored if type not a string or bit sequence.

`int2 flags`	(in) Bit zero specifies the direction to read/write for circular files. (0 = newest record, 1 = oldest record)
`union value`	(in/out) Value of field retrieved or value to be stored. When storing strings they must be of the length given above. When strings are retrieved they become NULL terminated, hence the length allocated to receive the string must be one more than the length specified above. Bit sequences will start at bit zero and be length bits long. See below for a description of the union types.
`int2 status`	(out) Return value of actual remote putdat/putdat call.

The union structure of the value member used in the rgetdat_data structure is defined in nif_types.h. This structure and its members is defined as follows:

`short int2`	Two byte signed integer.
`long int4`	Four byte signed integer.
`float real4`	Four byte IEEE floating point number.
`double real8`	Eight byte (double precision) IEEE floating point number.
`char* str`	Pointer to string to be stored. Note this string need not be NULL terminated, but must be of the length specified by length (see rgetdat_data structure description above).
`unsigned short bits`	Two byte unsigned integer to be used to for bit sequences (partial integer). (Note the maximum length of a bit sequence is limited to 16.)

The program using this function must ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network. To meet this requirement, adhere to the following guideline:

```
(22 * number of fields) + sum of all string value
lengths in bytes <4000
```

Diagnostics

See “Diagnostics for Network API functions” on page 463.

Backward-compatibility Functions

The following functions are available for backwards compatibility.

hsc_napierrstr

rgethstpar_date

rgethstpar_ofst

rgetpnt

rgetval_numb

rgetval_ascii

rgetval_hist

rgetpntval

rgetpntval_ascii

rputpntval

rputpntval_ascii

rputval_hist

rputval_numb

rputval_ascii

hsc_napierrstr

Lookup an error string from an error number. This function is provided for backward compatibility.

VB Synopsis

```
hsc_napierrstr(ByVal err As Integer) As String
```

Arguments

Argument	Description
err	(in) The error number to lookup
texterr	(out) The error string returned

Diagnostics

This function will always return a usable string value.

rgethstpar_date

Retrieve history values for a Point based on date.

This function's synopsis and description are identical to that of "rgethstpar_ofst" on page 443.

rgethstpar_ofst

Retrieve history values for a point based on offset.

C synopsis

```
int rgethstpar_date
(
  char*                   server,
  int                     num_gethsts,
  rgethstpar_date_data*   gethstpar_date_data
);
int rgethstpar_ofst
(
  char*                   server,
  int                     num_gethsts,
  rgethstpar_ofst_data*   gethstpar_ofst_data
);
```

VB synopsis

```
rgethstpar_date(ByVal server As String,
                gethstpar_date_data
                As rgethstpar_date_data_str) As Integer
rgethstpar_ofst(ByVal server As String,
                gethstpar_ofst_data
                As rgethstpar_ofst_data_str) As Integer
```

Arguments

Argument	Description
server	(in) Name of server that the database resides on
num_gethsts	(in) The number of points passed to rgethstpar_xxxx in the gethstpar_xxxx_data argument
gethstpar_xxxx_data	(in/out) Pointer to a series of rgethstpar_xxxx_data structures (one for each point)

Description

This function is provided for backwards compatibility. The functions rhsc_ param_hist_dates and rhsc_param_hist_offsets should be used instead.

Use this function to retrieve history values for points. The two types of history (based on time or offset) are retrieved using the corresponding function variation. History will be retrieved from a specified time or offset going backwards in time. The history values to be accessed are referenced by the rgethst_date_data and rgethst_ofst_data structures (see below). The functions accept an array of these structures, thus providing access to multiple point history values with one function call.

Note that a successful return status from the rgethst call indicates that no network errors were encountered (that is, the request was received, processed and responded to). The status field in each call structure needs to be verified on return to determine the result of the individual remote calls.

The structure of the rgethst_date_data structure is defined in nif_types.h. This structure and its members are defined as follows:

`uint2 hist_type`	(in) Defines the type of history to retrieve, this will be one of the standard server history types. Namely using one of the following: HST_1MIN, HST_6MIN, HST_1HOUR, HST_ 8HOUR, HST_24HOUR, HST_5SECF, HST_ 1HOURE, HST_8HOURE, HST_24HOURE
`uint4 hist_start_date`	(in) Start date of history to receive in Julian days (number of days since 1st January 1981).
`ureal4 hist_start_ time`	(in) Start time of history to retrieve in seconds since midnight.
`uint2 num_hist`	(in) Number of history values per point to be retrieved.
`uint2 num_points`	(in) Number of points to be processed. MAXIMUM value allowed is 20.
`uint2* point_type_ nums`	(in) Array (of dimension num_points) containing the point type/numbers of the point history values to retrieve.
`uint2* point_params`	(in) Array of (dimension num_points) containing the parameter numbers of the history values to retrive.
`uchar* archive path`	(in) Pointer to the NULL terminated string containing the archive path name of the archive file. A NULL pointer implies that the system will use current history and any archive files which correspond to the value of the date and time parameters.

`real4* hist_values`	(out) Array (of dimension num_points * num_hist) to provide storage for the returned history values.
`uint2 gethst_status`	(out) Return value of the actual remote gethst_date call.

The structure of the rgethst_ofst_data structure is defined in nif_types.h. This structure and its members are defined as follows:

`uint2 hist_type`	(in) Defines the type of history to retrieve, this will be one of the standard server history types. Namely using one of the following defines: HST_1MIN, HST_6MIN, HST_1HOUR, HST_8HOUR, HST_24HOUR, HST_5SECF, HST_1HOURE, HST_8HOURE, HST_24HOURE
`uint4 hist_offset`	(in) Offset from latest history value in history intervals where offset=1 is the most recent history value).
`uint2 num_hist`	(in) Number of history values per point to be retrieved.
`uint2 num_points`	(in) Number of points to be processed. MAXIMUM value allowed is 20.
`uint2* point_type_nums`	(in) Array (of dimension num_points) containing the point type/numbers of the point history values to retrieve.
`uint2* point_params`	(in) Array of (dimension num_points) containing the parameter numbers of the history values to retrive.
`uchar* archive path`	(in) Pointer to the NULL terminated string containing the archive path name of the archive file. A NULL pointer implies that the system will use current history and any archive files which correspond to the value of the date and time parameters.
`real4* hist_values`	(out) Array (of dimension num_points * num_hist) to provide storage for the returned history values.
`uint2 gethst_status`	(out) Return value of the actual remote gethst_ofst call.

The program using this function call must ensure that the size of the network packets generated does not exceed the maximum packet size permitted on the network. To meet this requirement, adhere to the following guideline:

- For request packets for rgethst_date:

  ```
  (15 * number of history requests) + (2 * number of
  points requested) + string lengths of archive paths
  < 4000.
  ```

- For request packets for rgethist_ofst:

  ```
  (11 * number of history requests) + (2 * number of
  points requested) + string lengths of archive paths
  <4000.
  ```

- For response packets:

  ```
  (4 * number of history requests) + (4 * (For each
  history request the sum of (num_hist * num_
  points)))
  ```

Diagnostics

See “Diagnostics for Network API functions” on page 463.

rgetpnt

Get point type/number by point name string.

C Synopsis

```
int rgetpnt
(
  char*          server,
  int            num_points,
  rgetpnt_data*  getpnt_data
);
```

VB Synopsis

```
rgetpnt (ByVal server As String,
         ByVal num_points As Integer,
         getpnt_data() As rgetpnt_data_str) As
         Integer
```

Arguments

Argument	Description
server	(in) Name of server that the database resides on
num_points	(in) The number of points passed to rgetpnt in the getpnt_data argument
getpnt_data	(in/out) Pointer to a series of rgetpnt_data structures (one for each point)

Description

This function is provided for backwards compatibility. It cannot be used to access point information for points on Process Controllers. The rhsc_point_numbers function should be used instead.

This function enables the point type/number to be resolved from the point name. Each point name to be resolved is stored in a rgetpnt_data structure. The function accepts an array of structures, thus enabling multiple point names to be resolved with one function call.

The structure of rgetpnt_data is defined in nif_types.h. This structure and its members are defined as follows:

`char*`	`point_name`	(in) Pointer to a null terminated string containing the point name to be resolved into a point number.
`uint2`	`point_type_num`	(out) Return value of the point type/number for the point named above.
`uint2`	`getpnt_status`	(out) Return value of the actual remote getpnt call.

Note that a successful return status from the **rgetpnt** call indicates that no network errors, were encountered (that is, the request was received, processed and responded to). The status field in each call structure needs to be verified on return to determine the result of the individual remote calls.

The program using this function call must ensure that the size of the network packets generated does not exceed the maximum packet size permitted on the network. To meet this requirement, adhere to the following guideline:

```
(4 * number of points) + sum of string lengths of
point names in bytes <4000
```

Diagnostics

See “Diagnostics for Network API functions” on page 463.

See also

rhsc_point_numbers

rgetval_numb

Retrieve the value of a numeric point parameter.

This function's synopsis and description are identical to that of "rgetval_hist" on page 451.

rgetval_ascii

Retrieve the value of an ASCII point parameter.

This function's synopsis and description are identical to that of "rgetval_hist" on page 451.

rgetval_hist

Retrieve the value of a history point parameter.

C Synopsis

```
int rgetval_numb
(
  char*               server,
  int                 num_points,
  rgetval_numb_data*  getval_numb_data
);
int rgetval_ascii
(
  char*               server,
  int                 num_points,
  rgetval_ascii_data* getval_ascii_data
);
int rgetval_hist
(
  char*               server,
  int                 num_points,
  rgetval_hist_data*  getval_hist_data
);
```

VB Synopsis

```
rgetval_numb(ByVal server As String,
             ByVal num_points As Integer,
             getval_numb_data() As rgetval_numb_data_str)
             As Integer
rgetval_ascii(ByVal server As String,
              ByVal num_points As Integer,
              getval_ascii_data() As rgetval_ascii_data_str)
              As Integer
rgetval_hist(ByVal server As String,
             ByVal num_points As Integer,
             getval_hist_data() As rgetval_hist_data_str)
             As Integer
```

Arguments

Argument	Description
server	(in) Name of server that the database resides on
num_points	(in) The number of points passed to rgetval_xxxx in the getval_xxxx_data argument
getval_xxxx_data	(in/out) Pointer to a series of rgetval_xxxx_data structures (one for each point)

Description

This function is provided for backwards compatibility. It cannot be used to access point information for points on Process Controllers. The rhsc_param_values function should be used instead.

This function call enables access to point parameter values. The three types of parameters (numerical, ASCII and history) are accessed using the corresponding function variations. The point parameters to be accessed are referenced in the rgetval_numb_data, rgetval_ascii_data and rgetval_hist_data structures (see below). The functions accept an array of structures, thus providing access to multiple point parameter values with one call.

The structure of rgetval_numb_data is defined in nif_types.h. This structure and its members are defined as follows:

`uint2`	`point_type_num`	(in) Defines the point type/number to be accessed.
`uint2`	`point_param`	(in) Defines the point parameter to be accessed. (for example, process variable (PV), Mode (MD), Output (OP) or Set Point (SP). The definitions for all parameters are located in the parameters file.
`real4`	`param_value`	(out) Value of the point parameter retrieved.
`uint2`	`getval_status`	(out) The return value of the actual remote getval call.

The structure of rgetval_ascii_data is defined in nif_types.h. This structure and its members are defined as follows:

`uint2`	`point_type_num`	(in) Defines the point type/number to be accessed.
`uint2`	`point_param`	(in) Defines the point parameter to be accessed (for example, description (DESC)). The definitions for all parameter types are located in the parameters file.

`char*`	`param_value`	(out) NULL terminated string value of the point parameter. Note that this string can have a length of NIF_MAX_ASCII_PARAM_LEN +1 (for the termination), and that this amount of space must be allocated by the calling program.
`uint2`	`param_len`	(out) Useful length of above param_value retrieved (in bytes).
`uint2`	`getval_status`	(out) The return value of the actual remote getval call.

The structure of the rgetval_hist_data structure is defined in nif_types.h. This structure and its members are defined as follows:

`uint2`	`point_type_num`	(in) Defines the point type/number to be accessed.
`uint2`	`point_param`	(in) Defines the point parameter to be accessed (for example, 1 minute history, HST_1MIN). The definitions for all parameters are located in the parameters file.
`uint2`	`hist_offset`	(in) Offset from latest history value in history intervals to retrieve value, where hist_offset=1 is the most recent history value.
`real4`	`param_value`	(out) Value of the point parameter retrieved.
`uint2`	`getval_status`	(out) The return value of the actual remote getval call.

Note that a successful return status from the **rgetval** call indicates that no network errors were encountered (that is, the request was received, processed and responded to). The status field in each call structure must still be checked on return to determine the result of the individual remote calls.

The program using these function calls must ensure that the size of the network packets generated does not exceed the maximum packet size permitted on the network. This requirement can be met by adhering to the following guideline:

```
(12 * number of points) + sum of all string value
lengths in bytes <4000
```

Diagnostics

See “Diagnostics for Network API functions” on page 463.

See also

rhsc_param_values

rhsc_param_value_puts

rgetpntval

Get the numeric parameter value.

This function's synopsis and description are identical to that of "rgetpntval_ascii" on page 455.

rgetpntval_ascii

Get the ASCII parameter value.

VB Synopsis

```
rgetpntval(ByVal server As String,
           ByVal point As String,
           ByVal param As Integer,
           value As Single) As Integer
rgetpntval_ascii(ByVal server As String,
                 ByVal point As String,
                 ByVal param As Integer,
                 value As String,
                 ByVal length As Integer) As
                 Integer
```

Arguments

Argument	Description
server	(in) Name of server that the database resides on
point	(in) Name of point
param	(in) point parameter number
value	(out) Value of point parameter returned by function
length	(in) Maximum length of the string returned by rgetpntval_ascii

Description

This function is provided for backwards compatability. It cannot be used to access point information for points on Process Controllers. The rhsc_params_values function should be used instead.

RGETPNTVAL and RGETPNTVAL_ASCII provide VB interfaces to request a single parameter value that has the data types Single and String respectively. These functions can only be used to read one parameter value at a time. A function return of 0 is given if the parameter value was successfully read; else an error code is returned.

Diagnostics

See “Diagnostics for Network API functions” on page 463.

rputpntval

Set the numeric parameter value.

This function's synopsis and description are identical to that of "rputpntval_ascii" on page 457.

rputpntval_ascii

Set the ASCII parameter value.

VB Synopsis

```
rputpntval(ByVal server As String,
           ByVal point As String,
           ByVal param As Integer,
           value As Single) As Integer
rputpntval_ascii(ByVal server As String,
                 ByVal point As String,
                 ByVal param As Integer,
                 value As String) As Integer
```

Arguments

Argument	Description
server	(in) Name of server that the database resides on
point	(in) Name of point
param	(in) Point parameter number
value	(out) Value of point parameter returned by function

Description

This function is provided for backwards compatibility. It cannot be used to access point information for points on Process Controllers.

Diagnostics

See “Diagnostics for Network API functions” on page 463.

rputval_hist

Store history values.

This function's synopsis and description are identical to that of "rputval_ascii" on page 460.

rputval_numb

Store the value of numeric point parameters.

This function's synopsis and description are identical to that of "rputval_ascii" on page 460.

rputval_ascii

Store the value of ASCII point parameters.

C/C++ Synopsis

```
int rputval_numb
(
  char*               server,
  int                 num_points,
  rputval_numb_data*  putval_numb_data
);
int rputval_ascii
(
  char*               server,
  int                 num_points,
  rputval_ascii_data* putval_ascii_data
);
int rputval_hist
(
  char*               server,
  int                 num_points,
  rputval_hist_data*  putval_hist_data
);
```

VB Synopsis

```
rputval_numb(ByVal server As String,
             ByVal num_points As Integer,
             putval_numb_data() As rputval_numb_data_str)
             As Integer
rputval_ascii(ByVal server As String,
              ByVal num_points As Integer,
              putval_ascii_data() As rputval_ascii_data_str)
              As Integer
rputval_hist (ByVal server As String,
              ByVal num_points As Integer
              putval_hist_data() As rputval_hist_str)
              As Integer
```

Arguments

Argument	Description
server	(in) Name of server that the database resides on
num_points	(in) The number of points passed to rputval_xxxx in the putval_xxxx_data argument
putval_xxxx_data	(in/out) Pointer to a series of rputval_xxxx_data structures (one for each point)

Description

This function is provided for backwards compatability. It cannot be used to access point information for points on Process Controllers. The rhsc_param_value_puts function should be used instead.

This function call enables access to point parameter values. The three types of parameters (numerical, ASCII, and history) are accessed using the corresponding function variations. The point parameters to be accessed are referenced by the members of the rputval_numb_data, rputval_ascii_data, and rputval_hist_data structures (see below). The functions accept an array of structures, thus providing access to multiple point parameter values with one call.

The structure of the rputval_numb_data structure is defined in nif_types.h. This structure and its members are defined as follows:

`n_ushort`	`point_type_num`	(in) Defines the point type/number to be accessed.
`n_ushort`	`point_param`	(in) Defines the point parameter to be accessed. (for example, process variable (PV), Mode (MD), output (OP) or set point (SP). The definitions for parameter type are located in the parameters file.
`n_float`	`param_value`	(out) Value of point parameter to be stored.
`n_short`	`putval_status`	(out) The return value of the actual remote putval call.

The structure of the rputval_ascii_data structure is defined in nif_types.h. This structure and its members is defined as follows:

`n_ushort`	`point_type_num`	(in) Defines the point type/number to be accessed.
`n_ushort`	`point_param`	(in) Defines the point parameter to be accessed. (for example, description (DESC)). The definitions for parameter type are located in the parameters file.
`n_char*`	`param_value`	(in) ASCII string value of point parameter to be stored (Note this does not need to be null terminated).

uint2	param_len	(in) Length of above param_value to be stored (in bytes).
n_ushort	putval_status	(out) The return value of the actual remote putval call.

The structure of the rputval_hist_data structure is defined in nif_types.h. This structure and its members is defined as follows:

uint2	point_type_num	(in) Defines the point type/number to be accessed.
uint2	point_param	(in) Defines the point parameter to be accessed. (for example, 1 minute history (HST_1MIN). The definitions for parameter type are located in the parameters file.
uint2	hist_offset	(in) Offset from latest history value in history intervals to store value. (Where hist_offset=1 is the most recent history value)
real4	param_value	(in) Value of point parameter to be stored.
uint2	putval_status	(out) The return value of the actual remote putval call.

Note that a successful return status from the **rputval** call indicates that no network error was encountered (that is, the request was received, processed, and responded to). The status field in each call structure needs to be verified on return to determine the result of the individual remote calls.

The program using these function calls must ensure that the size of the network packets generated do not exceed the maximum packet size permitted on the network. This requirement can be met by adhering to the following guideline:

```
(12 * number of points) + sum of all string value
lengths in bytes <4000
```

Diagnostics

See “Diagnostics for Network API functions” on page 463.

Diagnostics for Network API functions

Unless otherwise stated, all Network API functions behave as follows: upon successful completion, a value of 0 is returned; otherwise one or more of the following error codes is returned.

CTLOK (0x8220)

This is not actually an error code, but an indication that the control was executed successfully.

GHT_HOST_TABLE_FULL (0x8808)

The API cannot store further information about host systems.

M4_CDA_ERROR (0x8155)

The CDA subsystem has reported an error. The two most likely causes are that the CDA service has been stopped on the primary server, or you have attempted to write to a read-only process point.

M4_CDA_WARNING (0x8156)

The CDA subsystem has reported a warning.

M4_DEVICE_TIMEOUT (0x106)

There has been a timeout when communicating to a field device. This may occur when attempting to read from a process point parameter if the CDA service has been stopped on the primary server. It may also occur if a field device fails to respond at all, or before the timeout period, when performing a control.

M4_GDA_COMMS_ERROR (0x8153)

There has been a communications error. See the log file for further details. This may occur when accessing a remote point if the remote server is offline or failing over. You may also see this error when accessing a flexible point.

M4_GDA_COMMS_WARNING (0x8154)

There has been a communications warning.

M4_GDA_ERROR (0x8150)

There has been an error reported by the data access subsystem. See the log file for further details. This may occur when accessing a remote point (on another server) or a flexible point.

M4_INV_PARAMETER (0x8232)

There was an attempt to access a parameter either by name or by parameter number, but the point does not have a parameter by that name or number.

M4_INV_POINT (0x8231)

There was an attempt to access a point either by name or by point number, but that point name or number does not exist.

M4_PNT_ON_SCAN (0x8212)

There was an attempt to write to a read-only parameter of a non-process point while it was on scan.

M4_SYSTEM_OFFLINE (0x83fc)

The system is offline.

NADS_ARRAY_DIM_ERROR (0x83A0)

A VB array has been dimensioned with an incorrect number of dimensions. The API expects all arrays to be single dimensioned.

NADS_ARRAY_INVALID_ELEMENT_SIZE (0x83A1)

There is a mismatch between the size of the elements passed to the API and the size of elements expected by the API. Ensure that you have not modified any byte-alignment settings in Visual Basic.

NADS_ARRAY_OVERFLOW (0x839F)

A VB array passed to the API is not large enough to contain the information requested.

NADS_BAD_POINT_PAR (0x838C)

A bad point parameter value was sent or received.

NADS_CLOSE_ERR (0x8394)

A network error occurred. The network socket could not be closed correctly.

NADS_GLOBAL_ALLOC_FAIL (0x8396)

The system was unable to allocate enough memory to perform the requested operation. Close any unnecessary running application to free more memory.

NADS_GLOBAL_LOCK_FAIL (0x8395)

An internal error occurred. The system was unable to access internal memory.

NADS_HOST_ER (0x8392)

The server name specified was not recognized. Check the `hosts` file and DNS settings.

NADS_HOST_MISMATCH (0x8388)

Retries exhausted and last reply was from the wrong host.

NADS_HOST_NOT_PRIMARY (0x8398)

The host is in redundant backup mode.

NADS_INCOMPLETE_HEADER (0x8387)

Retries exhausted and last reply was a runt packet.

NADS_INIT_ER (0x8390)

An internal error occurred. The system was unable to initialize correctly. Restart your application.

NADS_INVALID_LIST_SIZE (0x839B)

The number of requests specified when calling the function was less than 1 and is invalid.

NADS_INVALID_PROT (0x838E)

An internal error occurred. An unknown network protocol was specified.

NADS_INVALID_STATUS (0x8397)

An internal error occurred. The server returned an invalid status.

NADS_NO_DLL (0x838D)

An internal error occurred. No network dll could be found.

NADS_NO_SUCH_FUNC (0x8384)

The remote server being contacted does not support the requested function.

NADS_NO_SUCH_VERS (0x8383)

The remote server being contacted does not support the requested version for the function concerned.

NADS_PARTIAL_FUNC_FAIL (0x839A)

Warning that at least one request (and possibly all requests) in the list has returned its status in error.

NADS_PORT_MISMATCH (0x8389)

Retries exhausted and last reply was from the wrong protocol port.

NADS_RCV_TIMEOUT (0x8386)

The request timed out while waiting for the reply. Check network connections and that the server is running.

NADS_REQ_COUNT_MISMATCH (0x839C)

An internal error occurred. The number of requests sent by the Client and received by the Server do not match.

NADS_RX_BUFFER_EMPTY (0x8382)

An internal error occurred. A pull primitive has failed due to the NADS Stream receive buffer being empty.

NADS_RX_ERROR (0x8393)

An internal error occurred. A message was not received.

NADS_SOCK_ER (0x8391)

An internal error occurred. The socket count could not be opened.

NADS_TRANS_ID_MISMATCH (0x838A)

Retries exhausted and last reply was from an obsolete request.

NADS_TX_BUFFER_FULL (0x8381)

A push primitive has failed due to the NADS Stream transmit buffer being full.

NADS_TX_ER (0x838F)

The API failed to transmit a message.

NADS_VAR_TYPE_MISMATCH (0x839D)

The VARIANT data type used in VB does not match the requested type of the PARvalue union in C.

NADS_WRONG_PROGRAM (0x8385)

The remote server being contacted has a NADS program number assignment other than that specified in the request.

Errors Received During a Failover

You may receive the following errors during a manual or automatic failover:

- M4_SYSTEM_OFFLINE
- NADS_HOST_NOT_PRIMARY

If you are accessing a remote point and the DSA system is undergoing a manual or automatic failover you may see M4_GDA_COMMS_ERROR.

Using Experion PKS's Automation Objects

14

This chapter provides an overview of issues applicable to developing applications that use Experion PKS's Automation Object Models.

Experion PKS includes the following object models, each of which represents a particular aspect of the system.

Object Model	Represents
Server Automation Object Model	The server, points, events, assets and reports
HMIWeb Object Model	Station and HMIWeb displays
Station Scripting Objects	Station-level scripts
Station Object Model	DSP displays

Server Automation Object Model

The Server Automation Object Model represents the server, points, events, assets and reports.

Notes

- If you are using Visual Basic, choose **Project** > **References**, and select `HSC Server Automation Model 1.0` from the list.
- The Server object is the only object that can be directly created with the Visual Basic CreateObject function or the "New" keyword.
- You must only create one Server object and cache its existence, although you can make copies of it.
- The Server object can only be created on a server if the database is loaded.
- An application that uses the Server Automation model can be run as:
  - An application with an allocated LRN. This is subject to the same security measures as any other application.
  - A utility on the server. This requires physical access to the server.

Applicable documentation

See the *Server Scripting Reference*.

Example

This example shows how to create the Server object.

```
Set objServer =
CreateObject("HSCAutomationServer.Server")
```

HMIWeb Object Model

The HMIWeb Object Model represents Station and HMIWeb displays.

Notes

- The Application object is the only object that can be directly created with the Visual Basic CreateObject function or the “New” keyword.
- DSP displays are represented by the Station Object Model.

Applicable documentation

See the *HMIWeb Display Building Guide*.

Example

This example shows how to create the top-level object (Application) of the HMIWeb Object Model.

```
Set objStationApp =
CreateObject("Station.Application")
```

Once created, the application can then control Station through the object variable `objStationApp`. For example, to instruct Station to call up a display called “CompressorStatus”, the application would use the following code.

```
objStationApp.CurrentPage = CompressorStatus
```

Station Scripting Objects

Station Scripting Objects (SSOs) are ActiveX controls that attach Station-level scripts to a Station. SSOs are based on the HMIWeb Object Model.

Notes

- The sample Visual Basic project for an SSO `.vbp` provides the framework for implementing an SSO. (The project and associated components are zipped into `SSO_Sample.zip`. This file is located in `Station\Samples`.)
- Every SSO must implement a detach method. See "Implementing a Detach method" on page 471.

Applicable documentation

See the *HMIWeb Display Building Guide*.

To create an SSO:

1 Open the sample SSO project in Visual Basic.

2 Change the **Project name** to something appropriate, which is unique.

When you change the name, the **ProgID** also changes (The ProgID is of the form *`ProjectName.ClassName`*.) For example, if you change the project name to `OperStations`, the **ProgId** will change to `OperStations.clsSSO`.

3 Write your scripts.

The sample SSO contains some simple code that adds entries to the Dictionary object, and displays a message box when Station connects to the server.

4 Compile the SSO by choosing **File** > **Make SSO.dll**. If there are any errors, you must fix them before moving onto the next step.

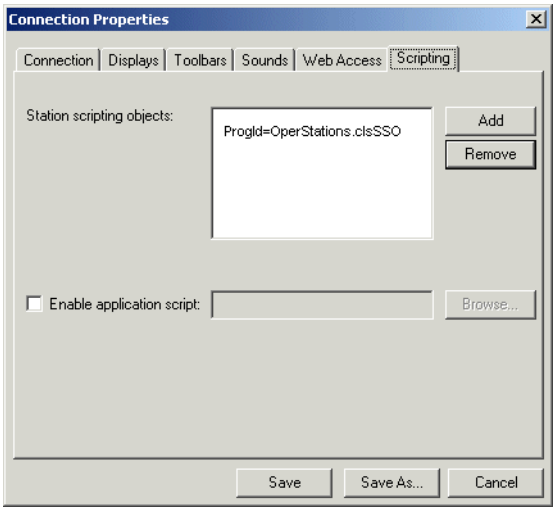
5 For each Station that needs the SSO:

a. Copy the SSO to the Station computer and register it. See "Registering an SSO" on page 471. (You can skip this step if you compiled the SSO on the computer because it automatically registers itself if the compilation is successful.)

b. Choose **Station** > **Connection Properties** to open the Connection Properties dialog box.

c. Click the Scripting tab.

d. Click **Add** to add a new entry in the **Station scripting objects** list and type the SSO's ProgID after "`ProgID =`".



6 Click **Save** to save the changes to the connection.

Registering an SSO

You must register an SSO on each Station computer that needs to use it. (Unless you have compiled it on the computer.)

To register an SSO:

1 Copy the SSO to the computer.

2 Open a Command Prompt Window.

3 Type **`regsrv32 SsoName.dll`**, where *`SsoName`* is the name of the SSO (including its path).

Implementing a Detach method

An SSO must implement a detach method so that the SSO detaches correctly when Station exits. Include the following code in every SSO.

```
Public Sub Detach()
  Set m_objStation = Nothing
End Sub
```

Implementing SetStationObject

The SetStationObject method must be implemented so that Station will create your SSO. As soon as Station has created your SSO, it calls SetStationObject, passing in a reference to Station's Application object.

You may use this method to initialize a global variable in your SSO that it references to Station's Application object.

Visual Basic example:

```
Dim withEvents m_objStation As Station.Application4
Public Sub SetStationObject(ByRef objStation As
Station.Application4)
  Set m_objStation = objStation


End Sub
```

Station Object Model

The Station Object Model represents DSP displays.

Notes

- Except for DSP displays and earlier versions of Station, the Station Object Model has been superseded by the HMIWeb Object Model.
- In order to control DSP displays, you must first create Station using the Application object of the HMIWeb Object Model (see “HMIWeb Object Model” on page 469). After creating the Application object, you can then control DSP displays using the Station Object Model.

Applicable documentation

See the *Display Building Guide*.

Example

This example shows how to call up the Alarm Summary, a DSP display whose display number is `5`. (The variable, `objStationApp`, represents Station, which has already been created using the Application object of the HMIWeb Object Model.)

```
objStationApp.CurrentPage = 5
```

Glossary

accumulator point

A *point* type used to represent counters. Information contained in the accumulator point can include: the raw value, a process value, a rollover value, a scale factor, and a meter factor.

acronym

An acronym is a text string that is used to represent a state or value of a *point* in a *display*. From an operator's point of view, it much easier to understand the significance of an acronym such as "Stopped", compared with an abstract value such as "0".

action algorithm

One of two types of algorithm you can assign to a point in order to perform additional processing to change point parameter values. An action algorithm performs an action when the value of the PV changes. Contrast with *PV algorithm*.

ActiveX

COM-based technology for creating objects and components.

ActiveX component

An ActiveX component is a type of program designed to be called up from other applications, rather than being executed independently. An example of an ActiveX component is a custom dialog box, which works in conjunction with *scripts*, to facilitate operator input into *Station*.

ADO

Active Data Object.

alarm

An indication (visual and/or audible) that alerts an operator at a Station of an abnormal or critical condition. Each alarm has a type and a *priority.* Alarms can be assigned either to individual points or for system-wide conditions, such as a controller communications failure. Alarms can be viewed on a Station display and included in reports. Experion PKS classifies alarms into the following types:

- PV Limit
- Unreasonable High and Unreasonable Low
- Control Failure
- External Change

alarm/event journal

A file that records all alarms and events. It is accessed to generate reports and can also be archived to off-line media.

alarm priority

One of four levels of severity specified for the alarm. The alarm priorities from least to most severe are:

- Journal
- Low
- High
- Urgent

algorithm

See *point algorithm*.

analog point

A point type that is used to represent continuous values that are either real or integer. Continuous values in a process could be: pressure, flow, fill levels, or temperature.

ANSI

American National Standards Institute

API

Application Programming Interface

application program

A user-written program integrated into Experion PKS using the Application Programming Interface (API).

asset

A logical sub-section of your plant or process. Custom displays, points, and access configuration may be associated with an asset. Operators and Stations can be assigned access to particular assets only.

automatic checkpointing

In a redundant server system, automatic checkpoint is the automatic transfer of database updates from the primary server to the backup server.

auxiliary parameter

An analog point parameter in addition to PV, SP, OP, and MD. Up to four auxiliary parameters can be used to read and write four related values without having to build extra points.

bad value

A parameter value, (for example, PV), that is indeterminate, and is the result of conditions such as unavailable input.

Client software

An umbrella term covering Experion PKS Quick Builder, Station, and Display Builder software.

channel

The communications port used by the server to connect to as controller. Channels are defined using the Quick Builder tool.

CIM

Communications Interface Module

CNI card

ControlNet EISA Interface card.

collection

A collection is a set of named values or *display objects* that are used in *scripts*.

COM

Component Object Model

Control Builder

The control building software for the Process Controller.

control failure alarm

For *analog* and *status* points, an *alarm* configured to trigger when an OP, SP, MD, or a parameter control is issued and a demand scan on the source address, performed by the server, finds their value does not match the controlled value.

control level

A security designation assigned to a *point* that has a destination address configured (for analog or status points only). A control level can be any number from 0 to 255. An operator will be able to control the point only if they have been assigned a control level equal to, or higher than, the point control level.

control parameters

Point parameters defined to be used as a control. A control parameter has both a source and a destination address. The destination for the parameter value is usually an address within the controller. Control parameters can be defined as automatic (server can change) or manual (operator can change).

controller

A device that is used to control and monitor one or more processes in field equipment. Controllers include Programmable Logic Controllers (PLCs), loop controllers, bar code readers, and scientific analyzers.

Controllers can be defined using the Quick Builder tool. Some controllers can be configured using Station displays.

database controller

See *User Scan Task controller*.

database point

Any *point* that has one or more parameters with database addresses.

DCD

Data Carry Detect

DCS

Digital Control System

DDE

Dynamic Data Exchange

default

The value that an application automatically selects if the user does not explicitly select another value.

deleted items

In Quick Builder, an item that has been flagged for deletion from the server database and appears in the Deleted grouping. When a download is performed, the item is deleted from both the server database and the Quick Builder project database.

demand scan

A one-time-only scan of a point parameter that can be requested either by an operator, a report, or an application.

DHCP

Dynamic Host Configuration Protocol

display

Station uses displays to present Experion PKS information to operators in a manner that they can understand. The style and complexity of displays varies according to the type of information being presented.

Displays are created in *Display Builder*.

Display Builder

The Honeywell tool for building customized graphical displays representing process data.

display object

A display object is a graphic element, such as an alphanumeric, a pushbutton or a rectangle, in a *display*.

Display objects that represent point information (such as an alphanumeric) or issue commands (such as a pushbutton) are called “dynamic” display objects.

Distributed System Architecture (DSA)

An option that enables multiple Experion PKS servers to share data, alarms, and history without the need for duplicate configuration on any server.

DNS

Domain Name System

DSR

Data Signal Ready

DTE

Data Terminal Equipment

DTR

Data Terminal Ready

dual-bit status point

A status point that reads two bits. Status points can read one, two or three bits.

EIM

Ethernet Interface Module

ELPM

Ethernet Loop Processor Module

EMI

Electromagnetic Interference

event

A significant change in the status of an element of the system such as a point or piece of hardware. Some events have a low, high, or urgent priority, in which case they are further classified as alarms. Events can be viewed in Station and included in reports.

Within the context of *scripts* (created in *Display Builder* and used in *Station*), an event is a change in system status or an operator-initiated action that causes a *script* to run.

Event Archiving

Event Archiving allows you to archive events to disk or tape, where they may be retrieved if needed.

EXE

Executable.

exception scan

A scan that takes place only when a change occurs at a controller address configured for a point parameter. Some controllers can notify the server when a change occurs within the controller. The server uses exception polling to interrogate the controller for these changes. This type of scan can be used to reduce the scanning load when a fast periodic scan is not required.

export

In relation to Station displays, this refers to the process of registering a *display* with the *server* so that it can be called up in *Station*.

In relation to Quick Builder, this refers to the process of converting the configuration data in a project file into text files for use with other applications.

Extended history

A type of history collection that provides snapshots of a point at a designated time interval that can be:

- 1-hour snapshots
- 8-hour snapshots
- 24-hour snapshots

Fast history

An type of history that provides a 5-second snapshot history for points.

field address

The address within the controller that contains stored information from a field device being monitored by the controller.

free format report

An optional report type that enables users to generate their own report.

FTP

File Transfer Protocol

group

A group of up to eight related points whose main parameter values appear in the same group display. Sometimes called “operating group”.

history

Point values stored to enable tracking and observation of long-term trends. Analog, status, and accumulator point PVs can be defined to have history collected for them.Three types of history collection are available:

- Standard
- Extended
- Fast

history gate

A status point parameter that is used to control the collection of history for an analog or status point. The history is only collected if the gate state value of the nominated parameter is in the nominated state.

host server

In a DSA system, the server on which a remote point’s definition is stored and from which alarms form the point originate.

HTTP

Hypertext Transfer Protocol

IEEE

Institute of Electrical and Electronic Engineers

input value

Values that are usually scanned from the *controller* registers but can be from other server addresses. Input values can represent eight discrete states. Up to three values can be read from an address in order to determine a state.

IRQ

Interrupt Request

item

In Quick Builder, the elements necessary for data acquisition and control that comprise the Experion PKS server data and are defined in the project file. These are:

- Channels
- Controllers
- Stations
- Points
- Printers

item grouping

A collection of items grouped by a common property.

item list

In Quick Builder, a listing of the items defined in the project file that displays in every Project View. The item list can be used to find an item and then display its properties.

item number

Item numbers are used in the server database to identify items. In Quick Builder, the number is assigned to an item internally. The item numbers for channels, controllers, Stations and printers can be overwritten in Quick Builder to match an existing system database.

local display object

A dynamic *display object* that displays information or issues a command, but which is not linked to the *server*. Such display objects are used in conjunction with *scripts*.

local server

The server to which the Station is connected.

MCI

Media Control Interface

MD

Experion PKS abbreviation for *mode*.

method

A programmatic means of controlling or interrogating the *Station Automation object model*. A method is equivalent to the terms “function” or “command” used in some programming languages.

Microsoft Excel Data Exchange

A network option that can be used to capture the most recent point and history information in the server and display it in Microsoft Excel spreadsheets, primarily for reporting.

Mode

A point parameter which determines whether or not the operator can control the point value. For example, in a status point, the mode determines whether the operator can control the output value, and in an analog point the mode determines the control of the setpoint. If the mode is set to manual, the operator can change the value.

Network Node controller

A server running the system software defined as a controller to another server running the system software. The local server can scan and control points that have been defined in the remote Network Node controller as long as those points have also been defined in the local server. The Network Node option is provided for backward compatibility.

ODBC

See *Open Database Connectivity.*

ODBC driver

A driver that processes ODBC (Open Database Connectivity) calls, queries the database, and returns the results. See also *Open Database Connectivity.*

OP

Experion PKS abbreviation for *output*.

OPC

OPC stands for OLE (Object Linking & Embedding) for Process Control. It is a set of standards to facilitate interoperability between applications within the Process Control Industry. These include automation/control applications, field systems/devices or business/office applications.

OPC specifies a standard interface to be used between two types of applications called OPC clients and OPC servers. An OPC server is an application which collects data, generally directly from a physical device, and makes it accessible through the OPC interface. An OPC client requests and uses the data provided by an OPC Server. By having a standard interface OPC clients and servers written by different vendors can communicate.

Open Database Connectivity

A standard set of function calls for accessing data in a database. These calls include the facility to make SQL (Structured Query Language) queries on the database. To use ODBC you must have support from the client application (for example, Microsoft Access) which will generate the ODBC calls and from some database-specific software called an *ODBC driver*.

operator ID

A unique identification assigned to each operator. If Operator-Based security is enabled, the operator must use this ID and a password to sign on to a Station.

operator password

A character string (not echoed on screen) used with the operator ID to sign on to a Station.

operator security level

See *security level*.

Operator-Based security

Operator-Based security comprises an operator ID and password, which must be entered at a Station in order to access Experion PKS functions.

output

A *point* parameter used to issue control values. The output (OP) is often related to the mode (MD) parameter and can be changed by an operator only if the mode is manual.

parameter

The different types of values accessed by *points* are known in Experion PKS as "point parameters."

Experion PKS can store and manage multiple values in the one point.You can therefore use a single point to monitor and control a complete loop. The names of the parameters reflect their most common usage. They can, however, be used to hold any controller values.

periodic scan

A defined regular interval in which the server acquires information from the controller and processes the value as a point parameter. The scan period must be defined in Quick Builder for each point source parameter value.

PIN

Plant Information Network

PLC

Programmable logic controller

point

A data structure in the server database, usually containing information about a field entity. A point can contain one or more parameters.

point algorithm

A prescribed set of well-defined rules used to enhance a point's functionality. The point algorithm accomplishes this by operating on the point data either before or after normal point processing.

There are two types of point algorithms, PV (processed every time the point parameter is scanned) and Action (processed only when a point parameter value changes).

point detail display

A display that shows the current point information. Each point has a Point Detail display.

primary server

This is the PC that normally runs the database software, performs processing tasks, and allocates resources to client PCs. If the primary server is unavailable, the secondary server takes over until it is available again.

Process Controllers

The term used to refer to all control hardware (chassis, power supply, Control Processor, and ControlNet bridge) as a single entity in a Experion PKS system.

Process software

An umbrella term for Control Builder and other hybrid controller software.

process variable

An actual value in a process: a temperature, flow, pressure, and so on. Process variables may be sourced from another parameter and may also be calculated from two or more measured or calculated variables using algorithms.

programmable logic controller (PLC)

A control and monitoring unit that connects to a field device and controls low-level plant processes with very high-speed responses. A PLC usually has an internal program that scans the PLC input registers and sets the output registers to the values determined by the program. When connected to the server, the input and output values stored in the PLC registers can be referenced, and the server can read and write to these memory addresses.

project

In Quick Builder, a working database file that enables you to make changes to the server database without affecting the configuration data that is currently being used to run the system.

project view

In Quick Builder, a window in which you can view, add, and modify any items in the current project file.

property

An attribute or characteristic of an object within the *Station Automation object model*. For example, a *display object* has properties that define its height, width and color.

property tab

In Quick Builder, a tab in the Project View window that displays information about the currently selected item or items. Most of the information displayed can be modified.

PV

Experion PKS abbreviation for *process variable*.

PV algorithm

One of two types of algorithm you can assign to a point in order to perform additional processing to change point parameter values. A PV algorithm changes the value of the point process value (PV) input only. Contrast with *Action algorithm*.

PV clamp

For an analog point, a configuration that will immobilize the process value (PV) at 0% if it falls below the entry low limit value or at 100% if it goes above the entry high limit value.

PV period

An amount of time specified for the scanning of the point process value (PV) parameter. The PV period determines the frequency with which the scan will be performed by the server. The server groups point addresses into scan packets by PV period and controller.

Quick Builder

Quick Builder is a graphical tool that is used to define the hardware items and some point types in a Experion PKS system. Quick Builder can run either on a Experion PKS server, on another computer in your system, or on a laptop.

After defining hardware and points with Quick Builder, you download these definitions from Quick Builder to the Experion PKS server database.

recipe

A set of points used in a process. The Recipe Manager option enables point parameters for sets of points to be downloaded with pre-configured working values. The individual point parameters are the recipe “ingredients.”

recordset

An ADO object which contains data organized in fields and records.

redundant server

A second server used as a backup system. In a redundant server system the “redundant” server is actively linked to the “primary” server. Active linking ensures that data in the second server is constantly updated to mirror the primary server.

remote server

A server that supplies data to a local server via either a local area network (LAN) or a wide area network (WAN).

report

Information collected by the server database that is formatted for viewing. There are several pre-formatted reports, or the user can customize a report. Reports may be generated on demand or at scheduled intervals. Reports can be printed or displayed on a Station.

REX

Request to exit.

RFI

Radio Frequency Interference

RLSD

Receive Line Signal Detect

RTS/CTS

Request to send/clear to send

RTU

See *controller*.

SafeBrowse object

A SafeBrowse object is a Web browser specifically designed for use with *Station*. SafeBrowse includes appropriate security features that prevent users from displaying unauthorized Web pages or other documents in Station.

scan

The technique used to read data from a controller. Scans are conducted for point parameters with source addresses (for example, PV, SP, OP, MD, An). Experion PKS uses demand, exception, and periodic scanning techniques.

scan packet

A group of point parameter source addresses assembled by the server and used as the basic unit of server data acquisition. The server groups points into scan packets based on the controller address that they reference and the scan period defined.

scan period

The time interval that specifies the frequency at which the Experion PKS server reads input values from the memory addresses of controllers. Scan periods are measured in seconds; a scan period of 120 seconds means that the server scans the controller once every 120 seconds.

scheduler

A facility used to schedule the control of a point on either a periodic or once-only basis.

script

A script is a mini-program that performs a specific task. Scripts use the *Station Automation object model* to control and interrogate *Station* and its *displays*.

security level

Access to Experion PKS functions is limited by the security level that has been assigned to each operator. Experion PKS has six security levels. An operator is assigned a security level and may perform functions at or below the security level that has been assigned to that operator.

server

The computer on which the Experion PKS database software runs.

Server software

An umbrella term used to refer to the database software and server utilities installed on the Experion PKS server computer.

server Station

A computer running both the Experion PKS database (server) software and the Station software.

setpoint

The desired value of a process variable. Setpoint is a point parameter, whose value may be entered by the operator. The setpoint can be changed any number of times during a single process. The setpoint is represented in engineering units.

shape

A shape is a special type of *display object* that can be used in numerous *displays*.

Shapes can be used as "clip-art" or as *shape sequences*.

shapelink

A shapelink is, in effect, a "window" which always displays one *shape* of a *shape sequence*. For example, a shapelink representing a point's status displays the shape that corresponds to the current status.

shape sequence

A shape sequence is a set of related shapes that are used in conjunction with *shapelinks*. A shape sequences can be used to:

- Represent the status of a point (Each shape represents a particular status).
- Create an animation (Each shape is one "frame" in the animation.)

SLC

Small Logic Controllers

SOE

Sequence of events

softkey

A softkey is a function key which, when pressed, performs an action specified in the configuration details for the current *display*.

SP

Experion PKS abbreviation for *set point*.

SQL

Structured Query Language

Standard history

A type of history collection for a point that provides one-minute snapshots and the following averages based on the one-minute snapshots:

- 6-minute averages
- 1-hour averages
- 8-hour averages
- 24-hour averages

Station

The main operator interface to Experion PKS. Stations can run either on a remote computer through a serial or LAN link, or on the server computer.

When Station is running on the Experion PKS server computer, it is often referred to as a *server Station*.

Station Automation object model

The Station Automation object model provides the programming interface through which *scripts* control *Station* and its *displays*.

status point

A point type used to represent discrete or digital field values. The point can have input, output, and mode values. Input values can be read from up to three consecutive, discrete locations in the controller and thus can represent up to 8 states.

Output values can be used to control up to two consecutive discrete locations in a controller. Output values can be automatic or operator-defined.

Mode values apply to output values and determine whether or not the output value is operator-defined or automatic.

supervisory control

The action of writing information to a controller. Experion PKS enables both automatic and manual supervisory control. See *Mode*.

task

A task is any of the standard server programs or an application program that can be invoked from a *display.*

TCP/IP

Transmission Control Protocol/Internet Protocol. A standard network protocol.

terminal server

A device on the local area network (LAN) that connects to a controller by way of a serial connection and enables the controller to “talk to” the Experion PKS server on the LAN.

timer

A timer is a programming mechanism for running *scripts* at regular intervals in *Station*.

trend

A display in which changes in value over time of one or more point parameters are presented in a graphical manner.

Unreasonable High and Unreasonable Low alarms

Alarms configured for an unreasonably high value and an unreasonably low value for the PV of an analog point.

User Scan Task controller

A server software option used to configure a server database table (called a “user file”) to act as a controller. The server interfaces with the user file rather than the actual device.

In this way you can write software to interface with the server and to communicate with devices that are connected to, but not supported by, the Experion PKS server. The Experion PKS server can then scan data from the user files into points configured on the User Scan Task controller and, for control, the Experion PKS server can write point control data to the user file or a control queue.

USKB

Universal Station keyboard

USR

Unit Start Request

utility

Experion PKS programs run from a command line to perform configuration and maintenance functions; for example, the **lisscn** utility.

virtual controller

See *User Scan Task controller.*

WINS

Windows Internet Name Service

WWW

World Wide Web.

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