

gclib 566

C API for Galil controllers and PLCs

Galil Motion Control

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Chapter 1

Getting Started

The Galil Communication Library (gclib) is a communication library for Galil motion controllers and PLCs. A number of programming languages, operating systems, and hardware platforms are supported.

The library consists of a basic set of function calls ([gclib.h](#)), and an open-source extension library ([gclibo.h](#)). A number of examples are provided to demonstrate how to use the library with various [languages](#).

The gclib will import virtually anywhere a dll/so/dylib can be imported. See [installation](#) for details. Please contact support@galil.com if the language or platform required is not listed.

Contents

- [List of all functions](#)
- [Installation](#) and supported operating systems
- [Language Support](#)
- [Using gclib](#)
- [Example Projects](#)

Release Notes

See the update history of gclib in the [release notes](#).

Galil maintains an [RSS](#) page to notify users of updates.

See the update history of [gcaps](#) in the [release notes](#).

Technical Support

For help please email support@galil.com, or call [Galil Applications](#).

Chapter 2

Example Projects

Description

Welcome to gclib Example Projects. The Galil Communication Library (gclib) is a communication library for Galil motion controllers and PLCs. A number of programming languages, operating systems, and hardware platforms are supported.

These in-depth examples will demonstrate how to use the basics of gclib such as connecting to the controller and issuing commands, as well as more advanced topics such as assigning a controller an IP Address and monitoring interrupts.

Projects

Example	Description
Commands Example	Demonstrates various uses of GCommand() and GUtility() .
Message Example	Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.
Position Tracking Example	Puts controller into Position Tracking Mode and accepts user-entered positions.
Jog Example	Puts controller into Jog Mode and accepts user input to adjust the speed.
Vector Mode Example	Puts controller into Vector Mode and accepts a file defining vector points.
IP Assigner Example	Assigns controller an IP Address given a serial number and a 1 byte address.
Motion Complete Example	Uses interrupts to track when the motion of controller is completed.
Record Position Example	Record user's training and saves to a text file.
Contour Example	Record user's training and plays back training through contour mode.
Remote Server Example	Advertise local gcaps server on the network.
Remote Client Example	Discover and connect to other gcaps servers on the network.

Instructions

For build instructions, please select a supported language:

- [C/C++](#)
- [C#.NET](#)
- [VB.NET](#)

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

2.1 Commands Example

C++	C#	Visual Basic
Example	Example	Example
Logic	Logic	Logic
Instructions	Instructions	Instructions

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

Concepts

This example demonstrates:

- How to connect to a controller via IP Address.
- How to issue basic commands.
- How to read data back from the controller.
- How to get context on errors that occur in the program.

Prerequisites

A Galil controller is required for this example.

Command Line Arguments

This example requires 1 argument:

- The IP Address of a Galil controller.

```
commands_example.exe 192.168.42.200
```

Example Output

```
`*****`
`***** GCmdT() example *****`
`*****`
GCmdT() will return a trimmed response of GCommand()
The command 'PR ?,?' will return the relative position of the A and B axes
«PR ?,? with GCommand(): 0, 10000
:»
«PR ?,? with GCmdT(): 0, 10000»
`*****`
`***** GCmdI() example *****`
`*****`
GCmdI() will return the value of GCommand() parsed as an int
The command 'MG _LMS' will return the available space in the vector buffer of the S plane.
MG _LMS with GCmdT(): 511.0000
MG _LMS with GCmdI(): 511
`*****`
`***** GCmd() example *****`
`*****`
GCmd() will execute the given command but does not return a value.
GCmd is useful for basic operations such as beginning motion or setting speed
GCmd(g, "BG A");
GCmd(g, "SP 5000");
`*****`
`***** GCmdD() example *****`
`*****`
GCmdD() will return the value of GCommand parsed as a double
The command 'MG @AN[1]' will return the value of Analog Input 1
MG @AN[1] with GCmdD(): 9.7726
```

```

'*****
'***** Galil Double Format *****
'*****
Galil Controllers expect double values to be formatted to 4 decimal places
Unformatted double value: 0.00235
Formatted double value rounded to 4 decimal places: 0.0024
'*****
'***** G_UTIL_ERROR_CONTEXT example *****
'*****
GUtility() with G_UTIL_ERROR_CONTEXT: Broken Pipe

```

2.2 Message Example

C++	C#	Visual Basic
Example	Example	Example
Logic	Logic	Logic
Instructions	Instructions	Instructions

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Concepts

This example demonstrates:

- How to connect to a controller via IP Address.
- How to issue basic commands.
- How to reconstitute a full message from [GMessage\(\)](#).
- How to detect differences in crashed DMC code and Trace.
- How to print messages.
- How to use Keep Alive to maintain connection to gcaps.

Prerequisites

A Galil controller with a motor connected at the A axis is needed for this example.

Command Line Arguments

This example requires 1 argument:

- The IP Address of a Galil controller.

```
message_example.exe 192.168.42.96
```

Example Output

```

'*****
Example GMessage() usage
'*****
<HELLO WORLD
>
Trace Line: 0 i=0
Trace Line: 1 #A
Trace Line: 2 MGi
Standard Line: 0.0000

```

```
Trace Line: 3 i=i+1
Trace Line: 4 WT100
Trace Line: 5 JP#A,i<1
Trace Line: 6 i=i/0
Crashed Code: ?6 i=i/0
```

2.3 Position Tracking Example

C++	C#	Visual Basic
Example	Example	Example
Logic	Logic	Logic
Instructions	Instructions	Instructions

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

Concepts

This example demonstrates:

- How to connect to a controller via IP Address.
- How to issue basic commands.
- A controller in position tracking mode.

Prerequisites

A Galil controller with a motor connected at the A axis is needed for this example.

Command Line Arguments

This example has 1 required argument and 1 optional argument:

- Required: The IP Address of a Galil controller.
- Optional: The speed of the controller in Position Tracking mode (Default 5000).

```
position_tracking_example.exe 192.168.42.96 4000
```

Example Output

```
Begin Position Tracking with speed 5000. Enter a non-number to exit.
Enter a new position:
4000
Enter a new position:
-8000
Enter a new position:
10000
Enter a new position:
```

2.4 Jog Example

C++	C#	Visual Basic
Example	Example	Example

C++	C#	Visual Basic
Logic	Logic	Logic
Instructions	Instructions	Instructions

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

Concepts

This example demonstrates:

- How to connect to a controller via IP Address.
- How to issue basic commands.
- A controller in jogging mode.
- How to utilize keyboard input at the console.

Prerequisites

A Galil controller with a motor connected at the A axis is needed for this example.

Note

Linux users will need to install the ncurses library.

Command Line Arguments

This example requires 1 argument:

- The IP Address of a Galil controller.

```
jog_example.exe 192.168.42.96
```

Example Output

```
Enter a character on the keyboard to change the motor's speed:
<q> Quit
<a> -2000 counts/s
<s> -500 counts/s
<d> +500 counts/s
<f> +2000 counts/s
<r> Direction Reversal
Jog Speed: 0
Jog Speed: 2000
Jog Speed: 4000
Jog Speed: 6000
Jog Speed: -6000
Jog Speed: -8000
Jog Speed: -6000
```

2.5 Vector Mode Example

C++	C#	Visual Basic
Example	Example	Example
Logic	Logic	Logic
Instructions	Instructions	Instructions

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

Concepts

This example demonstrates:

- How to connect to a controller via IP Address.
- How to issue basic commands.
- A controller in vector mode.
- How to read and maintain the length of the vector buffer.
- How to read in a file of vector points and apply them to the controller.

Prerequisites

A Galil controller with two motors: one connected at the A axis and the other connected at the B axis.

Command Line Arguments

This example requires 2 arguments:

- The IP Address of a Galil controller.
- The path to a file containing vector commands.

```
vector_example.exe 192.168.42.92 vector_points.txt
```

2.6 IP Assigner Example

C++	C#	Visual Basic
Example	Example	Example
Logic	Logic	Logic
Instructions	Instructions	Instructions

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

Concepts

This example demonstrates:

- How to issue basic commands.
- How to listen on the network for Galil Controllers requesting an IP Address.
- How to assign a Galil Controller an IP Address.
- How to connect to a controller via IP Address.
- How to get information on a connected controller such as MAC Address and Serial Number.

Prerequisites

A Galil controller connected to the same network as the host computer.

Command Line Arguments

This example requires 2 arguments:

- The serial number of your controller. The value to use is the number after the prefix on the controller's serial number marking. For example, if the serial number is marked as *BV-1234*, the value to use for this argument is *1234*.
- A value between 1-254 that defines the last byte of the newly assigned IP Address. This example will assign an IP address that matches your computer's IP address, with the last byte changed. For example, if your IP address is *192.168.42.92* and *96* is specified, the controller will be assigned *192.168.42.96*. The example will ping the IP address to ensure that the IP address is not already taken.

```
ip_assigner_example.exe 1234 96
```

2.7 Motion Complete Example

C++	C#	Visual Basic
Example	Example	Example
Logic	Logic	Logic
Instructions	Instructions	Instructions

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

Concepts

This example demonstrates:

- How to connect to a controller via IP Address.
- How to issue basic commands.
- How to move the controller to a precise position.
- How to monitor the interrupts of the controller.

Prerequisites

A Galil controller with two motors: one connected at the A axis and the other connected at the B axis.

Command Line Arguments

This example requires 1 argument:

- The IP Address of a Galil controller.

```
motion_complete_example.exe 192.168.42.96
```

Example Output

```
\*****\
Example GInterrupt() usage
\*****\
Position: 0, 0, 0, 0, 0, 0, 0, 0
Beginning independent motion...
Motion Complete on A and B
Position: 8000, 10000, 0, 0, 0, 0, 0, 0
```

2.8 Record Position Example

C++	C#	Visual Basic
Example	Example	Example
Logic	Logic	Logic
Instructions	Instructions	Instructions

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

Concepts

This example demonstrates:

- How to connect to a controller via IP Address.
- How to issue basic commands.
- How to manage a record array (RC/RD/RA) ring buffer.
- How to record position data and save to a text file.

Prerequisites

A Galil controller with a motor connected at the A axis and B axis is needed for this example.

Command Line Arguments

This example requires 3 arguments:

- The IP Address of a Galil controller.
- The path to a file to save Axis A positional data.
- The path to a file to save Axis B positional data.

```
record_position_example.exe 192.168.42.96 axis_a.csv axis_b.csv
```

2.9 Contour Example

C++	C#	Visual Basic
Example	Example	Example
Logic	Logic	Logic
Instructions	Instructions	Instructions

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

Concepts

This example demonstrates:

- How to connect to a controller via IP Address.
- How to issue basic commands.
- How to record position data and save to a text file.
- How to play back recorded data using contour mode.

Prerequisites

A Galil controller with a motor connected at the A axis and the B axis is needed for this example.

Command Line Arguments

This example requires 3 arguments:

- The IP Address of a Galil controller.
- The path to a csv file to store positional data for the A axis.
- The path to a csv file to store positional data for the B axis.

```
contour_example.exe 192.168.42.200 axis_a.csv axis_b.csv
```

2.10 Remote Server Example

C++	C#	Visual Basic
Example	Example	Example
Logic	Logic	Logic
Instructions	Instructions	Instructions

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

Concepts

This example demonstrates:

- How to advertise your gcaps server on the network for others to discover

Prerequisites

This example works best in conjunction with the [Remote Client Example](#) running on a separate machine on the same network.

Note

Linux users will need to install the ncurses library.

2.11 Remote Client Example

C++	C#	Visual Basic
Example	Example	Example
Logic	Logic	Logic
Instructions	Instructions	Instructions

We are always interested in what our customers would like to see! To request any new examples or supported languages, please email support@galil.com.

Concepts

This example demonstrates:

- How to discover other gcaps servers on your local network
- How to connect to other gcaps servers
- How to list available hardware on your connected server

Prerequisites

This example works best in conjunction with the [Remote Server Example](#) running on a separate machine on the same network.

Note

Linux users will need to install the ncurses library.

Example Output

Text colored green represents user input.

```
<s> List available servers on the network
<h> List available hardware on currently connected server
<0-9> Enter numbers 0-9 to connect to a server by index
<l> Set active server back to local server
<q> Quit
```

```
h
192.168.42.28, DMC4080 Rev 1.3c, Controller, 192.168.42.1
COM1
COM3
COM4
```

```
s
Available Servers:
<0> Example Server
```

```
0
Server set to: Example Server
```

```
h
/dev/ttyS0
/dev/ttyUSB0
```

```
l
Server set to: Local
```

2.12 C/C++

Please choose an operating system to get detailed instructions on how to build the gclib example projects.

- [Microsoft Windows](#)
- [Linux](#)

2.12.1 Microsoft Windows

Copy files

- Navigate to a convenient, empty, writable location, e.g. `C:\Users\{username}\Documents\Galil\cpp_↵examples`.
- Copy the contents of `C:\Program Files (x86)\Galil\gclib\examples\cpp\examples` to this location.

Open Visual Studio Project

The following instructions were performed on *Visual Studio Professional 2017* and *Visual Studio Professional 2019* and can be extended to other Visual Studio versions. For brevity, the instructions assume the default installation location of `C:\Program Files (x86)\Galil\gclib` and a build type of `x64`.

- Launch *Visual Studio 2017* or *Visual Studio 2019*.
- Choose *File->Open->Project/Solution....*
- Navigate to the `examples.vcxproj` file in the `C:\Users\{username}\Documents\Galil\cpp_examples` directory.
- Click *Open*.
- In the *Solution Explorer* right-click on the *examples* project file, choose *Properties*.
 - Click the *Configuration Manager...* button.
 - * Under *Active solution platform*: choose `x64`.
 - * Click *Close*.
 - Highlight *Configuration Properties* in the side bar, and set the following project properties.
 - * *Configuration Properties -> Debugging -> Environment* add **PATH=C:\Program Files (x86)\Galil\gclib\dl\x64;%PATH%**
 - * Click *OK*.
- Many of the examples require command line arguments to execute. To enter command line arguments in Visual Studio:
 - In the *Solution Explorer* right-click on the *examples* project file, choose *Properties*.
 - * Under *Configuration Properties*, highlight *Debugging* in the side bar. Enter the appropriate arguments in the *Command Arguments* box. Refer to each [example's landing page](#) for required command line arguments.
- Ensure the *Solution Configurations* and *Solution Platforms* are set to *Debug* and *x64* respectively.
- Hit *F5* to build and run the example.

Run a Different Example

To run a different example, remove the current example from the solution and add the next example.

- In the *Solution Explorer* right-click on `commands_example.cpp`, choose *Remove*.
 - Click the *Remove* button.
- In the *Solution Explorer* right-click on the *examples* project file, choose *Add->Existing Item*.
 - Navigate to the desired example file and click *Add*.
- Hit *F5* to build and run the example.

2.12.2 Linux

Copy examples to a temporary directory

Create temporary directory:

```
mkdir ~/temp
```

Copy examples to ~/temp

```
cp /usr/share/doc/gclib/src/gclib_example_projects.tar.gz ~/temp
```

Navigate to ~/temp

```
cd ~/temp
```

Extract the examples with command:

```
tar -xzf gclib_example_projects.tar.gz
```

Run Make

To build all examples:

```
make
```

To build a single example:

```
make commands.o
```

To run an example:

```
./commands_example.out
```

2.13 C#.NET

Open Visual Studio Project

The following instructions were performed on *Visual Studio Professional 2017* and can be extended to other Visual Studio versions. For brevity, the instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib** and a build type of **x64**.

Copy files

- Navigate to a convenient, empty, writable location, e.g. **C:\Users\{username}\Documents\Galil\cs_examples**.
- Copy the contents of **C:\Program Files (x86)\Galil\gclib\examples\cs\examples** to this location.

Configure Project

- Launch *Visual Studio 2017*.
- Choose *File->Open->Project/Solution....*
- Navigate to the `examples.sln` file in the `C:\Users\{username}\Documents\Galil\cs_examples` directory.
- Click *Open*.
- In the *Solution Explorer* right-click on the *examples* project file, choose *Properties*.
 - Click the *Build* tab.
 - * At the top of the window next to *Platform* choose *x64*.
 - * Click *Save*.
 - * Close the properties window.
 - In the *Solution Explorer* right-click on the *examples* project file, choose *Add->Existing Item*.
 - * Navigate to the `gclib C# wrapper` at location `C:\Program Files (x86)\Galil\gclib\source\wrappers\cs` and select *gclib.cs*.
 - * Click *OK*.
- Many of the examples require command line arguments to execute. To enter command line arguments in Visual Studio:
 - In the *Solution Explorer* right-click on the *examples* project file, choose *Properties*.
 - * Under *Debug*, enter the appropriate arguments in the *Command line arguments* box. Refer to each [example's landing page](#) for required command line arguments.
- Ensure the *Solution Configurations* and *Solution Platforms* are set to *Debug* and *x64* respectively.
- Hit *F5* to build and run the example.

Run a Different Example

To run a different example, change the *Startup object* to the new example.

- In the *Solution Explorer* right-click on the *examples* project file, choose *Properties*.
 - Click the *Application* tab.
 - * Under the *Startup object* dropdown, select a different example.
 - Click the *Debug* tab.
 - * Enter the appropriate arguments in the *Command line arguments* box. Refer to each [example's landing page](#) for required command line arguments.
- Hit *F5* to build and run the example.

2.14 VB.NET

Open Visual Studio Project

The following instructions were performed on *Visual Studio Professional 2017* and can be extended to other Visual Studio versions. For brevity, the instructions assume the default installation location of `C:\Program Files (x86)\Galil\gclib` and a build type of **x64**.

Copy files

- Navigate to a convenient, empty, writable location, e.g. **C:\Users\{username}\Documents\Galil\vb_↵examples**.
- Copy the contents of **C:\Program Files (x86)\Galil\gclib\examples\vb\examples** to this location.

Configure Project

- Launch *Visual Studio 2017*.
- Choose *File->Open->Project/Solution....*
- Navigate to the examples.sln file in the **C:\Users\{username}\Documents\Galil\vb_↵examples** directory.
- Click *Open*.
- In the *Solution Explorer* right-click on the *examples* project file, choose *Properties*.
 - Click the *Compile* tab.
 - * At the top of the window next to *Platform* choose *x64*.
 - * Close the properties window.
 - In the *Solution Explorer* right-click on the *examples* project file, choose *Add->Existing Item*.
 - * Navigate to the gclib VB wrapper at location **C:\Program Files (x86)\Galil\gclib\source\wrappers\vb** and select *gclib.vb*.
 - * Click *OK*.
- Many of the examples require command line arguments to execute. To enter command line arguments in Visual Studio:
 - In the *Solution Explorer* right-click on the *examples* project file, choose *Properties*.
 - * Under *Debug*, enter the appropriate arguments in the *Command line Arguments* box. Refer to each [example's landing page](#) for required command line arguments.
- Ensure the *Solution Configurations* and *Solution Platforms* are set to *Debug* and *x64* respectively.
- Hit *F5* to build and run the example.

Run a Different Example

To run a different example, change the *Startup object* to the new example.

- In the *Solution Explorer* right-click on the *examples* project file, choose *Properties*.
 - Click the *Application* tab.
 - * Under the *Startup object* dropdown, select a different example.
 - Click the *Debug* tab.
 - * Enter the appropriate arguments in the *Command line arguments* box. Refer to each [example's landing page](#) for required command line arguments.
- Hit *F5* to build and run the example.

Chapter 3

Installation

Supported Operating Systems

- Most versions are 64 bit (x64). A 32 bit (x86) version of gclib is also available on Windows.
- Older operating systems are listed along with the last Galil builds. On Linux, install these packages in this order `gclib -> gcapsd -> GDK`.

Microsoft Windows				
10				
8.1, No Galil Connect				
Older Versions	gclib	gcaps	GDK	
7	245.331.480	1.0.0.151	1.0.24.655	
Ubuntu				
20.04				
18.04				
Older Versions	gclib	gcaps	GDK	
16.04	200.252.396	1.0.0.130	1.0.7.353	
14.04	189.224.370			
12.04	130.114.278			
Red Hat and CentOS				
Red Hat 8 & CentOS 8 Linux				
Red Hat 7 & CentOS 7 Linux				
Older Versions	gclib	gcaps	GDK	
Red Hat 6 & CentOS 6 Linux	147.185.319			
Fedora				
32				
31				
Older Versions	gclib	gcaps	GDK	
30	267.339.528	1.0.0.210	1.0.25.696	
29	239.316.448	1.0.0.149	1.0.18.601	
28	222.301.423	1.0.0.143	1.0.13.526	
27	200.252.396	1.0.0.130	1.0.7.353	
26	195.232.387	1.0.0.128	1.0.5.307	
25	194.232.386	1.0.0.128	1.0.5.305	
24	189.224.370	1.0.0.124	1.0.4.276	
23	154.190.329	1.0.0.68		
22	130.114.278			
21	130.114.278			
Raspberry Pi				

Microsoft Windows				
Buster, Raspberry Pi 4				
Stretch, Raspberry Pi 3+				
Older Versions	gclib	gcaps	GDK	
Jessie, Raspberry Pi 2	194.232.386			
Apple				
Older Versions	gclib	gcaps	GDK	
Yosemite	189.220.368			

3.1 Microsoft Windows

Tested versions

See the [installation](#) page for supported versions.

Install

On Windows, gclib is distributed in the following formats.

- An executable installer which will install the library in the proper location to work with the included examples and documentation. PCI users can optionally install the PCI driver from within this installer.
- A zip file containing the same set of files as the executable but in a zip archive. PCI users can use the stand-alone PCI driver installer.
 - A stand-alone PCI driver installer for PCI users (DMC-1806, 1800, 1802, 1417).

Note

The PCI driver is compatible with GalilTools but is enhanced for gclib/GDK communications.

Download Installer

Recommended. All instructions and examples depend on the installation paths.

Download Zip

For custom deployment or non-default file locations. Downloads are available on the [release notes](#) page.

Required third-party DLLs

gclib is built using **MSVC 2017** and requires run-time components available in the [Microsoft Visual C++ Redistributable for Visual Studio 2017](#)

The gclib installer will automatically install these prerequisites for both 32 bit (x86) and 64 bit (x64) builds.

If using the zip installation, the binaries must be downloaded and installed manually.

Silent Installation

For developers wishing to bundle gclib within their own installers, execute the gclib installer with the /S switch to run silently with defaults. If the Galil security certificate is not already trusted on the deployment target, a digital signature dialog may be presented.

Uninstall

Run `uninstall.exe` in "C:\Program Files (x86)\Galil\gclib"

Alternatively, the *Add or remove programs* Control Panel can be used to remove all Galil software by product.

Upgrading and Older Versions

The release notes page lists all available versions of gclib. Galil recommends uninstalling any current version of gclib before installing other versions.

Installed Directories

The installation is organized into several directories.

dll

The *dll* directory contains the binary *dynamic link libraries* (DLLs) for x86 and/or x64 architectures. **Dynamically linked executables must have the correct dlls in their path at runtime.**

doc

The *doc* directory contains this documentation and a printable, pdf version.

examples

The *examples* directory contains example projects for various compilers. The *cpp* directory contains *x_examples.h* and the implementation of the example files documented in this manual.

Warning

Before using the examples, copy the files to a user location such as *C:\Users\user\Documents*. Failing to do so may cause source files to be deleted upon gclib uninstallation.

include

The *include* directory contains header files needed for compiling code. The compiler will need to know where these files are at compile time.

See the compiler-specific directions for more information, e.g. [mingw](#).

lib

The *lib* directory contains linker files (*gclib.lib* and *gclibo.lib*) for x86 and/or x64 architectures. The linker should include *gclib.lib* and *gclibo.lib*.

source

The *source* directory contains source files such as [gclibo.c](#).

3.2 Ubuntu Linux

Tested versions

See the [installation](#) page for supported versions.

Installation

Note

Adding the `package repository` is a prerequisite to continue.

Install

Install gclib and gcapsd (recommended)

```
# apt install gclib gcapsd
```

Uninstall

If gclib is to be removed from the system, the following commands may be used.

```
# apt remove gclib gcapsd
```

Upgrading

To upgrade gclib to the newest release, use the following command.

```
# apt install --only-upgrade gclib gcapsd
```

List All Versions

Galil keeps older versions of gclib and gcapsd available for users. To list all versions use the following command.

```
$ apt-cache madison gclib gcapsd
```

Installing Older Versions

Warning

When using gcaps, a compatible pairing of gcaps and gclib must be used. Galil maintains this compatibility with installations and upgrades. Installing GDK will also install compatible versions of gclib and gcaps. When installing older versions manually, it is the user's responsibility to ensure compatible versions.

Append the desired version's information after the package name.

```
# apt install gclib=<version> gcapsd=<version>
```

An Example

On the developer's machine, gclib is installed with the current version.

```
$ sudo apt install gclib gcapsd
```

After installation, the versions can be queried.

```
$ apt list --installed gclib gcapsd
Listing... Done
gcapsd/unknown,now 205-1 amd64 [installed]
gclib/unknown,now 517-1 amd64 [installed]
```

On the deployment machine, the precise versions can now be specified.

```
$ sudo apt install gclib=517-1 gcapsd=205-1
```

Serial Ports and USB

If access to the serial ports or USB (e.g. DMC-4103) is desired through gclib, the following will provide steps to join the correct access group. If using USB, be sure the controller is powered and the usb is plugged in before beginning.

Determine group with access

```
$ ls -l /dev/ttyUSB* /dev/ttyS*
crw-rw----. 1 root dialout  4, 64 Mar  3 16:39 /dev/ttyS0
crw-rw----. 1 root dialout  4, 65 Mar  3 16:39 /dev/ttyS1
crw-rw----. 1 root dialout  4, 66 Mar  3 16:39 /dev/ttyS2
crw-rw----. 1 root dialout  4, 67 Mar  3 16:39 /dev/ttyS3
crw-rw----. 1 root dialout 188,  0 Mar  6 11:08 /dev/ttyUSB0
```

In the above listing, **dialout** is the group that needs to be joined. **uucp** is another common group that may be listed.

Add the desired *username* to the group.

```
$ sudo gpasswd -a username dialout
[sudo] password for username:
Adding user username to group dialout
```

Log out and back in for change to take effect.

```
$ groups
username wheel dialout
```

gclib can now connect to serial and usb devices from user *username*.

PCI Controllers

If using a Galil PCI controller, the PCI driver must be installed.

Extract source and build driver

```
$ tar -xf /usr/share/doc/gclib/src/gclib_pci.tar.gz
$ make
```

Copy module and add to kernel

```
$ sudo cp galilpci.ko /lib/modules/$(uname -r)
$ sudo depmod
$ sudo modprobe galilpci
```

Add galil group for access to PCI

```
$ sudo groupadd -f -K GID_MIN=100 -K GID_MAX=499 galil
$ sudo cp 90-galilpci.rules /etc/udev/rules.d/
$ sudo udevadm control --reload-rules
$ sudo udevadm trigger
$ sudo usermod -a -G galil username #exchange "username" with actual user's name
```

Logout and back in. The PCI hardware is now available for access.

```
$ ls -l /dev/galil*
crw-rw---- 1 root galil 10, 56 Jun  9 11:07 /dev/galilpci0
$ echo -e "\x12\x16\r" > /dev/galilpci0
$ cat /dev/galilpci0
DMC1846 Rev 1.1a
:
```

Documentation

The documentation is left as a tarball to minimize disk usage. The latest release version of the user manual is available at the following link.

- <http://www.galil.com/sw/pub/all/doc/gclib/html/>

Offline html

The following allows viewing of the html docs from the installation.

```
$ tar -xzf /usr/share/doc/gclib/gclib_doc.tar.gz html
$ firefox html/index.html
```

3.3 Red Hat 8 & CentOS 8 Linux**Tested versions**

See the [installation](#) page for supported versions.

Installation

Note

Adding the `package repository` is a prerequisite to continue.

Install

Install gclib and gcapsd (recommended)

```
# dnf install gclib gcapsd
```

Approve *Installed size* and *Importing GPG key*, if prompted.

Uninstall

If gclib is to be removed from the system, the following commands may be used.

```
# dnf remove gclib gcapsd
```

Upgrading

To upgrade gclib to the newest release, use the following command.

```
# dnf upgrade gclib gcapsd
```

List All Versions

Galil keeps older versions of gclib and gcapsd available for users. To list all versions use the following command.

```
$ dnf list gclib gcapsd --showduplicates
```

Installing Older Versions

Warning

When using gcaps, a compatible pairing of gcaps and gclib must be used. Galil maintains this compatibility with installations and upgrades. Installing GDK will also install compatible versions of gclib and gcaps. When installing older versions manually, it is the user's responsibility to ensure compatible versions.

Append the desired version's information after the package name.

```
# dnf install gclib-<version> gcapsd-<version>
```

An Example

On the developer's machine, gclib is installed with the current version.

```
$ sudo dnf install gclib gcapsd
```

After installation, the versions can be queried.

```
$ dnf list gclib gcapsd --installed
Installed Packages
gcapsd.x86_64                194-1                @galil
gclib.x86_64                 506-1                @galil
```

On the deployment machine, the precise versions can now be specified.

```
$ sudo dnf install gclib-506-1 gcapsd-194-1
```

Serial Ports and USB

If access to the serial ports or USB (e.g. DMC-4103) is desired through gclib, the following will provide steps to join the correct access group. If using USB, be sure the controller is powered and the usb is plugged in before beginning.

Determine group with access

```
$ ls -l /dev/ttyUSB* /dev/ttyS*
crw-rw----. 1 root dialout  4, 64 Mar  3 16:39 /dev/ttyS0
crw-rw----. 1 root dialout  4, 65 Mar  3 16:39 /dev/ttyS1
crw-rw----. 1 root dialout  4, 66 Mar  3 16:39 /dev/ttyS2
crw-rw----. 1 root dialout  4, 67 Mar  3 16:39 /dev/ttyS3
crw-rw----. 1 root dialout 188,  0 Mar  6 11:08 /dev/ttyUSB0
```

In the above listing, **dialout** is the group that needs to be joined. **uucp** is another common group that may be listed.

Add the desired *username* to the group.

```
$ sudo gpasswd -a username dialout
[sudo] password for username:
Adding user username to group dialout
```

Log out and back in for change to take effect.

```
$ groups
username wheel dialout
```

gclib can now connect to serial and usb devices from user *username*.

PCI Controllers

If using a Galil PCI controller, the PCI driver must be installed.

Install prerequisites

```
# dnf update kernel
```

Reboot

```
# dnf install kernel-devel-$(uname -r)
# dnf install kernel-headers-$(uname -r)
# dnf install gcc
```

Extract source and build driver

```
$ tar -xf /usr/share/doc/gclib/src/gclib_pci.tar.gz
$ make
```

Copy module and add to kernel

```
# cp galilpci.ko /lib/modules/$(uname -r)
# depmod
# modprobe galilpci
```

Add galil group for access to PCI

```
# groupadd -f -K GID_MIN=100 -K GID_MAX=499 galil
# cp 90-galilpci.rules /etc/udev/rules.d/
# udevadm control --reload-rules
# udevadm trigger
# usermod -a -G galil username #exchange "username" with actual user's name
```

Logout and back in. The PCI hardware is now available for access.

```
$ ls -l /dev/galil*
crw-rw---- 1 root galil 10, 56 Jun  9 11:07 /dev/galilpci0
$ echo -e "\x12\x16\r" > /dev/galilpci0
$ cat /dev/galilpci0
DMC1846 Rev 1.1a
:
```

Documentation

The documentation is left as a tarball to minimize disk usage. The latest release version of the user manual is available at the following link.

- <http://www.galil.com/sw/pub/all/doc/gclib/html/>

Offline html

The following allows viewing of the html docs from the installation.

```
$ tar -xzf /usr/share/doc/gclib/gclib_doc.tar.gz html
$ firefox html/index.html
```

3.4 Red Hat 7 & CentOS 7 Linux

Tested versions

See the [installation](#) page for supported versions.

Installation

Note

Adding the [package repository](#) is a prerequisite to continue.

Install

Install gclib and gcapsd (recommended)

```
# yum install gclib gcapsd
```

Approve *Installed size* and *Importing GPG key*, if prompted.

Uninstall

If gclib is to be removed from the system, the following commands may be used.

```
# yum remove gclib gcapsd
```

Upgrading

To upgrade gclib to the newest release, use the following command.

```
# yum upgrade gclib gcapsd
```

List All Versions

Galil keeps older versions of gclib and gcapsd available for users. To list all versions use the following command.

```
$ yum list gclib gcapsd --showduplicates
```

Installing Older Versions

Warning

When using gcaps, a compatible pairing of gcaps and gclib must be used. Galil maintains this compatibility with installations and upgrades. Installing GDK will also install compatible versions of gclib and gcaps. When installing older versions manually, it is the user's responsibility to ensure compatible versions.

Append the desired version's information after the package name.

```
# yum install gclib-<version> gcapsd-<version>
```

An Example

On the developer's machine, gclib is installed with the current version.

```
# yum install gclib gcapsd
```

After installation, the versions can be queried.

```
$ yum list installed gclib gcapsd
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
* base: centos-distro.lgservers.com
* epel: sjc.edge.kernel.org
* extras: mirror.shastacoe.net
* updates: mirrors.oit.uci.edu
Installed Packages
gcapsd.x86_64                                194-1
gclib.x86_64                                506-1
```

@galil
@galil

On the deployment machine, the precise versions can now be specified.

```
# yum install gclib-506-1 gcapsd-194-1
```

If a newer version was previously installed, downgrade with the following.

```
# yum downgrade gclib-506-1 gcapsd-194-1
```

Serial Ports and USB

If access to the serial ports or USB (e.g. DMC-4103) is desired through gclib, the following will provide steps to join the correct access group. If using USB, be sure the controller is powered and the usb is plugged in before beginning.

Determine group with access

```
$ ls -l /dev/ttyUSB* /dev/ttyS*
crw-rw----. 1 root dialout  4, 64 Mar  3 16:39 /dev/ttyS0
crw-rw----. 1 root dialout  4, 65 Mar  3 16:39 /dev/ttyS1
crw-rw----. 1 root dialout  4, 66 Mar  3 16:39 /dev/ttyS2
crw-rw----. 1 root dialout  4, 67 Mar  3 16:39 /dev/ttyS3
crw-rw----. 1 root dialout 188,  0 Mar  6 11:08 /dev/ttyUSB0
```

In the above listing, **dialout** is the group that needs to be joined. **uucp** is another common group that may be listed.

Add the desired *username* to the group.

```
$ sudo gpasswd -a username dialout
[sudo] password for username:
Adding user username to group dialout
```

Log out and back in for change to take effect.

```
$ groups
username wheel dialout
```

gclib can now connect to serial and usb devices from user *username*.

PCI Controllers

If using a Galil PCI controller, the PCI driver must be installed.

Install prerequisites

```
# yum update kernel
```

Reboot

```
# yum install kernel-devel-$(uname -r)
# yum install kernel-headers-$(uname -r)
# yum install gcc
```

Extract source and build driver

```
$ tar -xf /usr/share/doc/gclib/src/gclib_pci.tar.gz
$ make
```

Copy module and add to kernel

```
# cp galilpci.ko /lib/modules/$(uname -r)
# depmod
# modprobe galilpci
```

Add galil group for access to PCI

```
# groupadd -f -K GID_MIN=100 -K GID_MAX=499 galil
# cp 90-galilpci.rules /etc/udev/rules.d/
# udevadm control --reload-rules
# udevadm trigger
# usermod -a -G galil username #exchange "username" with actual user's name
```

Logout and back in. The PCI hardware is now available for access.

```
$ ls -l /dev/galil*
crw-rw---- 1 root galil 10, 56 Jun  9 11:07 /dev/galilpci0
$ echo -e "\x12\x16\r" > /dev/galilpci0
$ cat /dev/galilpci0
DMC1846 Rev 1.1a
:
```

Documentation

The documentation is left as a tarball to minimize disk usage. The latest release version of the user manual is available at the following link.

- <http://www.galil.com/sw/pub/all/doc/gclib/html/>

Offline html

The following allows viewing of the html docs from the installation.

```
$ tar -xzf /usr/share/doc/gclib/gclib_doc.tar.gz html
$ firefox html/index.html
```

3.5 Red Hat 6 & CentOS 6 Linux

Tested versions

This version of Linux has **x64/AMD64 Support Only**. Contact Galil if another version is required for an application. See the [installation](#) page for supported versions.

Installation

On Red Hat, gclib is distributed in an RPM repository. The following steps can be performed to install gclib.

Download Galil's repository information

This step installs Galil's RPM repositories and only needs to be done once.

Point a browser at <http://www.galil.com/sw/pub/rhel/6/galilrpm-2-1.noarch.rpm> and install the rpm.

Install Package

Install gclib package, approve "Installed size" and "Importing GPG key", if prompted.

```
# yum install gclib
```


Uninstall Package

To uninstall gclib.

```
# yum remove gclib
```

Serial Ports and USB

If access to the serial ports or USB (e.g. DMC-4103) is desired through gclib, the following will provide steps to join the correct access group. If using USB, be sure the controller is powered and the usb is plugged in before beginning.

Determine group with access

```
$ ls -l /dev/ttyUSB* /dev/ttyS*
crw-rw----. 1 root dialout  4, 64 Mar  3 16:39 /dev/ttyS0
crw-rw----. 1 root dialout  4, 65 Mar  3 16:39 /dev/ttyS1
crw-rw----. 1 root dialout  4, 66 Mar  3 16:39 /dev/ttyS2
crw-rw----. 1 root dialout  4, 67 Mar  3 16:39 /dev/ttyS3
crw-rw----. 1 root dialout 188,  0 Mar  6 11:08 /dev/ttyUSB0
```

In the above listing, **dialout** is the group that needs to be joined. **uucp** is another common group that may be listed.

Add the desired *username* to the group.

```
$ sudo gpasswd -a username dialout
[sudo] password for username:
Adding user username to group dialout
```

Log out and back in for change to take effect.

```
$ groups
username wheel dialout
```

gclib can now connect to serial and usb devices from user *username*.

PCI Controllers

If using a Galil PCI controller, the PCI driver must be installed.

Install prerequisites

```
# yum update kernel
```

Reboot

```
# yum install kernel-devel-$(uname -r)
# yum install kernel-headers-$(uname -r)
# yum install gcc
```

Extract source and build driver

```
$ tar -xf /usr/share/doc/gclib/src/gclib_pci.tar.gz
$ make
```

Copy module and add to kernel

```
# cp galilpci.ko /lib/modules/$(uname -r)
# depmod
# modprobe galilpci
```

Add galil group for access to PCI

```
# groupadd -f -K GID_MIN=100 -K GID_MAX=499 galil
# cp 90-galilpci.rules /etc/udev/rules.d/
# udevadm control --reload-rules
# udevadm trigger
# usermod -a -G galil username #exchange "username" with actual user's name
```

Logout and back in. The PCI hardware is now available for access.

```
$ ls -l /dev/galil*
crw-rw---- 1 root galil 10, 56 Jun  9 11:07 /dev/galilpci0
$ echo -e "\x12\x16\r" > /dev/galilpci0
$ cat /dev/galilpci0
DMC1846 Rev 1.1a
:
```

Documentation

The documentation is left as a tarball to minimize disk usage. The latest release version of the user manual is available at the following link.

- <http://www.galil.com/sw/pub/all/doc/gclib/html/>

Offline html

The following allows viewing of the html docs from the installation.

```
$ tar -xzf /usr/share/doc/gclib/gclib_doc.tar.gz html
$ firefox html/index.html
```

3.6 Fedora Linux

Tested versions

See the [installation](#) page for supported versions.

Installation

Note

Adding the [package repository](#) is a prerequisite to continue.

Install

Install gclib and gcapsd (recommended)

```
# dnf install gclib gcapsd
```

Approve *Installed size* and *Importing GPG key*, if prompted.

Uninstall

If gclib is to be removed from the system, the following commands may be used.

```
# dnf remove gclib gcapsd
```

Upgrading

To upgrade gclib to the newest release, use the following command.

```
# dnf upgrade gclib gcapsd
```

List All Versions

Galil keeps older versions of gclib and gcapsd available for users. To list all versions use the following command.

```
$ dnf list gclib gcapsd --showduplicates
```

Installing Older Versions

Warning

When using gcaps, a compatible pairing of gcaps and gclib must be used. Galil maintains this compatibility with installations and upgrades. Installing GDK will also install compatible versions of gclib and gcaps. When installing older versions manually, it is the user's responsibility to ensure compatible versions.

Append the desired version's information after the package name.

```
# dnf install gclib-<version> gcapsd-<version>
```

An Example

On the developer's machine, gclib is installed with the current version.

```
$ sudo dnf install gclib gcapsd
```

After installation, the versions can be queried.

```
$ dnf list gclib gcapsd --installed
Installed Packages
gcapsd.x86_64                194-1                @galil-gcapsd
gclib.x86_64                 506-1                @galil-gclib
```

On the deployment machine, the precise versions can now be specified.

```
$ sudo dnf install gclib-506-1 gcapsd-194-1
```

Serial Ports and USB

If access to the serial ports or USB (e.g. DMC-4103) is desired through gclib, the following will provide steps to join the correct access group. If using USB, be sure the controller is powered and the usb is plugged in before beginning.

Determine group with access

```
$ ls -l /dev/ttyUSB* /dev/ttyS*
crw-rw----. 1 root dialout  4, 64 Mar  3 16:39 /dev/ttyS0
crw-rw----. 1 root dialout  4, 65 Mar  3 16:39 /dev/ttyS1
crw-rw----. 1 root dialout  4, 66 Mar  3 16:39 /dev/ttyS2
crw-rw----. 1 root dialout  4, 67 Mar  3 16:39 /dev/ttyS3
crw-rw----. 1 root dialout 188,  0 Mar  6 11:08 /dev/ttyUSB0
```

In the above listing, **dialout** is the group that needs to be joined. **uucp** is another common group that may be listed.

Add the desired *username* to the group.

```
$ sudo gpasswd -a username dialout
[sudo] password for username:
Adding user username to group dialout
```

Log out and back in for change to take effect.

```
$ groups
username wheel dialout
```

gclib can now connect to serial and usb devices from user *username*.

PCI Controllers

If using a Galil PCI controller, the PCI driver must be installed.

Install prerequisites

```
$ sudo dnf install kernel-devel-$(uname -r)
$ sudo dnf install kernel-headers-$(uname -r)
$ sudo dnf install gcc
```

Extract source and build driver

```
$ tar -xf /usr/share/doc/gclib/src/gclib_pci.tar.gz
$ make
```

Copy module and add to kernel

```
$ sudo cp galilpci.ko /lib/modules/$(uname -r)
$ sudo depmod
$ sudo modprobe galilpci
```

Add galil group for access to PCI

```
$ sudo groupadd -f -K GID_MIN=100 -K GID_MAX=499 galil
$ sudo cp 90-galilpci.rules /etc/udev/rules.d/
$ sudo udevadm control --reload-rules
$ sudo udevadm trigger
$ sudo usermod -a -G galil username #exchange "username" with actual user's name
```

Logout and back in. The PCI hardware is now available for access.

```
$ ls -l /dev/galil*
crw-rw---- 1 root galil 10, 56 Jun  9 11:07 /dev/galilpci0
$ echo -e "\x12\x16\r" > /dev/galilpci0
$ cat /dev/galilpci0
DMC1846 Rev 1.1a
:
```

Documentation

The documentation is left as a tarball to minimize disk usage. The latest release version of the user manual is available at the following link.

- <http://www.galil.com/sw/pub/all/doc/gclib/html/>

Offline html

The following allows viewing of the html docs from the installation.

```
$ tar -xzf /usr/share/doc/gclib/gclib_doc.tar.gz html
$ firefox html/index.html
```

3.7 Raspberry Pi

Tested versions

See the [installation](#) page for supported versions.

Installation

Note

Adding the [package repository](#) is a prerequisite to continue.

Install

Install gclib and gcapsd (recommended)

```
# apt install gclib gcapsd
```

Note

See the [Remote Server Example](#) to make your Galil controllers easily accessible to other computers on your network.

Uninstall

If gclib is to be removed from the system, the following commands may be used.

```
# apt remove gclib gcapsd
```

Upgrading

To upgrade gclib to the newest release, use the following command.

```
# apt install --only-upgrade gclib gcapsd
```

List All Versions

Galil keeps older versions of gclib and gcapsd available for users. To list all versions use the following command.

```
$ apt-cache madison gclib gcapsd
```

Installing Older Versions

Warning

When using gcaps, a compatible pairing of gcaps and gclib must be used. Galil maintains this compatibility with installations and upgrades. Installing GDK will also install compatible versions of gclib and gcaps. When installing older versions manually, it is the user's responsibility to ensure compatible versions.

Append the desired version's information after the package name.

```
# apt install gclib=<version> gcapsd=<version>
```

An Example

On the developer's machine, gclib is installed with the current version.

```
$ sudo apt install gclib gcapsd
```

After installation, the versions can be queried.

```
$ apt list --installed gclib gcapsd
Listing... Done
gcapsd/unknown,now 205-1 amd64 [installed]
gclib/unknown,now 517-1 amd64 [installed]
```

On the deployment machine, the precise versions can now be specified.

```
$ sudo apt install gclib=517-1 gcapsd=205-1
```

Serial Ports and USB

If access to the serial ports or USB (e.g. DMC-4103) is desired through gclib, the following will provide steps to join the correct access group. If using USB, be sure the controller is powered and the usb is plugged in before beginning.

Determine group with access

```
$ ls -l /dev/ttyUSB* /dev/ttyS*
crw-rw----. 1 root dialout  4, 64 Mar  3 16:39 /dev/ttyS0
crw-rw----. 1 root dialout  4, 65 Mar  3 16:39 /dev/ttyS1
crw-rw----. 1 root dialout  4, 66 Mar  3 16:39 /dev/ttyS2
crw-rw----. 1 root dialout  4, 67 Mar  3 16:39 /dev/ttyS3
crw-rw----. 1 root dialout 188,  0 Mar  6 11:08 /dev/ttyUSB0
```

In the above listing, **dialout** is the group that needs to be joined. **uucp** is another common group that may be listed.

Check the user's group

The default *pi* username is already a member of dialout.

```
$ groups
pi adm dialout cdrom sudo audio video plugdev games users input netdev gpio i2c spi
```

If needed, add the desired *username* to the group.

```
$ sudo gpasswd -a username dialout
[sudo] password for username:
Adding user username to group dialout
```

Log out and back in for change to take effect.

```
$ groups
username wheel dialout
```

gclib can now connect to serial and usb devices from user *username*.

Documentation

The documentation is left as a tarball to minimize disk usage. The latest release version of the user manual is available at the following link.

- <http://www.galil.com/sw/pub/all/doc/gclib/html/>

Offline html

The following allows viewing of the html docs from the installation, in the GUI mode.

```
$ tar -xzf /usr/share/doc/gclib/gclib_doc.tar.gz html
$ epiphany html/index.html
```

3.8 Apple OS X

Tested versions

See the [installation](#) page for supported versions.

Warning

The latest Apple support is for *OSX 10.10, Yosemite*. Please contact Galil if your application requires a current version of Apple software.

Installation

On OS X, gclib is distributed in a dmg image. The following steps can be performed to install gclib.

Download the gclib dmg

- Open the dmg file and drag the gclib directory to the Applications alias or another installation location.

Create Environment Variable (Optional)

- To provide maximum functionality, e.g. usage of the [Python](#) wrapper, add to the `DYLD_LIBRARY_PATH` by typing the following at a Terminal prompt.

```
$ echo "export DYLD_LIBRARY_PATH=/Applications/gclib/dylib/:\$DYLD_LIBRARY_PATH" >> ~/.profile
```

- Log Out and back in to set the environment variable.

Make links for usb devices

If using the DMC4103 or another Galil USB product, symbolic links may be created so `GAddresses()` can list the controllers.

Make a link from the Terminal.

```
user-mac:~ user$ #plug in DMC4103 usb cable
user-mac:~ user$ ls /dev/tty.usb*
/dev/tty.usbserial-A402L6KG
user-mac:~ user$ #make a symbolic link so gclib can list it
user-mac:~ user$ sudo ln -s /dev/tty.usbserial-A402L6KG /dev/tty.usbserial0
user-mac:~ user$ #gclib searches start at 0
user-mac:~ user$ #GAddresses() will now list this device
```

Demonstrating with Python.

```
user-mac:~ user$ python
Python 2.7.10 (default, Jul 14 2015, 19:46:27)
[GCC 4.2.1 Compatible Apple LLVM 6.0 (clang-600.0.39)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> import gclib
>>> g = gclib.py()
>>> g.GAddresses()
{'/dev/tty.usbserial0': ''}
>>> g.GOpen("/dev/tty.usbserial0 -d")
>>> print(g.GInfo())
/dev/tty.usbserial0, DMC4143 Rev 1.2b, 9998
>>> g.GClose()
>>> exit()
user-mac:~ user$
```

Installed files

- The gclib shared object files
 - /Applications/gclib/dylib/gclib.0.dylib
 - /Applications/gclib/dylib/gclibo.0.dylib
- The gclib header files
 - /Applications/gclib/include/gclib_errors.h
 - /Applications/gclib/include/gclibo.h
 - /Applications/gclib/include/gclib.h
 - /Applications/gclib/include/gclib_record.h
- gclib documentation tarball
 - /Applications/gclib/doc/gclib_doc.tar.gz
- Example source tarball
 - /Applications/gclib/examples/gclib_examples.tar.gz
- Source files to modify/rebuild libgclibo.so
 - /Applications/gclib/source/gclibo_229_src.tar.gz
- GalilTools Communication Library (gcl) wrapper
 - /Applications/gclib/source/gclib_gcl.tar.gz

Documentation

The documentation is left as a tarball to minimize disk usage. The latest release version of the user manual is available at the following link.

- <http://www.galil.com/sw/pub/all/doc/gclib/html/>

Offline pdf

The following allows viewing of the pdf docs from the installation.

- Browse in the Finder to Applications/gclib/doc.
- Double-click the tar.gz file to extract it.
- Open the resultant directory.
- Open the pdf.

Offline html

The following allows viewing of the html docs from the installation.

- Browse in the Finder to Applications/gclib/doc.
- Double-click the tar.gz file to extract it.
- Open the resultant directory.
- Open the html directory.
- Double-click index.html to open the help.

Chapter 4

Language Support

Below are a number of examples demonstrating how to use the library with various languages and on various platforms.

- [C/C++](#)
- [Python](#)
- [.Net](#)
- [Java](#)

Can't find what you need? Please email support@galil.com, or call [Galil Applications](#).

4.1 C/C++

- [Microsoft Visual Studio 2019 \(16.0\)](#)
- [Microsoft Visual Studio 2017 \(15.0\)](#)
- [Microsoft Visual Studio 2015 \(14.0\)](#)
- [Microsoft Visual Studio 2013 \(12.0\)](#)
- [MinGW](#)
- [Borland C++](#)
- [gcc \(Linux\)](#)
- [clang \(OS X\)](#)

4.1.1 Microsoft Visual Studio 2019 (16.0)

For brevity, these instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib**.

x_simple.c from *VS2019 x64 Native Tools Command Prompt*

Open *x64 Native Tools Command Prompt for VS 2019*.

Copy files

Navigate to a convenient, empty, writable location.

Set an environment variable for the base path.

```
>set base=C:\Program Files (x86)\Galil\gclib
```

Copy simple example

```
>copy "%base%\examples\cpp\x_simple.c" .
```

Edit [GOpen\(\)](#) call as necessary

In a text editor, open *x_simple.c*. Find the [GOpen\(\)](#) call and update the address to match the desired hardware. See the documentation for [GOpen\(\)](#) for address formatting options.

Compile

```
>cl x_simple.c "%base%\lib\dynamic\x64\*.lib" -I "%base%\include"
```

Set Path to DLL

```
>set PATH=%base%\dll\x64\;%PATH%
```

Execute

```
>x_simple.exe
version: 211.211.211 1.0.0.128
info: 192.168.0.42, DMCC640 Rev 1.0g, 9999
response: 3757802.0000
:
```

Using the pre-configured MSVC project (x_examples.cpp)

The directory *gclib\examples\msvc* has fully functional MSVC examples. These instructions detail how to use the 2019 version.

- Copy *gclib\examples\msvc\2019_16.0\gclib_example* to a convenient, writable location.
- Run *gclib_example\gclib_example\copy_source.bat* to copy the files.
- Open *gclib_example\gclib_example.sln* in Visual Studio 2019.
- In the *Solution Explorer*, expand the *gclib_example* and expand *Source Files* to show a listing of source.
- Open *x_examples.cpp*.
- Find the [GOpen\(\)](#) call and update the address to match the desired hardware. See the documentation for [GOpen\(\)](#) for address formatting options.
- Find the `#if 0` preprocessor block enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.
- Hit *F5* to build and run the example.

Create Project with MSVC 2019 (x_examples.cpp)

The instructions below allow building a project from scratch.

The following instructions were performed on *Visual Studio Professional 2019* and can be extended to other Visual Studio versions. For brevity, the instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib** and a build type of **x64**.

- Launch *Visual Studio 2019*.
- At the initial start window, Choose *Create a new project*.
- In the *Create a new project* window, choose *Empty Project* and click *Next*.
- Choose a Name, e.g. **gclib_example**.

- Choose a Location, e.g. `C:\Users\user\Desktop`.
- Uncheck *Place solution and project in the same directory*.
- Click *Create*.
- In the *Solution Explorer*, right-click on *Source Files* and choose *Add->Existing Item*.
 - Navigate to the gclib installation directory, then to `examples\cpp` in the installation directory.
 - In *File Name* type `x_*.cpp` and click *Add*, this will filter out the files needed
 - Select all files in the file chooser and click *Add*.
- In the *Solution Explorer* right-click on `gclib_example`, choose *Properties*.
 - Click the *Configuration Manager...* button.
 - * Under *Active solution platform*: choose `x64`.
 - * Click *Close*.
 - Highlight *Configuration Properties* in the side bar, and set the following project properties.
 - * At the top of the window, change *Configuration*: to *All Configurations* and ensure *Platform* lists *Active(x64)*.
 - * *Configuration Properties -> C/C++ -> General -> Additional Include Directories* add **`C:\Program Files (x86)\Galil\gclib\include`**
 - * *Configuration Properties -> Linker -> General -> Additional Library Directories* add **`C:\Program Files (x86)\Galil\gclib\lib\dynamic\x64`**
 - * *Configuration Properties -> Linker -> Input -> Additional Dependencies* add **`gclib.lib;gclibo.lib;{rest of text}`** where `{rest of text}` is the original string that was in the cell. Note the semicolons between library files.
 - * *Configuration Properties -> Debugging -> Environment* add **`PATH=C:\Program Files (x86)\Galil\gclib\dll\x64;%PATH%`**
 - * Click *OK*.
- In the *Solution Explorer* open `x_examples.cpp`. Find the `GOpen()` call and update the address to match the desired hardware. See the documentation for `GOpen()` for address formatting options.
- Find the `#if 0` preprocessor blocks enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.
- Hit *F5* to build and run the example.

4.1.2 Microsoft Visual Studio 2017 (15.0)

For brevity, these instructions assume the default installation location of **`C:\Program Files (x86)\Galil\gclib`**.

`x_simple.c` from VS2017 x64 Native Tools Command Prompt

Open *x64 Native Tools Command Prompt for VS 2017*.

Copy files

Navigate to a convenient, empty, writable location.

Set an environment variable for the base path.

```
>set base=C:\Program Files (x86)\Galil\gclib
```

Copy simple example

```
>copy "%base%\examples\cpp\x_simple.c" .
```

Edit `GOpen()` call as necessary

In a text editor, open `x_simple.c`. Find the `GOpen()` call and update the address to match the desired hardware. See the documentation for `GOpen()` for address formatting options.

Compile

```
>cl x_simple.c "%base%\lib\dynamic\x64\*.lib" -I "%base%\include"
```

Set Path to DLL

```
>set PATH=%base%\dll\x64\;%PATH%
```

Execute

```
>x_simple.exe
version: 211.211.211 1.0.0.128
info: 192.168.0.42, DMCC640 Rev 1.0g, 9999
response: 3757802.0000
:
```

Using the pre-configured MSVC project (`x_examples.cpp`)

The directory `gclib\examples\msvc` has fully functional MSVC examples. These instructions detail how to use the 2017 version.

- Copy `gclib\examples\msvc\2017_15.0\gclib_example` to a convenient, writable location.
- Run `gclib_example\gclib_example\copy_source.bat` to copy the files.
- Open `gclib_example\gclib_example.sln` in Visual Studio 2017.
- In the *Solution Explorer*, expand the `gclib_example` and expand *Source Files* to show a listing of source.
- Open `x_examples.cpp`.
- Find the `GOpen()` call and update the address to match the desired hardware. See the documentation for `GOpen()` for address formatting options.
- Find the `#if 0` preprocessor block enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.
- Hit *F5* to build and run the example.

Create Project with MSVC 2017 (`x_examples.cpp`)

The instructions below allow building a project from scratch.

The following instructions were performed on *Visual Studio Professional 2017* and can be extended to other Visual Studio versions. For brevity, the instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib** and a build type of **x64**.

- Launch *Visual Studio 2017*.
- Choose *File->New->Project*.
- In the *New Project* dialog, choose *Visual C++->Empty Project*.
- Choose a Name, e.g. **gclib_example**.
- Choose a Location, e.g. `C:\Users\user\Desktop`.
- Check *Create directory for solution*.

- Click *OK*.
- In the *Solution Explorer*, right-click on *Source Files* and choose *Add->Existing Item*.
 - Navigate to the *gclib* installation directory, then to *examples\cpp* in the installation directory.
 - In *File Name* type **x_*.cpp** and click *Add*, this will filter out the files needed
 - Select all files in the file chooser and click *Add*.
- In the *Solution Explorer* right-click on *gclib_example*, choose *Properties*.
 - Click the *Configuration Manager...* button.
 - * Under *Active solution platform*: choose *x64*.
 - * Click *Close*.
 - Highlight *Configuration Properties* in the side bar, and set the following project properties.
 - * At the top of the window, change *Configuration:* to *All Configurations* and ensure *Platform* lists *Active(x64)*.
 - * *Configuration Properties -> C/C++ -> General -> Additional Include Directories* add **C:\Program Files (x86)\Galil\gclib\include**
 - * *Configuration Properties -> Linker -> General -> Additional Library Directories* add **C:\Program Files (x86)\Galil\gclib\lib\dynamic\x64**
 - * *Configuration Properties -> C/C++ -> Code Generation -> Spectre Mitigation* set to **Disabled**. If your application will cross trust boundaries, consider Spectre and Meltdown vulnerabilities before deploying.
 - * *Configuration Properties -> Linker -> Input -> Additional Dependencies* add **gclib.lib;gclibo.lib;{rest of text}** where {rest of text} is the original string that was in the cell. Note the semicolons between library files.
 - * *Configuration Properties -> Debugging -> Environment* add **PATH=C:\Program Files (x86)\Galil\gclib\dll\x64;%PATH%**
 - * Click *OK*.
- In the *Solution Explorer* open *x_examples.cpp*. Find the *GOpen()* call and update the address to match the desired hardware. See the documentation for *GOpen()* for address formatting options.
- Find the `#if 0` preprocessor blocks enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.
- Hit *F5* to build and run the example.

4.1.3 Microsoft Visual Studio 2015 (14.0)

For brevity, these instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib**.

x_simple.c from VS2015 x64 Native Tools Command Prompt

Open *VS2015 x64 Native Tools Command Prompt*.

Copy files

Navigate to a convenient, empty, writable location.

Set an environment variable for the base path.

```
>set base=C:\Program Files (x86)\Galil\gclib
```

Copy simple example

```
>copy "%base%\examples\cpp\x_simple.c" .
```

Edit `GOpen()` call as necessary

In a text editor, open `x_simple.c`. Find the `GOpen()` call and update the address to match the desired hardware. See the documentation for `GOpen()` for address formatting options.

Compile

```
>cl x_simple.c "%base%\lib\dynamic\x64\*.lib" -I "%base%\include"
```

Set Path to DLL

```
>set PATH=%base%\dll\x64\;%PATH%
```

Execute

```
>x_simple.exe
version: 211.211.211 1.0.0.128
info: 192.168.0.42, DMCC640 Rev 1.0g, 9999
response: 3757802.0000
:
```

Using the pre-configured MSVC project (`x_examples.cpp`)

The directory `gclib\examples\msvc` has fully functional MSVC examples. These instructions detail how to use the 2015 version.

- Copy `gclib\examples\msvc\2015_14.0\gclib_example` to a convenient, writable location.
- Run `gclib_example\gclib_example\copy_source.bat` to copy the files.
- Open `gclib_example\gclib_example.sln` in Visual Studio 2015.
- In the *Solution Explorer*, expand the `gclib_example` and expand *Source Files* to show a listing of source.
- Open `x_examples.cpp`.
- Find the `GOpen()` call and update the address to match the desired hardware. See the documentation for `GOpen()` for address formatting options.
- Find the `#if 0` preprocessor block enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.
- Hit *F5* to build and run the example.

Create Project with MSVC 2015 (`x_examples.cpp`)

The instructions below allow building a project from scratch.

The following instructions were performed on *Visual Studio Professional 2015* and can be extended to other Visual Studio versions. For brevity, the instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib** and a build type of **x64**.

- Launch *Visual Studio 2015*.
- Choose *File->New->Project*.
- In the *New Project* dialog, choose *Visual C++->Empty Project*.
- Choose a Name, e.g. **gclib_example**.
- Choose a Location, e.g. `C:\Users\user\Desktop`.
- Check *Create directory for solution*.

- Click *OK*.
- In the *Solution Explorer*, right-click on *Source Files* and choose *Add->Existing Item*.
 - Navigate to the *gclib* installation directory, then to *examples\cpp* in the installation directory.
 - In *File Name* type **x_*.cpp** and click *Add*, this will filter out the files needed
 - Select all files in the file chooser and click *Add*.
- In the *Solution Explorer* right-click on *gclib_example*, choose *Properties*.
 - Click the *Configuration Manager...* button.
 - * Under *Active solution platform*: choose *x64*.
 - * Click *Close*.
 - Highlight *Configuration Properties* in the side bar, and set the following project properties.
 - * At the top of the window, change *Configuration:* to *All Configurations* and ensure *Platform* lists *Active(x64)*.
 - * *Configuration Properties -> C/C++ -> Additional Include Directories* add **C:\Program Files (x86)\Galil\gclib\include**
 - * *Configuration Properties -> Linker -> General -> Additional Library Directories* add **C:\Program Files (x86)\Galil\gclib\lib\dynamic\x64**
 - * *Configuration Properties -> Linker -> Input -> Additional Dependencies* add **gclib.lib;gclibo.lib;{rest of text}** where {rest of text} is the original string that was in the cell. Note the semicolons between library files.
 - * *Configuration Properties -> Debugging -> Environment* add **PATH=C:\Program Files (x86)\Galil\gclib\dll\x64;%PATH%**
 - * Click *OK*.
- In the *Solution Explorer* open *x_examples.cpp*. Find the [GOpen\(\)](#) call and update the address to match the desired hardware. See the documentation for [GOpen\(\)](#) for address formatting options.
- Find the `#if 0` preprocessor blocks enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.
- Hit *F5* to build and run the example.

4.1.4 Microsoft Visual Studio 2013 (12.0)

For brevity, these instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib**.

x_simple.c from VS2013 x64 Native Tools Command Prompt

Open *VS2013 x64 Native Tools Command Prompt*.

Copy files

Navigate to a convenient, empty, writable location, e.g. *C:\temp*.

Set an environment variable for the base path.

```
C:\temp>set base=C:\Program Files (x86)\Galil\gclib
```

Copy simple example

```
C:\temp>copy "%base%\examples\cpp\x_simple.c" .
```

Edit `GOpen()` call as necessary

In a text editor, open `x_simple.c`. Find the `GOpen()` call and update the address to match the desired hardware. See the documentation for `GOpen()` for address formatting options.

Compile

```
C:\temp>cl x_simple.c "%base%\lib\dynamic\x64\*.lib" -I "%base%\include"
```

Set Path to DLL

```
C:\temp>set PATH=%base%\dll\x64\;%PATH%
```

Execute

```
C:\temp>x_simple.exe
rc: 0
version: 85.60.138
rc: 0
rc: 0
info: 10.1.3.17, DMC4020 Rev 1.2b, 291
rc: 0
response: 357247808.0000
:
```

Using the pre-configured MSVC project (`x_examples.cpp`)

The directory `gclib\examples\msvc` has fully functional MSVC examples. These instructions detail how to use the 2013 version.

- Copy `gclib\examples\msvc\2013_12.0\gclib_example` to a convenient, writable location, e.g. `C:\temp`.
- Run `gclib_example\gclib_example\copy_source.bat` to copy the files.
- Open `gclib_example\gclib_example.sln` in Visual Studio 2013.
- In the *Solution Explorer*, expand the `gclib_example` and expand *Source Files* to show a listing of source.
- Open `x_examples.cpp`
- Find the `GOpen()` call and update the address to match the desired hardware. See the documentation for `GOpen()` for address formatting options.
- Find the `#if 0` preprocessor block enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.
- Hit *F5* to build and run the example.

Create Project with MSVC 2013 (`x_examples.cpp`)

The instructions below allow building a project from scratch.

The following instructions were performed on *Visual Studio Professional 2013* and can be extended to other Visual Studio versions. For brevity, the instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib** and a build type of **x86 (win32)**.

- Launch *Visual Studio 2013*
- Choose *File->New->Project*
- In the *New Project* dialog, choose *Visual C++->Empty Project*
- Choose a Name, e.g. **gclib_example**

- Choose a Location, e.g. `C:\Users\user\Desktop`
- Check *Create directory for solution*
- Click *OK*
- In the *Solution Explorer*, right-click on *Source Files* and choose *Add->Existing Item*
 - Navigate to the `gclib` installation directory, then to `examples\cpp` in the installation directory
 - In *File Name* type `x_*.cpp` and click *Add*, this will filter out the files needed
 - Select all files in the file chooser and click *Add*
- In the *Solution Explorer* right-click on `gclib_example`, choose *Properties*, highlight *Configuration Properties*, and set the following project properties
 - At the top of the window, change *Configuration:* to *All Configurations* and ensure *Platform* lists *Active* (← *Win32*)
 - *Configuration Properties -> C/C++ -> Additional Include Directories* add **`C:\Program Files (x86)\Galil\gclib\include`**
 - *Configuration Properties -> Linker -> General -> Additional Library Directories* add **`C:\Program Files (x86)\Galil\gclib\lib\dynamic\x86`**
 - *Configuration Properties -> Linker -> Input -> Additional Dependencies* add **`gclib.lib;gclibo.← lib;{rest of text}`** where `{rest of text}` is the original string that was in the cell. Note the semicolons between library files.
 - *Configuration Properties -> Debugging -> Environment* add **`PATH=C:\Program Files (x86)\Galil\gclib\dll\x86;%PATH%`**
- In the *Solution Explorer* open `x_examples.cpp`. Find the `GOpen()` call and update the address to match the desired hardware. See the documentation for `GOpen()` for address formatting options.
- Find the `#if 0` preprocessor block enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.
- Hit *F5* to build and run the example.

4.1.5 MinGW

The following instructions were performed with x86 Minimalist GNU for Windows (MinGW) installed from <http://mingw-w64.sourceforge.net/download.php#mingw-builds>. For brevity, these instructions assume the default installation location of "C:\Program Files (x86)\Galil\gclib".

Copy Files

Copy "gclib\examples\mingw" to a convenient, writable location, e.g. "C:\temp". Run `C:\temp\mingw\copy← _source.bat` to copy all files.

x_simple.c

Edit `GOpen()` call as necessary

In a text editor, open `x_simple.c`. Find the `GOpen()` call and update the address to match the desired hardware. See the documentation for `GOpen()` for address formatting options.

Compile

- Launch the MinGW terminal, e.g. *Start -> All Programs -> MinGW-W64 project -> i686-4.9.1-posix-dwarf-rt_v3-rev3 -> Run Terminal*.
- Navigate to the directory with the files above.
- Compile the code.

```
C:\temp\mingw>gcc x_simple.c -L. -lgclibo -lgclib -o simple.exe
```

Execute

```
C:\temp\mingw>simple.exe
rc: 0
version: 85.60.138
rc: 0
rc: 0
info: 10.1.3.17, DMC4020 Rev 1.2b, 291
rc: 0
response: 1584328.0000
:
```

x_examples.cpp

Review and Modify source

- In a text editor, open *x_examples.cpp*. Find the [GOpen\(\)](#) call and update the address to match the desired hardware. See the documentation for [GOpen\(\)](#) for address formatting options.
- Find the `#if 0` preprocessor block enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.

Compile

- Launch the MinGW terminal, e.g. *Start -> All Programs -> MinGW-W64 project -> i686-4.9.1-posix-dwarf-rt_v3-rev3 -> Run Terminal*.
- Navigate to the directory with the files above.
- Compile the code.

```
C:\temp\mingw>g++ *.cpp -L. -lgclibo -lgclib -o examples.exe
```

Execute

```
C:\temp\mingw>examples.exe
Library version: 41.35.34
```

```
192.168.0.43, DMC4020 Rev 1.2b, 291
```

```
*****
Example GRead() and GWrite() usage
*****
```

```
Read 155 QR bytes.
```

```
*****
Example GCommand() usage
*****
Revision report, ^R^V
DMC4020 Rev 1.2b
:
```

```
Command Values
```

```
val is 10
val is 11
val is 3.1415
val is 9.869
```

```
Command Trimming
> 95653016.0000
:<
> 95653016.0000<
>95653016.0000<
```

```
Receiving Binary Data
QR read 155 bytes
```

```
Error handling
QD correctly trapped, not allowed, try GArrayDownload()
DL correctly trapped, not allowed, try GProgramDownload()
```

```
Modifying timeout
Burning program...OK
```

```
*****
Example GProgramDownload() and GProgramUpload() usage
*****
GProgramDownload() correctly errored. Can't fit with level 3 compression
Program Downloaded with compression level 4
Uploading program:
#A;i=0;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i
i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;EN
```

```
Program executed as expected
*****
Example GArrayDownload() and GArrayUpload() usage
*****
2.0000, 4.0000, 6.0000, 8.0000, 10.0000, 12.0000, 14.0000, 16.0000, 18.000
0000

2.0000, 1.0000, 3.0000, 5.0000, 10.0000, 12.0000, 14.0000, 16.0000, 18.000
0000

3.0000, 5.0000, 10.0000
```

```
*****
Example GRecord() usage
*****
```

```
QR-based data record
38564
393216000
```

```
DR-based data record
38670
38772
38874
38976
39078
39180
39282
39384
39486
39588
39690
```

```
QR-based data record with offsets
39692
39692
```

```
*****
Example GMessage() usage
*****
0.0000
1.0000
2.0000
```

```

3.0000
4.0000
5.0000
6.0000
7.0000
8.0000
9.0000

*****
Example GInterrupt() usage
*****
"UI 8" executed.

*****
Example GMotionComplete() usage
*****

Position: 0, 0
Beginning independent motion... Motion Complete on A
Position: 8000, 0

Position: 0, 0
Beginning vector motion... Motion Complete on vector plane S
Position: 6000, 0

examples.cpp executed OK
main() is finished. Press Enter to exit:

```

4.1.6 Borland C++

The following instructions were performed on:

Embarcadero C++ 7.10 for Win32 Copyright (c) 1993-2015 Embarcadero Technologies, Inc.

For brevity, these instructions assume the default installation location of "C:\Program Files (x86)\Galil\gclib".

Copy Files

Copy "gclib\examples\borland" to a convenient, writable location, e.g. "C:\temp". Run C:\temp\borland\copy←_source.bat to copy all files.

```

C:\temp>cd borland

C:\temp\borland>copy_source.bat
\Program Files (x86)\Galil\gclib\examples\cpp\x_arrays.cpp
\Program Files (x86)\Galil\gclib\examples\cpp\x_examples.cpp
\Program Files (x86)\Galil\gclib\examples\cpp\x_examples.h
\Program Files (x86)\Galil\gclib\examples\cpp\x_gcommand.cpp
\Program Files (x86)\Galil\gclib\examples\cpp\x_ginterrupt.cpp
\Program Files (x86)\Galil\gclib\examples\cpp\x_gmessage.cpp
\Program Files (x86)\Galil\gclib\examples\cpp\x_gmotioncomplete.cpp
\Program Files (x86)\Galil\gclib\examples\cpp\x_gread_gwrite.cpp
\Program Files (x86)\Galil\gclib\examples\cpp\x_grecord.cpp
\Program Files (x86)\Galil\gclib\examples\cpp\x_nonblocking.cpp
\Program Files (x86)\Galil\gclib\examples\cpp\x_programs.cpp
\Program Files (x86)\Galil\gclib\examples\cpp\x_simple.c
    12 file(s) copied.
\Program Files (x86)\Galil\gclib\include\gclib.h
\Program Files (x86)\Galil\gclib\include\gclibo.h
\Program Files (x86)\Galil\gclib\include\gclib_errors.h
\Program Files (x86)\Galil\gclib\include\gclib_record.h
    4 file(s) copied.
\Program Files (x86)\Galil\gclib\lib\dynamic\x86\gclib.lib
\Program Files (x86)\Galil\gclib\lib\dynamic\x86\gclibo.lib
    2 file(s) copied.
\Program Files (x86)\Galil\gclib\dll\x86\gclib.dll
\Program Files (x86)\Galil\gclib\dll\x86\gclibo.dll
    2 file(s) copied.

C:\temp\borland>

```

Modify Path

- Add Borland's compiler to the PATH variable.

```
C:\temp\borland>set PATH=c:\Program Files (x86)\Embarcadero\Studio\17.0\bin;%PATH%
```

Convert lib files

```
C:\temp\borland>move gclib.lib _gclib.lib
1 file(s) moved.
```

```
C:\temp\borland>move gclibo.lib _gclibo.lib
1 file(s) moved.
```

```
C:\temp\borland>coff2omf.exe _gclib.lib gclib.lib
COFF to OMF Converter Version 1.2.0 Copyright (c) 1999-2009 Embarcadero Technologies, Inc.
All rights reserved.
```

```
C:\temp\borland>coff2omf.exe _gclibo.lib gclibo.lib
COFF to OMF Converter Version 1.2.0 Copyright (c) 1999-2009 Embarcadero Technologies, Inc.
All rights reserved.
```

x_simple.c

Edit [GOpen\(\)](#) call as necessary

In a text editor, open *x_simple.c*. Find the [GOpen\(\)](#) call and update the address to match the desired hardware. See the documentation for [GOpen\(\)](#) for address formatting options.

Compile

```
C:\temp\borland>bcc32 gclib.lib gclibo.lib x_simple.c
Embarcadero C++ 7.10 for Win32 Copyright (c) 1993-2015 Embarcadero Technologies, Inc.
x_simple.c:
Turbo Incremental Link 6.72 Copyright (c) 1997-2015 Embarcadero Technologies, Inc.
```

Execute

```
C:\temp\borland>x_simple.exe
version: 130.115.279
info: 192.168.0.43, DMC4143 Rev 1.2b, 9998
response: 61016.0000
:
```

x_examples.cpp

Review and Modify source

- In a text editor, open *x_examples.cpp*. Find the [GOpen\(\)](#) call and update the address to match the desired hardware. See the documentation for [GOpen\(\)](#) for address formatting options.
- Find the `#if 0` preprocessor block enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.

Compile

```
C:\temp\borland>bcc32 -c *.cpp
```

Link

```
C:\temp\borland>bcc32 -o examples.exe *.obj gclib.lib gclibo.lib
```

Execute

```
C:\temp\borland>examples.exe
Library version: 130.115.279
```

```
192.168.0.43, DMC4020 Rev 1.2b, 291
```

```
*****
Example GRead() and GWrite() usage
*****
```

```
Read 155 QR bytes.
```

```
*****
Example GCommand() usage
*****
```

```
Revision report, ^R^V
DMC4020 Rev 1.2b
:
```

```
Command Values
```

```
val is 10
val is 11
val is 3.1415
val is 9.869
```

```
Command Trimming
```

```
> 95653016.0000
:<
> 95653016.0000<
>95653016.0000<
```

```
Receiving Binary Data
```

```
QR read 155 bytes
```

```
Error handling
```

```
QD correctly trapped, not allowed, try GArrayDownload()
DL correctly trapped, not allowed, try GProgramDownload()
```

```
Modifying timeout
```

```
Burning program...OK
```

```
*****
Example GProgramDownload() and GProgramUpload() usage
*****
```

```
GProgramDownload() correctly errored. Can't fit with level 3 compression
Program Downloaded with compression level 4
```

```
Uploading program:
```

```
#A;i=0;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i
i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;EN
```

```
Program executed as expected
```

```
*****
Example GArrayDownload() and GArrayUpload() usage
*****
```

```
2.0000, 4.0000, 6.0000, 8.0000, 10.0000, 12.0000, 14.0000, 16.0000, 18.000
0000
```

```
2.0000, 1.0000, 3.0000, 5.0000, 10.0000, 12.0000, 14.0000, 16.0000, 18.000
0000
```

```
3.0000, 5.0000, 10.0000
```

```
*****
Example GRecord() usage
*****
```

```
QR-based data record
```

```
38564
393216000
```

```
DR-based data record
```

```
38670
```

```

38772
38874
38976
39078
39180
39282
39384
39486
39588
39690

```

```

QR-based data record with offsets
39692
39692

```

```

*****
Example GMessage() usage
*****
0.0000
1.0000
2.0000
3.0000
4.0000
5.0000
6.0000
7.0000
8.0000
9.0000

```

```

*****
Example GInterrupt() usage
*****
"UI 8" executed.

```

```

*****
Example GMotionComplete() usage
*****

Position: 0, 0
Beginning independent motion... Motion Complete on A
Position: 8000, 0

Position: 0, 0
Beginning vector motion... Motion Complete on vector plane S
Position: 6000, 0

```

```

examples.cpp executed OK
main() is finished. Press Enter to exit:

```

4.1.7 gcc (Linux)

The following instructions were performed on

```

$ uname -a
Linux localhost.localdomain 3.17.4-301.fc21.x86_64 #1 SMP Thu Nov 27 19:09:10 UTC 2014 x86_64 x86_64 x86_64 GNU/Linux
$ g++ --version
g++ (GCC) 4.9.2 20150212 (Red Hat 4.9.2-6)

```

Copy Files

```

$ mkdir test
$ cd test
$ tar -xzf /usr/share/doc/gclib/src/gclib_examples.tar.gz
$ ls
x_arrays.cpp      x_gcommand.cpp    x_gmotioncomplete.cpp  x_programs.cpp
x_examples.cpp    x_ginterrupt.cpp  x_gread_gwrite.cpp     x_simple.c
x_examples.h      x_gmessage.cpp    x_grecord.cpp

```

x_simple.c

- In a text editor, open *x_simple.c*. Find the [GOpen\(\)](#) call and update the address to match the desired hardware. See the documentation for [GOpen\(\)](#) for address formatting options.

Compile

```
$ gcc -Wall -Werror x_simple.c -lgclib -lgclibo -o simple
```

Run

```
$ ./simple
rc: 0
version: 85.60.131
rc: 0
rc: 0
info: 10.1.3.17, DMC4020 Rev 1.2b, 291
rc: 0
response: 179340166.0000
:
```

x_examples.cpp

- In a text editor, open *x_examples.cpp*. Find the [GOpen\(\)](#) call and update the address to match the desired hardware. See the documentation for [GOpen\(\)](#) for address formatting options. Don't forget `-s ALL` if data records, interrupts, and messages are to be tested.
- Find the `#if 0` preprocessor block enclosing the example calls. Change to `#if 1` to run the examples. Comment out the function calls to be avoided. Note some calls attempt to move motors and not all functions are compatible with all Galil products.

Compile

```
$ g++ x_*.cpp -lgclib -lgclibo -o example
```

Run

```
$/example Library version: 85.60.131
10.1.3.17, DMC4020 Rev 1.2b, 291
Example GRead\(\) and GWrite\(\) usage
Read 155 QR bytes.
Example GCommand\(\) usage
Revision report, ^R^V DMC4020 Rev 1.2b :
Command Values val is 10 val is 11 val is 3.1415 val is 9.869
Command Trimming > 179798738.0000 :< > 179798738.0000< > 179798738.0000<
Receiving Binary Data QR read 155 bytes
Error handling QD correctly trapped, not allowed, try GArrayDownload\(\) DL correctly trapped, not allowed, try
GProgramDownload\(\)
Modifying timeout Burning program...OK
Example GProgramDownload\(\) and GProgramUpload\(\) usage
GProgramDownload\(\) correctly errored. Can't fit with level 3 compression Program Downloaded with com-
pression level 4 Uploading program: #A;i=0;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1
i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;EN
Program executed as expected
Example GArrayDownload\(\), GArrayUploadFile\(\), GArrayDownloadFile\(\), and GArrayUpload usage
2.0000, 4.0000, 6.0000, 8.0000, 10.0000, 12.0000, 14.0000, 16.0000, 18.0000, 20.0000
2.0000, 1.0000, 3.0000, 5.0000, 10.0000, 12.0000, 14.0000, 16.0000, 18.0000, 20.0000
3.0000, 5.0000, 10.0000 2.0000, 1.0000, 3.0000, 5.0000, 10.0000, 12.0000, 14.0000, 16.0000, 18.0000, 20.0000
Example GRecord\(\) usage
QR-based data record 36100 6000
DR-based data record 36204 36306 36408 36510 36612 36714 36816 36918 37020 37122 37224
QR-based data record with offsets 37224 37224
Example GMessage\(\) usage
```


0.0000 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000

Example [GInterrupt\(\)](#) usage

"UI 8" executed.

Example [GMotionComplete\(\)](#) usage

Position: 0, 0 Beginning independent motion... Motion Complete on A Position: 8000, 0

Position: 0, 0 Beginning vector motion... Motion Complete on vector plane S Position: 6000, 0

examples.cpp executed OK [main\(\)](#) is finished. Press Enter to exit:

4.1.8 clang (OS X)

The following instructions were performed on

```
$ sw_vers
ProductName:  Mac OS X
ProductVersion: 10.10.5
BuildVersion: 14F27
$ gcc --version
Configured with: --prefix=/Library/Developer/CommandLineTools/usr --with-gxx-include-dir=/usr/include/c++/4.2.1
Apple LLVM version 6.1.0 (clang-602.0.53) (based on LLVM 3.6.0svn)
Target: x86_64-apple-darwin14.5.0
Thread model: posix
```

Copy Files

```
$ cd ~
$ mkdir test
$ cd test
$ tar -xzf /Applications/gclib/examples/gclib_examples.tar.gz
$ cp /Applications/gclib/include/* .
$ cp /Applications/gclib/dylib/* .
$ ls
gclib.0.dylib  x_arrays.cpp      x_gmotioncomplete.cpp
gclib.h        x_examples.cpp    x_gread_gwrite.cpp
gclib_errors.h x_examples.h      x_grecord.cpp
gclib_record.h x_gcommand.cpp    x_nonblocking.cpp
gclibo.0.dylib x_ginterrupt.cpp  x_programs.cpp
gclibo.h       x_gmessage.cpp    x_simple.c
```

x_simple.c

- In a text editor, open *x_simple.c*. Find the [GOpen\(\)](#) call and update the address to match the desired hardware. See the documentation for [GOpen\(\)](#) for address formatting options.

Compile

```
$ gcc -Wall -Werror x_simple.c gclib.0.dylib gclibo.0.dylib -o simple
```

Run

```
$ ./simple
rc: 0
version: 126.108.229
rc: 0
rc: 0
info: 10.1.3.142, DMC4020 Rev 1.2a-BH, 291
rc: 0
response: 206676.0000
:
```

x_examples.cpp

- In a text editor, open *x_examples.cpp*. Find the [GOpen\(\)](#) call and update the address to match the desired hardware. See the documentation for [GOpen\(\)](#) for address formatting options. Don't forget `-s ALL` if data


```
3.0000, 5.0000, 10.0000
2.0000, 1.0000, 3.0000, 5.0000, 10.0000, 12.0000, 14.0000, 16.0000, 18.0000, 20.0000
```

```
*****
Example GRecord() usage
*****
```

```
QR-based data record
18358
0
```

```
DR-based data record
18462
18564
18666
18768
18870
18972
19074
19176
19278
19380
19482
```

```
QR-based data record with offsets
19482
19482
```

```
*****
Example GMessage() usage
*****
```

```
0.0000
1.0000
2.0000
3.0000
4.0000
5.0000
6.0000
7.0000
8.0000
9.0000
```

```
*****
Example GInterrupt() usage
*****
"UI 8" executed.
```

```
*****
Example GMotionComplete() usage
*****
```

```
Position: 0, 0
Beginning independent motion... Motion Complete on A
Position: 8000, 0
```

```
Position: 0, 0
Beginning vector motion... Motion Complete on vector plane S
Position: 6000, 0
```

```
*****
Example GMessage non-blocking usage
*****
422902.0000
```

```
*****
Example GInterrupt non-blocking usage
*****
F1
```

```
*****
```

Example GRecord non-blocking usage

```
*****
33786
```

```
examples.cpp executed OK
main() is finished. Press Enter to exit:
```

4.2 Python

Install gclib

The gclib Python wrapper assumes the default gclib [installation](#) location.

Install Python

- See <https://www.python.org/> if Python is not already installed on the system. The gclib Python wrapper supports Python versions 2 and 3.
- On Windows, choose to add Python to the environment variable during installation. This allows Python to be invoked from the command line.

Install the gclib Python module

Windows

- Type the following commands into a command prompt.

```
>cd %temp%
>mkdir py
>cd py
>copy "c:\Program Files (x86)\Galil\gclib\source\wrappers\python\*" .
c:\Program Files (x86)\Galil\gclib\source\wrappers\python\gclib.py
c:\Program Files (x86)\Galil\gclib\source\wrappers\python\setup.py
2 file(s) copied.
>copy "c:\Program Files (x86)\Galil\gclib\examples\python\*" .
c:\Program Files (x86)\Galil\gclib\examples\python\example.py
1 file(s) copied.
>python setup.py install
running install
running build
running build_py
creating build
creating build\lib
copying gclib.py -> build\lib
running install_lib
running install_egg_info
Removing C:\Users\user\AppData\Local\Programs\Python\Python37-32\Lib\site-packages\gclib-1.0-py3.7.egg-info
Writing C:\Users\user\AppData\Local\Programs\Python\Python37-32\Lib\site-packages\gclib-1.0-py3.7.egg-info
```

- The gclib Python wrapper is now installed. Go to the next section, **Using gclib from the Python Interpreter**.

Linux

- Type the following commands into a terminal prompt.

```
$ mkdir ~/py
$ cd ~/py
$ tar -xvf /usr/share/doc/gclib/src/gclib_python.tar.gz
gclib.py
setup.py
$ tar -xvf /usr/share/doc/gclib/src/gclib_python_examples.tar.gz
example.py
$ sudo python setup.py install
```

```
[sudo] password for user:
running install
running build
running build_py
creating build
creating build/lib
copying gclib.py -> build/lib
running install_lib
copying build/lib/gclib.py -> /usr/lib/python2.7/site-packages
byte-compiling /usr/lib/python2.7/site-packages/gclib.py to gclib.pyc
running install_egg_info
Writing /usr/lib/python2.7/site-packages/gclib-1.0-py2.7.egg-info
```

- The gclib Python wrapper is now installed. Go to the next section, **Using gclib from the Python Interpreter**.

OS X

- Be sure that the *Create Environment Variable* step has been followed in the [OS X](#) installation instructions.
- Type the following commands into a Terminal prompt.

```
$ mkdir ~/python_temp
$ cd ~/python_temp/
$ tar -xvf /Applications/gclib/source/gclib_python.tar.gz
x gclib.py
x setup.py
$ tar -xvf /Applications/gclib/examples/gclib_python_examples.tar.gz
x example.py
$ sudo python setup.py install
running install
running build
running build_py
creating build
creating build/lib
copying gclib.py -> build/lib
running install_lib
copying build/lib/gclib.py -> /Library/Python/2.7/site-packages
byte-compiling /Library/Python/2.7/site-packages/gclib.py to gclib.pyc
running install_egg_info
Writing /Library/Python/2.7/site-packages/gclib-1.0-py2.7.egg-info
```

- The gclib Python wrapper is now installed. Go to the next section, **Using gclib from the Python Interpreter**.

Using gclib from the Python Interpreter

- Invoke the [Python Interpreter](#).
- Type the following into the Python prompt.

```
>>> import gclib
>>> g = gclib.py()
>>> g.GOpen('192.168.0.42')
>>> print(g.GInfo())
192.168.0.42, DMC4080 Rev 1.2c, 783
```

Running Python scripts

- Navigate the terminal to the location from **Install the gclib Python module** where example.py was copied.
- Open *example.py* in a text editor.
- Set the address in the `g.GOpen()` call to match an available connection.
- Execute the following command at the Terminal.

```
$ python example.py
gclib version: py.127.110.250
192.168.0.42, DMC4080 Rev 1.2c, 783
```

- Experiment with the example by uncommenting sections, between the triple quotes, "".

```
$ python example.py
gclib version: py.127.110.250
192.168.0.42, DMC4080 Rev 1.2c, 783
GProgramDownload() correctly errored. Can't fit with level 3 compression
Uploaded program:
#A;i=0;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1
i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;i=i+1;EN
Downloaded program verified
Array element verified
  187942.0000

Starting move...
done.
```

Getting help

>>> help(g.GOpen) Help on method GOpen in module gclib:

GOpen(address) method of gclib.py instance Opens a connection a galil controller. See the gclib docs for address string formatting.

>>> help(g.GCommand) Help on method GCommand in module gclib:

GCommand(command) method of gclib.py instance Performs a command-and-response transaction on the connection. Trims the response.

>>> 'for a full listing, try help(g)'

4.3 .Net

- [VB.NET](#)
- [C#.NET](#)

4.3.1 VB.NET

gclib ships with *gclib.vb*, a Visual Basic class which exposes the functionality of the gclib. In addition, a VB forms example is included which demonstrates how to use *gclib.vb*. The following instructions were performed on Visual Studio Professional 2013 and can be extended to other Visual Studio versions.

Running the included Visual Basic Example

For brevity, these instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib**.

Copy files

- Navigate to a convenient, empty, writable location, e.g. *C:\temp*.
- Copy the contents of *C:\Program Files (x86)\Galil\gclib\examples\vb\2013_12.0\gclib_example* to this location.

Open in Microsoft Visual Studio 2013

- Open *gclib_example.sln* in Visual Studio. This demo was tested on MSVS 2013.

Add existing item, *gclib.vb*

- In the *Solution Explorer*, right-click on *gclib_example* and choose *Add->Existing Item...*
- Choose *C:\Program Files (x86)\Galil\gclib\source\wrappers\vb\gclib.vb*

Run Demo

- Type *F5* to run the program.
- Type a valid [GOpen\(\)](#) address in the text box and click Go.

Create Project from scratch with MSVC 2013

For brevity, these instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib**.

Configure Project

- Launch Visual Studio 2013
- Choose File->New->Project
- In the *New Project* dialog, choose Visual Basic -> Windows Forms Application
- Type *gclib_example* for the Name
- Choose a Location, e.g. C:\Users\user\Desktop
- Check *Create directory for solution*
- Click OK, the project will configure itself
- In the *Solution Explorer*, right click on *Solution 'gclib_example' (1 project)* and choose *Configuration Manager...*
 - In the *gclib_example* project row, click in the *Platform* column and choose <New...>
 - * Choose *x86* from *Type or select the new platform*:
 - * Choose *Any CPU* from *Copy settings from*:
 - * Check *Create new solutions platform*
 - * Click OK.
 - If x64 support is also desired, repeat the <New...> procedure for *x64*
 - In the *Active solution platform* combobox at the top of the *Configuration Manager* dialog, choose <Edit...>
 - * Select *Any CPU* and click the *Remove* button
 - * Click *Close*
 - Close the *Configuration Manager* dialog
- In the *Solution Explorer*, right-click on *gclib_example* and choose Add->Existing Item
 - Navigate to the installation location C:\Program Files (x86)\Galil\gclib\source\wrappers\vb
 - Choose *gclib.vb*
- In the *Solution Explorer* double-click on *gclib.vb*
 - Note that there is a preprocessor definition starting with `#if PLATFORM = "x86"` Then and `#ElseIf PLATFORM = "x64"` Then
 - Note that these sections of code enable/disable with the choice of the *Solution Platform* x86/x64, usually found in the Visual Studio toolbar
 - If a non-default gclib installation location is used, the paths in these sections of code must be updated to reflect the dll locations

Add some simple code

- In the *Solution Explorer* right-click on *Form1.vb* and choose *View Code*
- Replace the text in *Form1.vb* with the following code

```
Public Class Form1
    Dim gclib As New Gclib()
    Private Sub Form1_Load(sender As Object, e As EventArgs) Handles MyBase.Load
        Me.Text = "gclib simple example"
        Dim tb As New TextBox
        With tb
            .Multiline = True
            .Dock = DockStyle.Fill
            .Parent = Me
        End With
        Try
            'calls to gclib should be in a try-catch
            .AppendText("GVersion: " & gclib.GVersion() & vbCrLf)
            gclib.GOpen("192.168.0.42") 'Set an appropriate IP address here
            .AppendText("GInfo: " & gclib.GInfo() & vbCrLf)
            .AppendText("GCommand: " & gclib.GCommand("MG TIME") & vbCrLf)
        Catch ex As Exception
            .AppendText("ERROR: " & ex.Message)
        End Try
        Finally
            gclib.GClose() ' Don't forget to close!
        End Try
    End Sub
End Class
```

- In the `gclib.GOpen()` call, indicate a correct IP address for the controller that is used for this project
- Hit *F5* to run the project

4.3.2 C#.NET

`gclib` ships with *gclib.cs*, a C# class which exposes the functionality of the `gclib`. In addition, a C# forms example is included which demonstrates how to use *gclib.cs*.

For brevity, these instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib**.

Running the C# Example

Copy files

- Navigate to a convenient, empty, writable location, e.g. *C:\temp*.
- Copy the contents of *C:\Program Files (x86)\Galil\gclib\examples\cs\2013_12.0\gclib_example* to this location.

Open in Microsoft Visual Studio 2013

- Open *gclib_example.sln* in Visual Studio. This demo was tested on MSVS 2013.

Add existing item, *gclib.cs*

- In the *Solution Explorer*, right-click on *gclib_example* and choose *Add->Existing Item...*
- Choose *C:\Program Files (x86)\Galil\gclib\source\wrappers\cs\gclib.cs*

Run Demo

- Type *F5* to run the program.
- Type a valid `GOpen()` address in the text box and click Go.

Create Project from scratch with MSVC 2013

For brevity, these instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib**.

Configure Project

- Launch Visual Studio 2013
- Choose File->New->Project
- In the *New Project* dialog, choose Visual C# -> Windows Forms Application
- Type *gclib_example* for the Name
- Choose a Location, e.g. C:\Users\user\Desktop
- Check *Create directory for solution*
- Click OK, the project will configure itself
- In the *Solution Explorer*, right click on *Solution 'gclib_example' (1 project)* and choose *Configuration Manager...*
 - In the *gclib_example* project row, click in the *Platform* column and choose <New...>
 - * Choose *x86* from *Type or select the new platform:*
 - * Choose *Any CPU* from *Copy settings from:*
 - * Check *Create new solutions platform*
 - * Click OK.
 - If x64 support is also desired, repeat the <New...> procedure for x64
 - In the *Active solution platform* combobox at the top of the *Configuration Manager* dialog, choose <Edit...>
 - * Select *Any CPU* and click the *Remove* button
 - * Click *Close*
 - Close the *Configuration Manager* dialog
- In the *Solution Explorer*, right-click on *gclib_example* and choose *Properties*
 - Choose the *Build* item on the left
 - * In the *Configuration:* combobox, choose *All Configurations*
 - * Choose *x86* from the *Platform* combobox
 - * In *Conditional compilation symbols* type *x86*
 - If x64 is to be used also, add an *x64* token as well to the *x64 Platform*
 - Save and close the *Properties* window
- In the *Solution Explorer*, right-click on *gclib_example* and choose Add->Existing Item
 - Navigate to the installation location C:\Program Files (x86)\Galil\gclib\source\wrappers\cs
 - Choose *gclib.cs*
- In the *Solution Explorer* double-click on *gclib.cs*
 - Note that there is a preprocessor definition starting with *#if x86* and *#elif x64*
 - Note that these sections of code enable/disable with the choice of the *Solution Platform* x86/x64, usually found in the Visual Studio toolbar
 - If a non-default gclib installation location is used, the paths in these sections of code must be updated to reflect the dll locations

Add some simple code

- In the *Solution Explorer* right-click on *Form1.cs* and choose *View Code*
- Replace the text in *Form1.vb* with the following code

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace gclib_example
{
    public partial class Form1 : Form
    {
        gclib gclib = new gclib();
        public Form1()
        {
            InitializeComponent();
            this.Text = "gclib simple example";
            TextBox tb = new TextBox();
            tb.Multiline = true;
            tb.Dock = DockStyle.Fill;
            tb.Parent = this;
            try
            {
                //calls to gclib should be in a try-catch
                tb.AppendText("GVersion: " + gclib.GVersion() + "\n");
                gclib.GOpen("192.168.0.42"); //Set an appropriate IP address here
                tb.AppendText("GInfo: " + gclib.GInfo() + "\n");
                tb.AppendText("GCommand: " + gclib.GCommand("MG TIME") + "\n");
            }
            catch (Exception ex)
            {
                tb.AppendText("ERROR: " + ex.Message);
            }
            finally
            {
                gclib.GClose(); //Don't forget to close!
            }
        }
    }
}
```

- In the `gclib.GOpen()` call, indicate a correct IP address for the controller that is used for this project
- Hit *F5* to run the project

4.4 Java

`gclib` uses the venerable

`Java Native Access (JNA)` library to simplify integration into the Java Native Interface (JNI).

Attention

This is the initial version of the the `gclib` Java wrapper. As such, `GclibJava` ships as source files, not the compiled jar files. All functions are subject to change in future releases of `gclib`. Java hackers with recommendations on how to make this library better are encouraged to email support@galil.com. Somebody has to teach those Galil Java noobs what's what.

Windows

The following instructions were performed with 64 bit Windows 7 on [Oracle NetBeans IDE 8.2](#) and [Java 1.8.0_131](#).

For brevity, these instructions assume the default gclib installation location of "C:\Program Files (x86)\Galil\gclib".

Step-by-Step

1. Install [gclib](#) with 64 bit binaries (default install).
2. Install 64 bit NetBeans and Java, [jdk-8u131-nb-8_2-windows-x64.exe](#).
3. Launch NetBeans.
4. Create a new application.
 - (a) File | New Project...
 - (b) Under *Categories*, select *Java*.
 - (c) Under *Projects*, select *Java Application*.
 - (d) Click *Next*.
 - (e) Type `GclibTest` for the *Project Name*.
 - (f) Note the location of the *Project Folder*.
 - (g) Uncheck *Create Main Class*
 - (h) Click *Finish*
5. Open the *Project Folder* as noted above.
6. Open the *src* directory in the *Project Folder* location.
7. Copy the whole directory `C:\Program Files (x86)\Galil\gclib\examples\java\gclibtest` to this directory.
8. Copy the whole directory `C:\Program Files (x86)\Galil\gclib\source\wrappers\java\gclibjava` to this directory.
9. Create a directory at `c:\jna\`.
 - Another directory may be chosen. The purpose of this directory is to hold jna's *jar* binary for the Java classpath.
10. Download a copy of *jna.jar* to the new directory.
 - <https://github.com/java-native-access/jna#download>
 - This example uses *jna-4.4.0.jar*.
11. In the NetBeans *Projects* tab, expand *GclibTest*.
12. Right-click on *Libraries* and choose *Add JAR/Folder...*
13. Navigate to the *jna.jar* saved above. Click *Open* to add *jna.jar* to the classpath.
14. In the NetBeans *Projects* tab, right-click on *GclibTest* and choose *Properties*.
15. Choose the *Run* item out of the *Categories* options tree.
16. In the *Main Class* text box, type `gclibtest.GclibTest`. Click *OK*.
17. In the NetBeans *Projects* tab, expand *GclibTest* | *Source Packages* | *gclibtest*.
18. Double click *GclibTest.java*, and find the line containing `gclib.GOpen`.
19. Update the address for the desired hardware.
20. Choose *Run* | *Run Project (GclibTest)* or hit the `F6` key to run the application.
21. The application output will print in the NetBeans *Output* window.

Documentation

The GclibJava class has helpful documentation for developing a Java application. Use the following instructions to create the Javadoc.

1. In the NetBeans *Projects* tab, right-click *GclibTest*.
2. Choose *Generate Javadoc* to create the documentation and open it in the system's default browser.

Chapter 5

Using gclib

- [gcaps](#)
- [Program Preprocessor](#)
- [Thread Safety](#)
- [Galil Widgets](#)
- [Rebuilding gclibo](#)
- [Software Licenses](#)
- [Legacy Compatibility](#)

5.1 gcaps

gcaps is a communication server natively supported by gclib to multiplex Galil hardware communication features. It runs in the background on the host computer, as a service or daemon.

Incidentally, the name *gcaps* is an acronym for the improbable name *Galil Controller Asynchronous Proxy Server*. Yet another tidbit to impress friends at parties.

gclib & gcaps

gclib will attempt to use gcaps whenever [GOpen\(\)](#) is called without the `--direct` or `-d` switch. Other than this small difference, gclib function calls through gcaps operate as if the connection was direct. The first version of gclib supporting gcaps is 299.

Other gcaps Usage

The following functions will attempt to use gcaps first to gather data. If gcaps is not found, the functions will fall back to user space calls to populate information.

gclib Function	Usage	If gcaps unavailable
GVersion()	Provide the version of gclib and gcaps (if available).	No gcaps version.
GlpRequests()	Provide a list of all Galil controllers requesting IP addresses via BOOT-P or DHCP.	Must be root.
GAssign()	Assigns an IP address over the Ethernet to a controller at a given MAC address.	Must be root.
GAddresses()	Provides a listing of all available connection addresses.	Must be root, or user must be in device group.

Because gcaps runs as a service on Windows, and as a system daemon on Linux, gcaps runs with root privileges.

See *If gcaps unavailable* column in the above table when running without gcaps.

If gcaps is unavailable when these functions are run, a ~ 1 second delay will be incurred while gclib searches for the absent server. In order to prevent gcaps usage in these functions, comment out the symbol `G_USE_GCAPS` in `gclibo.h` and rebuild gclibo. See [Rebuilding gclibo](#).

5.2 Program Preprocessor

gclib's program downloader provides a preprocessor for DMC code. The preprocessor modifies the program prior to download providing a number of language features not present in native DMC code.

The preprocessor is invoked in the following two ways.

1. With both `GProgramDownload()` and `GProgramDownloadFile()` via the `preprocessor` argument. Downloading code with null for the preprocessor argument uses defaults.
2. From within DMC code via in-band preprocessor directives.

The preprocessor argument

`GProgramDownload()` and `GProgramDownloadFile()` can be called with a string passed to the `preprocessor` argument. The program will be modified based on this string prior to download. See *Preprocessor Options* below for syntax.

In-band Operation

DMC code can be written with special markup to signal the preprocessor to take actions prior to download.

For example, the following program will invoke the in-band preprocessor. The specifics are described below.

```
## Author: Zaphod Beeblebrox
## Project: Total Perspective Vortex
//the above 4 hashmarks enable the preprocessor
##option "--min 4" //use a minimum of level four compression
REM REM-style comments are supported at all times
PRA=1000
BGA
AMA
EN
```

The REM Comment

Lines beginning with the string `REM` are removed prior to download. `REM` comments are always removed regardless of whether the other preprocessor options are enabled or not.

Double Hash

Most preprocessor statements begin with a double hash, `##`. When proceeded by a space, the double hash acts like a `REM` comment.

When proceeded by a character other than space, `##` is interpreted as a preprocessor directive. For example, see `##option` below.

Note

Double hash lines are removed from the program only when the preprocessor is enabled with a quad hash.

Quad Hash to enable

In order to enable the in-band preprocessor, the first two lines of the DMC program must start with a double hash. This syntax of using two lines with double hashmarks is called a *quad hash*.

Content may follow the hash marks. For example, a good code writing style is to use double hash comments as a comment header showing author, project name, etc.

C-style comments

With the preprocessor enabled, C-style comments may be used with the `//` prefix. These comments are very similar to `REM` comments. The primary advantage of using this comment over `REM` is that `//` comments may occur anywhere in a line. This is helpful for line comments such as the following.

```
SIA= 1,25,25,0<4>1 //SSI 25 bits total, all single turn, no status
```

Strings containing `//` are not interpreted as comments.

Note

`//` comments are removed from the program only when the preprocessor is enabled with a quad hash.

Preprocessor Directives

Note

Directives are only followed when the preprocessor is enabled with a quad hash.

##option

The `option` directive allows passing switches directly to the preprocessor with the same syntax as the `preprocessor` argument in `GProgramDownload()` and `GProgramDownloadFile()`. The syntax of the `option` directive is the following.

```
##option "{preprocessor switches}"
```

For example, the following line will disable compression in the program.

```
##option "--max 0"
```

See *Preprocessor Options* below for other switches.

##include

The `include` directive provides a way to include the contents of another DMC file in the current program. This is useful for reusing code such as automatic subroutines, homing operations, or controller initialization routines.

The contents of the file will be inserted in place of the `include` line. The insertion occurs prior to code compression.

The syntax of the `include` directive is the following.

```
##include "{filename}"
```

For example,

```
##include "c:\galil\initialize.dmc"
##include "homing.dmc"
```

To write more portable code, use the `include` directive with just the file name, no absolute path. The path to find the file on the system is set depending on usage.

1. In the *Galil Design Kit*, specify the include path in GDK's *settings* with the `--search` or `-I` switch as defined below.
2. When downloading code via `GProgramDownload()` or `GProgramDownloadFile()`, use the `--search` or `-I` switch in the `preprocessor` argument.
3. Finally, if the file is in the executable search path, the file will be found. However, one of the previous two options is more reliable.

##gclib

Galil Design Kit uses the `##gclib` directive in *GDK Macros*. `gclib` ignores this directive.

In-band Support

In addition to `gclib`, *Galil Design Kit* supports the preprocessor. Proper preprocessor usage will be colored in the Editor's syntax highlighter. If the quad hash is not present, preprocessor syntax will be colored differently to indicate improper usage.

The preprocessor is not supported in software prior to GDK/`gclib`. DMC code downloads using the in-band preprocessor in prior generation software (e.g. GalilTools or SmartTerm) will fail with a TC code of 61, *Duplicate or bad label*.

Preprocessor Options

Compression, `--min`, `--max`

- Default uses minimum compression needed to fit the program.
- `--max n` provides compression up to and including level *n*. Only the necessary compression will be performed up to level *n*.
- `--min n` will compress at least up to and including *n*. *n* defined as with `--max`.

Compression Levels, *n*

- Level 0 (mandatory)
 1. Remove lines beginning with `REM`.
 2. Remove trailing semicolons.
 3. Comment blank lines with `'`.
 4. Remove white space (space/tab) in front of `#` (label declarations).
 5. Remove white space after commands.
 6. Line ends changed to carriage return.
 7. Replace leading tabs with double space.
 8. Replace non-leading tabs with single space.
 9. A backslash (`\`) character on a line other than a preprocessor line will result in an error.
- Level 1
 1. Remove unnecessary spaces. Strings, comments (`'`), and no-ops (`NO`) are not changed.
- Level 2
 1. Remove comments (`'`) but not no-ops (`NO`).
- Level 3
 1. Remove no-ops (`NO`).
- Level 4
 1. Break apart compound lines that are too long.
 2. Compact lines of code to maximize line usage.
 3. Use backtick to support long lines where applicable.

Code insertion, `--insert`

- Default begins at line zero and overwrites anything present.
- `--insert arg` invokes the insert option of the firmware's `DL` command. *arg* can be one of the following.
 1. Line number, e.g. `100`. Program insertion will occur on the line after the line specified.
 2. Variable name, e.g. `myvar`. Program insertion will occur on the line after the line equal to the value of the variable.
 3. Label callout, e.g. `#mylabel`. Program insertion will occur on the line after the label.
 4. A lone `#` symbol. Program insertion will occur on the line after the last line in the program buffer.
- Compression directives `--max` and `--min` are followed.
- All original code following the point of insertion is cleared.
- Not all products support the `--insert` operation, e.g. DMC-30010. See the [DL](#) command for support.

Warning

It is the user's responsibility to ensure that the code will fit in the inserted location. The preprocessor will not check line numbers when executing the `--insert` option.

Include Search Paths, `--search`, `-I`

- The `##include` directive will attempt to open its string argument directly. The open will succeed if the argument is the absolute path, or if the argument is in the executable's path, e.g. in the same directory.
- `--search path` allows the user to specify a directory or directories to be searched for the `include` file in case the first open fails.
 - For historical reasons, `-I` is shorthand for `--search`.
- Multiple directories may be specified with multiple `-I` directives.
- For in-band code, `-I` must be specified prior to the include.
- A common use for `-I` is to specify only the filename in the DMC source code and use the `preprocessor` argument during download to specify the path to the files. This allows the files to be moved without a change to source code.
- Search order
 1. The `##include` argument is checked first as-is.
 2. Then each `-I` argument in the `preprocessor` argument, in the order specified.
 3. Then `##option` directives in the DMC file, in the order specified.
- If the search path contains spaces, enclose the path in double quotes, escaped with a backslash. See example below.

In-band Example

```
##option "-I /code/dmc/homing"
##option "-I \"/code/dmc/other code\"/"
##include "auto.dmc"
//executable's directory will be checked
//then c:\code\dmc\homing
//then c:\code\dmc\other code
```

Macro Definition, `--define`, `-D`

- `--define` provides a way to substitute one token for another. This is useful for writing code that is generic until program download. Wherever the token is found in code, it is substituted by the replacement. The replacement occurs right before code compression.
- `-D` is shorthand for `--define`.
- The token should consist of a starting backslash character, followed by upper or lower case alphanumeric characters, underscores, and an ending backslash.
- The common usage for this feature is to write code with a token, and then call the program download with the `-D` switch.

In this example, an axis is defined at download time. Specifying the following for the preprocessor argument

```
--define \ax\:A
```

would cause the following code

```
SH\ax\
JG\ax\=1000
BG\ax\
```

to be downloaded as

```
SHA
JGA=1000
BGA
```

This causes the *A* axis to be addressed.

Note

The macro `\pid\` is reserved for exclusive use by GDK.

Conditional Directives, `--ifdef`, `--ifndef`

To specify a preprocessor directive should be executed only if a macro is defined, use `--ifdef`.

```
##option "--ifdef \minify\ --min 4" //maximally compress code if minify macro set
```

To specify a preprocessor directive should be executed only if a macro is NOT defined, use `--ifndef`.

```
##option "--ifndef \axis\ -D \axis\:A" //Default to axis A
```

GDK Support

- See the `preprocessor` text box in the *Editor* settings page to set the desired preprocessor setting for developing in GDK's editor.

5.3 Thread Safety

The Basics

- The easiest way to multithread, and/or to use multiple applications to access the same hardware, is to communicate through [gcaps](#).
- Just leave out `-d` and `--direct` in your [GOpen\(\)](#) address and [gcaps](#) will be used.
- Each thread, and each application, should use their own [GCon](#) handle. In the higher-level [Language Support](#), each thread or application should manage their own [gclib](#) object. Don't pass the connection handle between threads.

The Formalism

[gclib](#) supports multi-threaded operation with the following operational definitions.

[gclib](#) is "reentrant"

Reentrant means that a given [gclib](#) function call may be invoked in multiple threads when passed distinct arguments. For example, [GCommand\(\)](#) may be called simultaneously in different threads so long as the following arguments have unique values, indicating they point to unique memory.

- [GCon](#) `g`, the connection must be unique.
- [GBufOut](#) `buffer`, the writable buffer must be unique.
- [GSize](#) `*bytes_returned`, the writable value must be unique.

[gclib](#) is not "thread-safe"

Thread safety would imply that a given [gclib](#) function call could be invoked in multiple threads when passed *the same* arguments. This mode of operation **is not** supported by [gclib](#). In other words, it is not safe to call [GCommand\(\)](#) simultaneously in different threads if any mutable arguments point to the same memory.

In short, it is **not** safe to call [GCommand\(\)](#) in multiple threads to the same physical connection.

If such operation is required, it is the user's responsibility to use a mutual exclusion (mutex) or other mechanism to protect memory.

Multi-threaded access to the same connection with [gcaps](#)

[gcaps](#) provides a multiplexing capability to Galil hardware. When using [gcaps](#), it is therefore safe to call [GCommand\(\)](#) in multiple threads to the *same physical connection* (though not the same [GCon](#) value). [gclib](#) can connect multiple times to the same Galil connection through [gcaps](#). Because the [GCon](#) variable is unique, the reentrant capability of [gclib](#) can be used to communicate to the same physical connection through [gcaps](#).

5.4 Galil Widgets

Note

gclib provides the communications foundation for the Galil Widgets project. Galil Widgets are a collection of .Net WinForms User Controls that provide quick development of custom graphical user interfaces (GUIs) that communicate with Galil Motion Controllers and PLCs.

Galil Widgets has been designed to support three general user needs

The software novice, or the hurried prototyper

Within minutes, a full UI can be laid out. All controls can be configured with menus and mouse clicks for an absolute minimum requirement for writing code. The quick start guide, and Microsoft Visual Studio Express is all that is needed to make a free application GUI with minimal effort.

The .Net developer, adding to pre-existing code.

In addition to the point-and-click configuration of the tools, each tool has a set of public function calls and properties which allows the C# or VB.Net user the ability to integrate the Galil Widgets into a .Net application with ease.

The power user

The entire Galil Widgets source code is available in the installation package. This allows users to tweak, extend, and add Widgets to the library with ease. The "GalilWidget" interface defines a number of function calls that new Widgets should implement to function correctly.

The following widgets are currently available

- **GWComs**: Communications to Galil hardware including event-driven handling of asynchronous traffic.
- **GWTerm**: A terminal for direct user interaction with the hardware.
- **GWPoll**: A polling tool to display important data on screen.
- **GWSettings**: A tool for displaying, editing, backing up, and restoring controller parameters and mission-critical variables. Program backup and loading, and firmware upgrades are also supported.
- **GWDataRec**: A data record visualization tool. Used to display controller status through user-configurable labels, "soft LEDs", and analog sliders.

For more information, get the free **Galil Widgets package**

See the [Galil Widgets release notes](#) for changes.

Screen shots of an example motion controller configuration (left), and a similar RIO configuration (right)

5.5 Rebuilding gclibo

gclib ships with a compiled version of the open source portion, *gclibo*. However, if a source modification is desired, the following instructions will help with recompiling this portion of the library.

Windows

For brevity, these instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib** and a build type of **x86 (win32)**. The following instructions were performed on *Visual Studio Professional 2015* and can be extended to other Visual Studio versions.

Preparation

Create a working directory. A convenient, empty, writable location, e.g.

```
C:\>mkdir %homepath%\Desktop\temp
```

Note

In this documentation, a single *greater-than* character (>) will indicate a command prompt at this working directory.

Recompiling gclibo requires the source code for the open source compression library **zlib**. This can be downloaded from the zlib website: <http://zlib.net/zlib1211.zip>.

Extract the downloaded zlib source files to the working directory.

Open *VS2015 x86 Native Tools Command Prompt* and navigate to the working directory.

```
C:\Program Files (x86)\Microsoft Visual Studio 14.0\VC>cd %homepath%\Desktop\temp
C:\Users\user\Desktop\temp>dir /b
zlib-1.2.11
```

Copy files

Set an environment variable for the base path.

```
>set base="C:\Program Files (x86)\Galil\gclib"
```

Set an environment variable for the zlib base path.

```
>set zlib="%CD%\zlib-1.2.11"
```

Copy the gclibo source files.

```
>copy %base%\source\gclibo\*.c .
C:\Program Files (x86)\Galil\gclib\source\gclibo\arrays.c
C:\Program Files (x86)\Galil\gclib\source\gclibo\gclibo.c
      2 file(s) copied.
```

Modify source

Make any necessary changes. For this example, the **GInfo()** function was changed from

```
GReturn GCALL GInfo(GCon g, GCStringOut info, GSize info_len)
{
    return GUtility(g, G_UTIL_INFO, info, &info_len);
}

to
GReturn GCALL GInfo(GCon g, GCStringOut info, GSize info_len)
{
    strncpy(info, "My controller", info_len);
    return G_NO_ERROR;
    //return GUtility(g, G_UTIL_INFO, info, &info_len);
}
```

Compile and copy

Compile the source code.

```
>cl -c *.c %zlib%\*.c -I %base%\include -I %zlib% -DBUILDING_GCLIB
```

Link the binaries.

```
>link /DLL *.obj %base%\lib\dynamic\x86\gclib.lib /OUT:gclibo.dll
```

Copy

Copy back to the installation location from the file explorer. This will require administrator privileges.

- Copy gclibo.lib to "C:\Program Files (x86)\Galil\gclib\lib\dynamic\x86"
- Copy gclibo.dll to "C:\Program Files (x86)\Galil\gclib\dll\x86"

Test

Copy simple example

```
>copy %base%\examples\cpp\x_simple.c .
```

Edit **GOpen()** call as necessary.

Compile

```
>cl x_simple.c %base%\lib\dynamic\x86\*.lib -I %base%\include
```

Set Path to DLL

```
>set PATH=%base%\dll\x86\;%PATH%
```

Execute

```
>x_simple.exe
rc: 0
version: 85.60.138
rc: 0
rc: 0
info: My controller
rc: 0
response: 355000958.0000
:
```

Linux

Recompiling gclibo requires the source code for the open source compression library **zlib**. Make will automatically download the needed project from the zlib website: <https://www.zlib.net/>.

Copy files

```
$ mkdir test
$ cd test
$ tar -xzf /usr/share/doc/gclib/src/gclibo_src.tar.gz
$ cp /usr/include/gclib*.h .
```

Modify source

Make any necessary changes. For this example, the **GInfo()** function was changed from

```
GReturn GCALL GInfo(GCon g, GCStringOut info, GSize info_len)
{
    return GUtility(g, G_UTIL_INFO, info, &info_len);
}
to
GReturn GCALL GInfo(GCon g, GCStringOut info, GSize info_len)
{
    strncpy(info, "My controller", info_len);
    return G_NO_ERROR;
    //return GUtility(g, G_UTIL_INFO, info, &info_len);
}
```

Make and install

```
# make install -f makefile_gclibo
Acquiring zlib
wget -q http://zlib.net/zlib-1.2.11.tar.gz
shasum -a 256 -c zlib.sha256
zlib-1.2.11.tar.gz: OK
tar -xzf zlib-1.2.11.tar.gz
Compiling zlib
gcc -c -Wall -w -fPIC -fvisibility=hidden -DBUILDING_GCLIB -DHAVE_VISIBILITY zlib-1.2.11/*.c
Compiling open source component, libgclibo.so.0.0
gcc -Izlib-1.2.11 -c -Wall -Werror -fPIC -fvisibility=hidden -DBUILDING_GCLIB -DHAVE_VISIBILITY gclibo.c array
Linking open source component into shared library.
gcc -shared -o libgclibo.so.0.0 *.o -lgclib -L. -Wl,-rpath=/usr/lib -Wl,-soname=libgclibo.so.0
```

```
strip --strip-unneeded libgclibo.so.0.0
Installing libgclibo.so.0.0
install -m 755 libgclibo.so.0.0 /usr/lib
ldconfig
# make clean -f makefile_gclibo
Cleaning project...
```

Test

Extract simple example

```
$ tar -xzf /usr/share/doc/gclib/src/gclib_examples.tar.gz x_simple.c
```

Edit **GOpen()** call as necessary.

Compile

```
$ gcc x_simple.c -Wall -Werror -lgclib -lgclibo -o simple
```

Execute

```
$ ./simple
rc: 0
version: 85.60.131
rc: 0
rc: 0
info: My controller
rc: 0
response: 182879322.0000
:
```

OS X

Copy files

```
$ mkdir test
$ cd test
$ tar -xvf /Applications/gclib/source/gclibo_src.tar.gz x gclibo.h
x gclibo.c
x arrays.c
x makefile_gclibo
$ cp /Applications/gclib/include/* .
$ cp /Applications/gclib/dylib/gclib.0.dylib .
$ ls
arrays.c gclib.h gclib_record.h gclibo.h
gclib.0.dylib gclib_errors.h gclibo.c makefile_gclibo
```

Modify source

Make any necessary changes. For this example, the **GInfo()** function was changed from

```
GReturn GCALL GInfo(GCon g, GCStringOut info, GSize info_len)
{
    return GUtility(g, G_UTIL_INFO, info, &info_len);
}

to
GReturn GCALL GInfo(GCon g, GCStringOut info, GSize info_len)
{
    strncpy(info, "My controller", info_len);
    return G_NO_ERROR;
    //return GUtility(g, G_UTIL_INFO, info, &info_len);
}
```

Make and install

```
$ make -f makefile_gclibo
Open source component, gclibo.0.dylib
Compiling open source component.
gcc -c -Wall -Werror -fPIC -fvisibility=hidden -DBUILDING_GCLIB -DHAVE_VISIBILITY *.c
Linking open source component into shared library.
```

```
gcc -dynamiclib -o gclibo.0.dylib *.o gclib.0.dylib
strip -u -r gclibo.0.dylib
Cleaning up.
$ make install -f makefile_gclibo
Installing gclibo.0.dylib
cp gclibo.0.dylib /Applications/gclib/dylib
$ make clean -f makefile_gclibo
Cleaning project...
```

Test

Extract simple example

```
$ tar -xzf /Applications/gclib/examples/gclib_examples.tar.gz x_simple.c
```

Edit [GOpen\(\)](#) call as necessary.

Compile

```
$ gcc x_simple.c -Wall -Werror gclib.0.dylib gclibo.0.dylib -o simple
```

Execute

```
$ ./simple
rc: 0
version: 127.110.253
rc: 0
rc: 0
info: My controller
rc: 0
response: 182879322.0000
:
```

5.6 Software Licenses

For purposes of licensing, gclib is broken into two categories.

1. The closed source portion is covered under the [Closed Source License](#). This covers the binaries created for the [gclib.h](#) interface.
2. The open source portion and all examples and wrappers are covered under the [Open Source License](#).

The informal software licenses are provided to describe the user's responsibilities in a format that is easy to read and understand. If more legal verbiage is required or if any questions arise regarding the following details, please contact Galil for clarification.

5.6.1 Closed Source License

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This license includes the closed source portion of the gclib, defined by the header file [gclib.h](#) as outlined in the accompanying documentation (the docs).

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Galil Motion Control
 270 Technology Way
 Rocklin, CA 95765, USA
 support@galil.com
 1 (800) 377-6329
 1 (916) 626-0102
 www.galil.com

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 - (2) Modified files must be commented at the top of the file with the original Galil version number and the author of the modifications.
 - (3) This license NEED NOT appear with binaries or executables if the source code is not included.
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Galil Motion Control
 270 Technology Way
 Rocklin, CA 95765, USA
 support@galil.com
 1 (800) 377-6329
 1 (916) 626-0102
 www.galil.com

5.7 Legacy Compatibility

- [GalilTools](#) included the GCL (GalilTools Communication Library). gclib ships with an open source wrapper implementation of the GCL.
- [DMC32 OSU](#) is intended for existing applications that used software based on the legacy DMCWIN32 library for Windows XP and earlier.

5.7.1 GalilTools

To provide maximum compatibility, gclib ships with an open source wrapper implementation of the GCL (GalilTools Communication Library). Users wanting to upgrade to gclib that have source built on Galil.h can use this wrapper to minimize source changes. This wrapper is also indicated for users that want the same function calls as Galil.h, but don't want the usage of `QT` as in galil1.dll.

This wrapper is intended for existing applications already using the library distributed with GalilTools (galil1.dll) or the previous STL library (galil2.dll). New applications should be written with gclib.

Windows

Compile galil2.dll with MSVC 2013

The following instructions were performed on *Visual Studio Professional 2013* and can be extended to other Visual Studio versions. For brevity, the instructions assume the default installation location of **C:\Program Files (x86)\Galil\gclib** and a build type of **x86 (win32)**.

Launch the compiler command prompt

- Open *VS2013 x86 Native Tools Command Prompt*.
- Navigate to a convenient, writable location, e.g. *C:\temp*.

Set an environment variable for the base path

```
C:\temp>set base=C:\Program Files (x86)\Galil\gclib
```

Compile the source code

Note the quotes.

```
C:\temp>cl -c "%base%\source\wrappers\gcl\*.cpp" -I "%base%\include" -EHsc -MD
```

Link the source code

Note the quotes.

```
C:\temp>link /DLL gcl_datarecord.obj gcl_galil.obj "%base%\lib\dynamic\x86\gclib.lib" "%base%\lib\dynamic\x86\gclibo.lib"
```

The output files *galil2.dll* and *galil2.lib* can now be used in a project using the GCL.

Test

Help the loader find the right dlls.

```
C:\temp>set PATH=%PATH%;%BASE%\dll\x86
```

Link the simple example.

```
C:\temp>link gcl_simple.obj "%base%\lib\dynamic\x86\gclib.lib" "%base%\lib\dynamic\x86\gclibo.lib" galil2.lib
```

Run the example.

```
C:\temp>simple.exe
Galil2.dll wrapper, gclib 106.75.180
10.1.3.169, DMC4020 Rev 1.2c, 291
```

Linux

Copy files

```
$ tar -xzf /usr/share/doc/gclib/src/gclib_gcl.tar.gz
$ ls
Galil.h          gcl_galil.cpp  gcl_simple.cpp
gcl_datarecord.cpp gcl_galil.h    makefile
```

Make and install

```
$ make
gcl open source wrapper for gclib
  Compiling wrapper, libgalil.so.2.0
g++ -c -fPIC -std=c++11 gcl_datarecord.cpp gcl_galil.cpp
  Linking wrapper into shared library.
g++ -shared -o libgalil.so.2.0 *.o -Wl,-soname=libgalil.so.2
strip --strip-unneeded libgalil.so.2.0
  Cleaning up.
```

```
$ sudo make install
Installing libgalil.so.2.0
install -m 755 libgalil.so.2.0 /usr/lib
install -m 644 Galil.h /usr/lib
ldconfig
ln -s /usr/lib/libgalil.so.2 /usr/lib/libgalil.so
$ make clean
Cleaning project...
```

Test

```
$ g++ gcl_simple.cpp -lgil -lgclib -lgclibo -o simple
$ ./simple
Galil2.dll wrapper, gclib 95.71.164
10.1.3.169, DMC4020 Rev 1.2c, 291
```

5.7.2 DMC32 OSU

Note

gclib provides the communications foundation for the *DMC32 Operating System Upgrade (OSU)* project.

DMC32 OSU is intended for existing applications that used software based on the legacy DMCWIN32 library for Windows XP and earlier. If such an application must be upgraded to Windows 7 ‡, 8, 8.1, or 10 DMC32 OSU may be used on these O.S. upgrades.

‡ Galil's support for Windows 7 has ended. Please click [here](#) for more information.

Galil's Windows XP support statement,

<http://www.galil.com/about/xp-support>

- For more information refer to the documentation, <http://www.galil.com/sw/pub/all/doc/dmc32osu/html/index.html>
- See the release notes for changes, <http://www.galil.com/sw/pub/all/rn/dmc32osu.html>
- The installer is available for download from Galil's website, http://www.galil.com/sw/pub/win/dmc32osu/galil_dmc32_osu_exe.html

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GDataRecord4000	Data record struct for DMC-4000 controllers, including 4000, 4200, 4103, and 500x0	158
GDataRecord47000_ENC	Data record struct for RIO-471xx and RIO-472xx PLCs. Includes encoder fields	164
GDataRecord47162	Data record struct for RIO-47162	166
GDataRecord47300_24EX	Data record struct for RIO-47300 with 24EX I/O daughter board	167
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Chapter 10

Module Documentation

10.1 API

10.1.1 Description

Language Support	C++	C#	VB.NET	Java	Python
gclib Functions	Yes	Yes	Yes	Yes	Yes
Data Records and Data Structures	Yes	Yes	Yes	No	No
gclib Macros	Yes	No	No	No	No
gclib Typedefs	Yes	No	No	No	No

Files

- file [gclib.h](#)
- file [gclibo.h](#)
- file [gclibo.c](#)
- file [gclib_record.h](#)
- file [gclib_errors.h](#)

Data Structures

- struct [GDataRecord4000](#)
Data record struct for DMC-4000 controllers, including 4000, 4200, 4103, and 500x0.
- struct [GDataRecord52000](#)
Data record struct for DMC-52000 controller. Same as DMC-4000, with bank indicator added at byte 40.
- struct [GDataRecord1806](#)
Data record struct for DMC-1806 controller.
- struct [GDataRecord2103](#)
Data record struct for DMC-2103 controllers.
- struct [GDataRecord1802](#)
- struct [GDataRecord30000](#)
Data record struct for DMC-30010 controllers.
- struct [GDataRecord47000_ENC](#)
Data record struct for RIO-471xx and RIO-472xx PLCs. Includes encoder fields.
- struct [GDataRecord47300_ENC](#)
Data record struct for RIO-47300. Includes encoder fields.
- struct [GDataRecord47300_24EX](#)
Data record struct for RIO-47300 with 24EX I/O daughter board.
- struct [GDataRecord47162](#)
Data record struct for RIO-47162.

- union [GDataRecord](#)

Data record union, containing all structs and a generic byte array accessor.

Macros

- `#define GCLIB_DLL_EXPORTED`
- `#define GCALL __stdcall`
Specify calling convention for Windows.
- `#define G_DR 1`
Value for [GRecord\(\)](#) method variable for acquiring a data record via DR mode.
- `#define G_QR 0`
Value for [GRecord\(\)](#) method variable for acquiring a data record via QR mode.
- `#define G_BOUNDS -1`
For functions that take range options, e.g. [GArrayUpload\(\)](#), use this value for full range.
- `#define G_CR 0`
For [GArrayUpload\(\)](#), use this value in the delim field to delimit with carriage returns.
- `#define G_COMMA 1`
For [GArrayUpload\(\)](#), use this value in the delim field to delimit with commas.
- `#define G_PUBLISH_SERVER 1`
For [GPublishServer\(\)](#), use this value to publish server to local network.
- `#define G_REMOVE_SERVER 0`
For [GPublishServer\(\)](#), use this value to remove server from local network.
- `#define G_UTIL_TIMEOUT 1`
[GUtility\(\)](#), Access to timeout.
- `#define G_UTIL_TIMEOUT_OVERRIDE 2`
[GUtility\(\)](#), read/write access to timeout override.
- `#define G_USE_INITIAL_TIMEOUT -1`
[GUtility\(\)](#), for timeout override. Set `G_UTIL_TIMEOUT_OVERRIDE` to this value to use initial [GOpen\(\)](#) timeout (`--timeout`).
- `#define G_UTIL_VERSION 128`
[GUtility\(\)](#), get a library version string.
- `#define G_UTIL_INFO 129`
[GUtility\(\)](#), get a connection info string.
- `#define G_UTIL_SLEEP 130`
[GUtility\(\)](#), specify an interval to sleep.
- `#define G_UTIL_ADDRESSES 131`
[GUtility\(\)](#), get a list of available connections.
- `#define G_UTIL_IPREQUEST 132`
[GUtility\(\)](#), get a list of hardware requesting IPs.
- `#define G_UTIL_ASSIGN 133`
[GUtility\(\)](#), assign IP addresses over the network.
- `#define G_UTIL_DEVICE_INITIALIZE 134`
[GUtility\(\)](#), sends CF, CW, EO etc. to initialize the connection. Useful after RS or other reset.
- `#define G_UTIL_PING 135`
[GUtility\(\)](#), uses ICMP ping to determine if an IP address is reachable and assigned.
- `#define G_UTIL_ERROR_CONTEXT 136`
[GUtility\(\)](#), provides additional error context, where available.
- `#define G_UTIL_GCAPS_HOST 256`
- `#define G_UTIL_GCAPS_VERSION 257`
[GUtility\(\)](#), get the version of the [gcaps](#) server.
- `#define G_UTIL_GCAPS_KEEPALIVE 258`

- *GUtility()*, Deprecated 20210119. No longer functional.
- #define **G_UTIL_GCAPS_ADDRESSES** 259
GUtility(), get a list of available connections from the *gcaps* server.
- #define **G_UTIL_GCAPS_IPREQUEST** 260
GUtility(), get a list of hardware requesting IPs from the *gcaps* server.
- #define **G_UTIL_GCAPS_ASSIGN** 261
GUtility(), assign IP addresses over the network from the *gcaps* server.
- #define **G_UTIL_GCAPS_PING** 262
GUtility(), uses ICMP ping to determine if an IP address is reachable and assigned. Ping sent from the *gcaps* server.
- #define **G_UTIL_GCAPS_LIST_SERVERS** 263
GUtility(), get a list of all available *gcaps* servers on the local network.
- #define **G_UTIL_GCAPS_PUBLISH_SERVER** 264
GUtility(), make local *gcaps* server discoverable by other *gcaps* servers on the local network.
- #define **G_UTIL_GCAPS_SET_SERVER** 265
GUtility(), set the new active *gcaps* server.
- #define **G_UTIL_GCAPS_SERVER_STATUS** 266
GUtility(), get information on the local server's name and if it is published to the local network.
- #define **G_UTIL_GCAPS_REMOTE_CONNECTIONS** 267
GUtility(), get a list of remote addresses connected to local server.
- #define **G_UTIL_GCAPS_SERVER_INFO** 268
- #define **G_SMALL_BUFFER** 1024
Most reads from Galil are small. This value will easily hold most, e.g. TH, TZ, etc.
- #define **G_HUGE_BUFFER** 524288
Most reads from Galil hardware are small. This value will hold the largest array or program upload/download possible.
- #define **G_LINE_BUFFER** 80
For writes, via command interpreter, to the Galil.
- #define **GCLIB_DLL_EXPORTED**
- #define **GCALL** __stdcall
- #define **MALLOCBUF** **G_HUGE_BUFFER**
Malloc used for large program and array uploads.
- #define **MAXPROG MALLOCBUF**
Maximum size for a program.
- #define **MAXARRAY MALLOCBUF**
Maximum size for an array table upload.
- #define **POLLINGINTERVAL** 100
Interval, in milliseconds, for polling commands, e.g. *GWaitForBool()*.
- #define **G_USE_GCAPS**
Use the GCAPS server in *GAddresses()*, *GAssign()*, *GIpRequests()*, and *GVersion()*. To avoid GCAPS, comment out this line and recompile, <http://galil.com/sw/pub/all/doc/gclib/html/gclibo.html>.
- #define **_CRT_SECURE_NO_WARNINGS**
- #define **GALILDATARECORDMAXLENGTH** 512
Max size for any Galil data record, equal to dual port ram size of PCI.
- #define **G_NO_ERROR** 0
Return value if function succeeded.
- #define **G_NO_ERROR_S** "no error"
- #define **G_GCLIB_ERROR** -1
General library error. Indicates internal API caught an unexpected error. Contact Galil support if this error is returned, softwaresupport@galil.com.
- #define **G_GCLIB_ERROR_S** "gclib unexpected error"
- #define **G_GCLIB_UTILITY_ERROR** -2
An invalid request value was specified to *GUtility*.
- #define **G_GCLIB_UTILITY_ERROR_S** "invalid request value or bad arguments were specified to *GUtility()*"

- `#define G_GCLIB_UTILITY_IP_TAKEN -3`
The IP cannot be assigned because ping returned a reply.
- `#define G_GCLIB_UTILITY_IP_TAKEN_S "ip address is already taken by a device on the network"`
- `#define G_GCLIB_NON_BLOCKING_READ_EMPTY -4`
GMessage, GInterrupt, and GRecord can be called with a zero timeout. If there wasn't data waiting in memory, this error is returned.
- `#define G_GCLIB_NON_BLOCKING_READ_EMPTY_S "data was not waiting for a zero-timeout read"`
- `#define G_GCLIB_POLLING_FAILED -5`
GWaitForBool out of polling trials.
- `#define G_GCLIB_POLLING_FAILED_S "exit condition not met in specified polling period"`
- `#define G_TIMEOUT -1100`
Operation timed out. Timeout is set by the `-timeout` option in `GOpen()` and can be overridden by `GSetting()`.
- `#define G_TIMEOUT_S "device timed out"`
- `#define G_OPEN_ERROR -1101`
Device could not be opened. E.G. Serial port or PCI device already open.
- `#define G_OPEN_ERROR_S "device failed to open"`
- `#define G_READ_ERROR -1103`
Device read failed. E.G. Socket was closed by remote host. See `G_UTIL_GCAPS_KEEPALIVE`.
- `#define G_READ_ERROR_S "device read error"`
- `#define G_WRITE_ERROR -1104`
Device write failed. E.G. Socket was closed by remote host. See `G_UTIL_GCAPS_KEEPALIVE`.
- `#define G_WRITE_ERROR_S "device write error"`
- `#define G_INVALID_PREPROCESSOR_OPTIONS -1204`
GProgramDownload was called with a bad preprocessor directive.
- `#define G_INVALID_PREPROCESSOR_OPTIONS_S "preprocessor did not recognize options"`
- `#define G_COMMAND_CALLED_WITH_ILLEGAL_COMMAND -1106`
GCommand() was called with an illegal command, e.g. ED, DL or QD.
- `#define G_COMMAND_CALLED_WITH_ILLEGAL_COMMAND_S "illegal command passed to command call"`
- `#define G_DATA_RECORD_ERROR -1107`
Data record error, e.g. DR attempted on serial connection.
- `#define G_DATA_RECORD_ERROR_S "data record error"`
- `#define G_UNSUPPORTED_FUNCTION -1109`
Function cannot be called on this bus. E.G. `GInterrupt()` on serial.
- `#define G_UNSUPPORTED_FUNCTION_S "function not supported on this communication bus"`
- `#define G_FIRMWARE_LOAD_NOT_SUPPORTED -1110`
Firmware is not supported on this bus, e.g. Ethernet for the DMC-21x3 series.
- `#define G_FIRMWARE_LOAD_NOT_SUPPORTED_S "firmware cannot be loaded on this communication bus to this hardware"`
- `#define G_ARRAY_NOT_DIMENSIONED -1200`
Array operation was called on an array that was not in the controller's array table, see LA command.
- `#define G_ARRAY_NOT_DIMENSIONED_S "array not dimensioned on controller or wrong size"`
- `#define G_CONNECTION_NOT_ESTABLISHED -1201`
Function was called with no connection.
- `#define G_CONNECTION_NOT_ESTABLISHED_S "connection to hardware not established"`
- `#define G_ILLEGAL_DATA_IN_PROGRAM -1202`
Data to download not valid, e.g. \ in data.
- `#define G_ILLEGAL_DATA_IN_PROGRAM_S "illegal ASCII character in program"`
- `#define G_UNABLE_TO_COMPRESS_PROGRAM_TO_FIT -1203`
Program preprocessor could not compress the program within the user's constraints.
- `#define G_UNABLE_TO_COMPRESS_PROGRAM_TO_FIT_S "program cannot be compressed to fit on the controller"`

- `#define G_BAD_RESPONSE_QUESTION_MARK -10000`
Operation received a ?, indicating controller has a TC error.
- `#define G_BAD_RESPONSE_QUESTION_MARK_S "question mark returned by controller"`
- `#define G_BAD_VALUE_RANGE -10002`
Bad value or range, e.g. GCon g variable passed to function was bad.
- `#define G_BAD_VALUE_RANGE_S "value passed to function was bad or out of range"`
- `#define G_BAD_FULL_MEMORY -10003`
Not enough memory for an operation, e.g. all connections allowed for a process already taken.
- `#define G_BAD_FULL_MEMORY_S "operation could not complete because of a memory error"`
- `#define G_BAD_LOST_DATA -10004`
Lost data, e.g. GCommand() response buffer was too small for the controller's response.
- `#define G_BAD_LOST_DATA_S "data was lost due to buffer or fifo limitations"`
- `#define G_BAD_FILE -10005`
Bad file path, bad file contents, or bad write.
- `#define G_BAD_FILE_S "file was not found, contents are invalid, or write failed"`
- `#define G_BAD_ADDRESS -10006`
Bad address.
- `#define G_BAD_ADDRESS_S "a bad address was specified in open"`
- `#define G_BAD_FIRMWARE_LOAD -10008`
Bad firmware upgrade.
- `#define G_BAD_FIRMWARE_LOAD_S "Firmware upgrade failed"`
- `#define G_GCAPS_OPEN_ERROR -20000`
gcaps connection couldn't open. Server is not running or is not reachable.
- `#define G_GCAPS_OPEN_ERROR_S "gcaps connection could not be opened"`
- `#define G_GCAPS_SUBSCRIPTION_ERROR -20002`
GMessage(), GRecord(), GInterrupt() called on a connection without --subscribe switch.
- `#define G_GCAPS_SUBSCRIPTION_ERROR_S "function requires subscription not specified in GOpen()"`

Typedefs

- `typedef int GReturn`
Every function returns a value of type GReturn. See [gclib_errors.h](#) for possible values.
- `typedef void * GCon`
Connection handle. Unique for each connection in process. Assigned a non-zero value in GOpen().
- `typedef unsigned int GSize`
Size of buffers, etc.
- `typedef int GOption`
Option integer for various formatting, etc.
- `typedef char * GCStringOut`
C-string output from the library. Implies null-termination.
- `typedef const char * GCStringIn`
C-string input to the library. Implies null-termination.
- `typedef char * GBufOut`
Data output from the library. No null-termination implied. Returned values may be null-terminated, see function documentation for details.
- `typedef const char * GBufIn`
Data input to the library. No null-termination, function will have a GSize to indicate bytes to write .
- `typedef unsigned char GStatus`
Interrupt status byte.
- `typedef void * GMemory`
Pointer to untyped memory for use in GUtility().
- `typedef uint8_t UB`

- typedef uint16_t **UW**
- typedef int16_t **SW**
- typedef int32_t **SL**
- typedef uint32_t **UL**

Functions

- GCLIB_DLL_EXPORTED **GReturn GCALL GOpen** (**GCStringIn** address, **GCon** *g)
Open a connection to a Galil Controller.
- GCLIB_DLL_EXPORTED **GReturn GCALL GClose** (**GCon** g)
Closes a connection to a Galil Controller.
- GCLIB_DLL_EXPORTED **GReturn GCALL GRead** (**GCon** g, **GBufOut** buffer, **GSize** buffer_len, **GSize** *bytes_read)
Performs a read on the connection.
- GCLIB_DLL_EXPORTED **GReturn GCALL GWrite** (**GCon** g, **GBufIn** buffer, **GSize** buffer_len)
Performs a write on the connection.
- GCLIB_DLL_EXPORTED **GReturn GCALL GCommand** (**GCon** g, **GCStringIn** command, **GBufOut** buffer, **GSize** buffer_len, **GSize** *bytes_returned)
Performs a command-and-response transaction on the connection.
- GCLIB_DLL_EXPORTED **GReturn GCALL GProgramDownload** (**GCon** g, **GCStringIn** program, **GCStringIn** preprocessor)
Downloads a program to the controller's program buffer.
- GCLIB_DLL_EXPORTED **GReturn GCALL GProgramUpload** (**GCon** g, **GBufOut** buffer, **GSize** buffer_len)
Uploads a program from the controller's program buffer.
- GCLIB_DLL_EXPORTED **GReturn GCALL GArrayDownload** (**GCon** g, const **GCStringIn** array_name, **GOption** first, **GOption** last, **GCStringIn** buffer)
Downloads array data to a pre-dimensioned array in the controller's array table.
- GCLIB_DLL_EXPORTED **GReturn GCALL GArrayUpload** (**GCon** g, const **GCStringIn** array_name, **GOption** first, **GOption** last, **GOption** delim, **GBufOut** buffer, **GSize** buffer_len)
Uploads array data from the controller's array table.
- GCLIB_DLL_EXPORTED **GReturn GCALL GRecord** (**GCon** g, union **GDataRecord** *record, **GOption** method)
*Provides a fresh copy of the controller's data record. Data is cast into a union, **GDataRecord**.*
- GCLIB_DLL_EXPORTED **GReturn GCALL GMessage** (**GCon** g, **GCStringOut** buffer, **GSize** buffer_len)
Provides access to unsolicited messages from the controller.
- GCLIB_DLL_EXPORTED **GReturn GCALL GInterrupt** (**GCon** g, **GStatus** *status_byte)
Provides access to PCI and UDP interrupts from the controller.
- GCLIB_DLL_EXPORTED **GReturn GCALL GFirmwareDownload** (**GCon** g, **GCStringIn** filepath)
Upgrade firmware.
- GCLIB_DLL_EXPORTED **GReturn GCALL GUtility** (**GCon** g, **GOption** request, **GMemory** memory1, **GMemory** memory2)
Provides read/write access to driver settings and convenience features based on the request variable.
- GCLIB_DLL_EXPORTED void **GCALL GSleep** (unsigned int timeout_ms)
*Uses **GUtility()** and **G_UTIL_SLEEP** to provide a blocking sleep call which can be useful for timing-based chores.*
- GCLIB_DLL_EXPORTED **GReturn GCALL GVersion** (**GCStringOut** ver, **GSize** ver_len)
*Uses **GUtility()**, **G_UTIL_VERSION** and **G_UTIL_GCAPS_VERSION** to provide the library and **gcaps** version numbers.*
- GCLIB_DLL_EXPORTED **GReturn GCALL GAddresses** (**GCStringOut** addresses, **GSize** addresses_len)
*Uses **GUtility()**, **G_UTIL_GCAPS_ADDRESSES** or **G_UTIL_ADDRESSES** to provide a listing of all available connection addresses.*
- GCLIB_DLL_EXPORTED **GReturn GCALL GInfo** (**GCon** g, **GCStringOut** info, **GSize** info_len)
*Uses **GUtility()** and **G_UTIL_INFO** to provide a useful connection string.*
- GCLIB_DLL_EXPORTED **GReturn GCALL GTimeout** (**GCon** g, short timeout_ms)

- Uses [GUtility\(\)](#) and [G_UTIL_TIMEOUT_OVERRIDE](#) to set the library timeout.*

 - GCLIB_DLL_EXPORTED [GReturn GCALL GCmd](#) (GCon g, [GCStringIn](#) command)

Wrapper around GCommand for use when the return value is not desired.
- GCLIB_DLL_EXPORTED [GReturn GCALL GCmdT](#) (GCon g, [GCStringIn](#) command, [GCStringOut](#) trimmed↔_response, [GSize](#) response_len, [GCStringOut](#) *front)

Wrapper around GCommand that trims the response.
- GCLIB_DLL_EXPORTED [GReturn GCALL GCmdI](#) (GCon g, [GCStringIn](#) command, int *value)

Wrapper around GCommand that provides the return value of a command parsed into an int.
- GCLIB_DLL_EXPORTED [GReturn GCALL GCmdD](#) (GCon g, [GCStringIn](#) command, double *value)

Wrapper around GCommand that provides the return value of a command parsed into a double.
- GCLIB_DLL_EXPORTED [GReturn GCALL GWaitForBool](#) (GCon g, [GCStringIn](#) predicate, int trials)

Blocking call that returns when the controller evaluates the predicate as true.
- GCLIB_DLL_EXPORTED [GReturn GCALL GMotionComplete](#) (GCon g, [GCStringIn](#) axes)

Blocking call that returns once all axes specified have completed their motion.
- GCLIB_DLL_EXPORTED [GReturn GCALL GRecordRate](#) (GCon g, double period_ms)

Sets the asynchronous data record to a user-specified period via DR.
- GCLIB_DLL_EXPORTED [GReturn GCALL GProgramDownloadFile](#) (GCon g, [GCStringIn](#) file_path, [GCStringIn](#) preprocessor)

Program download from file.
- GCLIB_DLL_EXPORTED [GReturn GCALL GProgramUploadFile](#) (GCon g, [GCStringIn](#) file_path)

Program upload to file.
- GCLIB_DLL_EXPORTED [GReturn GCALL GArrayDownloadFile](#) (GCon g, [GCStringIn](#) file_path)

Array download from file.
- GCLIB_DLL_EXPORTED [GReturn GCALL GArrayUploadFile](#) (GCon g, [GCStringIn](#) file_path, [GCStringIn](#) names)

Array upload to file.
- GCLIB_DLL_EXPORTED [GReturn GCALL GIpRequests](#) ([GCStringOut](#) requests, [GSize](#) requests_len)

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_IPREQUEST](#) or [G_UTIL_IPREQUEST](#) to provide a list of all Galil controllers requesting IP addresses via BOOT-P or DHCP.
- GCLIB_DLL_EXPORTED [GReturn GCALL GSetServer](#) ([GCStringIn](#) server_name)

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SET_SERVER](#) to set the new active server.
- GCLIB_DLL_EXPORTED [GReturn GCALL GListServers](#) ([GCStringOut](#) servers, [GSize](#) servers_len)

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_LIST_SERVERS](#) to provide a list of all available gcaps services on the local network.
- GCLIB_DLL_EXPORTED [GReturn GCALL GPublishServer](#) ([GCStringIn](#) name, [GOption](#) publish, [GOption](#) save)

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_PUBLISH_SERVER](#) to publish local gcaps server to the local network.
- GCLIB_DLL_EXPORTED [GReturn GCALL GServerStatus](#) ([GCStringOut](#) status, [GSize](#) status_len)

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SERVER_STATUS](#) to get information on the local server name and if it is published to the local network.
- GCLIB_DLL_EXPORTED [GReturn GCALL GRemoteConnections](#) ([GCStringOut](#) connections, [GSize](#) connections_length)

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_REMOTE_CONNECTIONS](#) to get a list of remote addresses connected to the local server.
- GCLIB_DLL_EXPORTED [GReturn GCALL GAssign](#) ([GCStringIn](#) ip, [GCStringIn](#) mac)

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ASSIGN](#) or [G_UTIL_ASSIGN](#) to assign an IP address over the Ethernet to a controller at a given MAC address.
- GCLIB_DLL_EXPORTED void [GCALL GError](#) ([GReturn](#) rc, [GCStringOut](#) error, [GSize](#) error_len)

Provides a human-readable description string for return codes.
- GCLIB_DLL_EXPORTED [GReturn GCALL GSetupDownloadFile](#) (GCon g, [GCStringIn](#) file_path, [GOption](#) options, [GCStringOut](#) info, [GSize](#) info_len)

Download a saved controller configuration from a file.

10.1.2 Function Documentation

10.1.2.1 GAddresses()

```
GReturn GCALL GAddresses (
    GCStringOut addresses,
    GSize addresses_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ADDRESSES](#) or [G_UTIL_ADDRESSES](#) to provide a listing of all available connection addresses.

Note

Serial ports are listed, e.g. COM1. Upon open, it may be necessary to specify a baud rate for the controller, e.g. `--baud 19200`. Default baud is 115200. See [GOpen\(\)](#).

Parameters

<i>addresses</i>	Buffer to hold the output string. Buffer will be null terminated, even if the data must be truncated to do so. See below for more information.
<i>addresses_len</i>	Length of buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

If [gcaps](#) is available, the listing will come from the server via [G_UTIL_GCAPS_ADDRESSES](#). In the absence of the server, gclib will use [G_UTIL_ADDRESSES](#) to generate the list.

- Ethernet controllers will be listed as *ip_address, revision_report, network_adapter_name, network_adapter↵_ip_address*. If an IP address is unreachable via ping, the address will be in parentheses.
- PCI controllers will be listed by their identifier, e.g. GALILPCI1.
- Serial ports will be listed by their identifier, e.g. COM1.

```
10.1.3.91, DMC4020 Rev 1.2e, LAN, 10.1.3.10
192.168.0.63, DMC4040 Rev 1.2f, Static, 192.168.0.41
(192.0.0.42), RIO47102 Rev 1.1j, Static, 192.168.0.41
GALILPCI1
COM1
COM2
```

Note

[GAddresses\(\)](#) will take up to 1 second to look for [gcaps](#).

See [x_examples.cpp](#) for an example.

Definition at line 54 of file [gclibo.c](#).

References [G_NO_ERROR](#), [G_UTIL_ADDRESSES](#), [G_UTIL_GCAPS_ADDRESSES](#), and [GUtility\(\)](#).

10.1.2.2 GArrayDownload()

```
GCLIB_DLL_EXPORTED GReturn GCALL GArrayDownload (
    GCon g,
    const GCStringIn array_name,
    GOption first,
    GOption last,
    GCStringIn buffer )
```

Downloads array data to a pre-dimensioned array in the controller's array table.

Warning

The array must already exist on the controller and be sufficient dimension to hold the desired array data, e.g. via DM.

Parameters

<i>g</i>	Connection's handle.
<i>array_name</i>	Null-terminated string containing the name of the array to download. Must match the array name used in DM.
<i>first</i>	The first element of the array for sub-array downloads. <code>G_BOUNDS</code> to omit.
<i>last</i>	The last element of the array for sub-array downloads. <code>G_BOUNDS</code> to omit.
<i>buffer</i>	Buffer containing the null-terminated data to be sent to the controller. The array data may be separated with <i>carriage return</i> , <i>carriage return + line feed</i> , or a <i>comma</i> . No spaces.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_arrays.cpp` for an example.

Referenced by `H_DownloadArraysFromList()`.

10.1.2.3 GArrayDownloadFile()

```
GCLIB_DLL_EXPORTED GReturn GCALL GArrayDownloadFile (
    GCon g,
    GCStringIn file_path )
```

Array download from file.

Downloads a csv file containing array data at `file_path`. If the arrays don't exist, they will be dimensioned.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the array file.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_arrays.cpp` for an example.

Definition at line 380 of file `arrays.c`.

References `G_BAD_FILE`, `G_NO_ERROR`, and `H_ArrayDownloadFromMemory()`.

10.1.2.4 GArrayUpload()

```
GCLIB_DLL_EXPORTED GReturn GCALL GArrayUpload (
    GCon g,
    const GCStringIn array_name,
    GOption first,
    GOption last,
    GOption delim,
    GBufOut buffer,
    GSize buffer_len )
```

Uploads array data from the controller's array table.

Parameters

<i>g</i>	Connection's handle.
<i>array_name</i>	Null-terminated string containing the name of the array to upload.
<i>first</i>	The first element of the array for sub-array uploads. <code>G_BOUNDS</code> to omit.
<i>last</i>	The last element of the array for sub-array uploads. <code>G_BOUNDS</code> to omit.
<i>delim</i>	Sets the delimiter between array elements in the returned data, <code>G_CR</code> specifies carriage return, <code>G_COMMA</code> specifies comma.
<i>buffer</i>	Buffer to receive the uploaded data. The data will be null terminated unless function returns <code>G_BAD_LOST_DATA</code> due to the buffer being too small to hold the data.
<i>buffer_len</i>	The length of the receive buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_arrays.cpp` for an example.

Referenced by `H_UploadArrayToList()`, and `write_array_to_file()`.

10.1.2.5 GArrayUploadFile()

```
GCLIB_DLL_EXPORTED GReturn GCALL GArrayUploadFile (
    GCon g,
    GCStringIn file_path,
    GCStringIn names )
```

Array upload to file.

Uploads the entire controller array table or a subset and saves the data as a csv file specified by `file_path`.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the array file, file will be overwritten if it exists.
<i>names</i>	Null-terminated string containing the arrays to upload, delimited with space. "" or null uploads all arrays listed in LA.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_arrays.cpp` for an example.

Definition at line 408 of file `arrays.c`.

References `G_NO_ERROR`, `GCmdT()`, `H_FreeArrays()`, `H_InitArrayNode()`, `H_UploadArrayToList()`, and `H_WriteArrayCsv()`.

10.1.2.6 GAssign()

```
GReturn GCALL GAssign (
    GCStringIn ip,
    GCStringIn mac )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ASSIGN](#) or [G_UTIL_ASSIGN](#) to assign an IP address over the Ethernet to a controller at a given MAC address.

Parameters

<i>ip</i>	The null-terminated ip address to assign. The hardware should not yet have an IP address.
<i>mac</i>	The null-terminated MAC address of the hardware.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

On Linux and Mac, the desired IP address will be pinged prior to the assignment. If the ping is returned, [GAssign\(\)](#) will return [G_GCLIB_UTILITY_IP_TAKEN](#).

If [gcaps](#) is available, the assign will be performed from the server via [G_UTIL_GCAPS_ASSIGN](#). [gcaps](#) will remember the assignment and will automatically assign the desired IP address should the controller ever request one again, e.g. after a controller master reset. To clear the remembered IP address from [gcaps](#), call [GAssign\(\)](#) with a blank string in place of the ip address. To remove all remembered ip addresses, specify a blank string for the mac address.

In the absence of the server, [gclib](#) will use [G_UTIL_ASSIGN](#) to assign. [GAssign\(\)](#) will take up to 1 second to look for [gcaps](#). When not using [gcaps](#), Linux/OS X users must be root to use [GAssign\(\)](#) and have UDP access to send on port 68.

See [x_examples.cpp](#) for an example.

Definition at line 70 of file [gclibo.c](#).

References [G_GCLIB_UTILITY_IP_TAKEN](#), [G_NO_ERROR](#), [G_UTIL_ASSIGN](#), [G_UTIL_GCAPS_ASSIGN](#), [G_UTIL_GCAPS_PING](#), [G_UTIL_PING](#), and [GUtility\(\)](#).

10.1.2.7 GCclose()

```
GCLIB_DLL_EXPORTED GReturn GCALL GCclose (
    GCon g )
```

Closes a connection to a Galil Controller.

Attention

gclib requires that [GCclose\(\)](#) be called whenever a program is finished with a controller. This includes when a program closes. A rule of thumb is that for every [GOpen\(\)](#) call on a given connection, a [GCclose\(\)](#) call should be found on every code path. Failing to call [GCclose\(\)](#) may cause controller resources to not be released or can hang the process if there are outstanding asynchronous operations. The latter can occur, for example, if a call to [GRead\(\)](#) times out and the process exits without calling [GCclose\(\)](#). In this case, [GRead\(\)](#) still has an outstanding asynchronous read pending. [GCclose\(\)](#) will terminate this operation allowing the process to exit correctly.

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [x_examples.cpp](#) for an example.

10.1.2.8 GCmd()

```
GReturn GCALL GCmd (
    GCon g,
    GCStringIn command )
```

Wrapper around [GCommand](#) for use when the return value is not desired.

The returned data is still checked for error, e.g. ? or timeout, but is not brought out through the prototype.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 237 of file `gclibo.c`.

References `G_SMALL_BUFFER`, and `GCommand()`.

Referenced by `check_interrupts()`, `commands()`, `contour()`, `GRecordRate()`, `H_DownloadArraysFromList()`, `H_DownloadData()`, `jog()`, `load_buf()`, `load_buffer()`, `message()`, `motion_complete()`, `position_tracking()`, `record_position()`, and `vector()`.

10.1.2.9 GCmdD()

```
GReturn GCALL GCmdD (
    GCon g,
    GCStringIn command,
    double * value )
```

Wrapper around `GCommand` that provides the return value of a command parsed into a double.

Use this function to retrieve the full Galil 4.2 range, e.g. for a variable value with fractional data, or the value of an Analog input or Output.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.
<i>value</i>	Pointer to a double that will be filled with the return value.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 289 of file `gclibo.c`.

References `G_NO_ERROR`, `G_SMALL_BUFFER`, and `GCommand()`.

Referenced by `commands()`, and `GRecordRate()`.

10.1.2.10 GCmdI()

```
GReturn GCALL GCmdI (
    GCon g,
    GCStringIn command,
    int * value )
```

Wrapper around `GCommand` that provides the return value of a command parsed into an int.

Use this function to get most values including TP, RP, TE, Digital I/O states, etc.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.
<i>value</i>	Pointer to an int that will be filled with the return value.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 278 of file `gclibo.c`.

References `G_NO_ERROR`, `G_SMALL_BUFFER`, and `GCommand()`.
 Referenced by `commands()`, `record_position()`, and `vector()`.

10.1.2.11 GCmdT()

```
GReturn GCALL GCmdT (
    GCon g,
    GCStringIn command,
    GCStringOut trimmed_response,
    GSize response_len,
    GCStringOut * front )
```

Wrapper around `GCommand` that trims the response.

For use when the return value is desired, is ASCII (not binary), and the response should be trimmed of trailing colon, whitespace, and optionally leading space.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.
<i>trimmed_response</i>	The trimmed response from the controller. Trailing space is trimmed by null terminating any trailing spaces, carriage returns, or line feeds.
<i>response_len</i>	The length of the <i>trimmed_response</i> buffer.
<i>front</i>	If non-null, upon return <i>*front</i> will point to the first non-space character in <i>trimmed_response</i> . This allows trimming the front of the string without modifying the user's buffer pointer, which may be allocated on the heap.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 243 of file `gclibo.c`.

References `G_NO_ERROR`, and `GCommand()`.

Referenced by `commands()`, `GArrayUploadFile()`, `GRecordRate()`, and `motion_complete()`.

10.1.2.12 GCommand()

```
GCLIB_DLL_EXPORTED GReturn GCALL GCommand (
    GCon g,
    GCStringIn command,
    GBufOut buffer,
    GSize buffer_len,
    GSize * bytes_returned )
```

Performs a *command-and-response* transaction on the connection.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller. The library will append a carriage return to the command string.
<i>buffer</i>	Buffer for the response. Will be filled with the response from the controller. The data will be null terminated unless the function returns <code>G_BAD_LOST_DATA</code> due to the buffer being too small to hold the data.
<i>buffer_len</i>	The size of the response buffer.
<i>bytes_returned</i>	The size of the data returned from the controller. This does not include null termination. This argument may be null if the value is not desired.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Referenced by `commands()`, `error()`, `GCmd()`, `GCmdD()`, `GCmdI()`, `GCmdT()`, `GWaitForBool()`, and `motion_↔complete()`.

10.1.2.13 GError()

```
void GCALL GError (
    GReturn rc,
    GCStringOut error,
    GSize error_len )
```

Provides a human-readable description string for return codes.

Parameters

<i>rc</i>	The return code to lookup.
<i>error</i>	The buffer to fill with the error text. Buffer will be null terminated, even if the data must be truncated to do so.
<i>error_len</i>	The length of the error buffer.

See `x_examples.cpp` for an example.

Definition at line 459 of file `gclibo.c`.

References `G_NO_ERROR`.

Referenced by `error()`.

10.1.2.14 GFirmwareDownload()

```
GCLIB_DLL_EXPORTED GReturn GCALL GFirmwareDownload (
    GCon g,
    GCStringIn filepath )
```

Upgrade firmware.

Parameters

<i>g</i>	Connection's handle.
<i>filepath</i>	The full file path to the Galil-supplied firmware hex file. See http://www.galil.com/downloads/firmware

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

```
ec(GInfo(g, buf, sizeof(buf))); //get conntroller info
cout << buf << '\n'; //print the info
ec(GFirmwareDownload(g, "F:/1806.dmc/dmc-1806-r11a.hex"));
ec(GInfo(g, buf, sizeof(buf))); //get the info again
cout << buf << '\n';
// example output:
// GALILPCI1, DMC1846 Rev 1.1a-CM, 4232
// GALILPCI1, DMC1846 Rev 1.1a, 4232
```

10.1.2.15 GInfo()

```
GReturn GCALL GInfo (
    GCon g,
```



```
GCStringOut info,
GSize info_len )
```

Uses [GUtility\(\)](#) and [G_UTIL_INFO](#) to provide a useful connection string.

Parameters

<i>g</i>	Connection's handle.
<i>info</i>	Buffer to hold the output string. Buffer will be null terminated, even if the data must be truncated to do so.
<i>info_len</i>	Length of buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

The response is *address*, *revision_report*, *serial_number*. For example:

```
COM2, RIO47102 Rev 1.1j, 37290
```

See `x_examples.cpp` for an example.

Definition at line 49 of file `gclibo.c`.

References [G_UTIL_INFO](#), and [GUtility\(\)](#).

10.1.2.16 GInterrupt()

```
GCLIB_DLL_EXPORTED GReturn GCALL GInterrupt (
    GCon g,
    GStatus * status_byte )
```

Provides access to PCI and UDP interrupts from the controller.

Interrupts can be generated automatically by the firmware on important events via `EI` (Enable Interrupt) or by the user in embedded DMC code via `UI` (User Interrupt). To use this function, `-s EI` must be used in the [GOpen\(\)](#) address string to subscribe to interrupts.

Parameters

<i>g</i>	Connection's handle.
<i>status_byte</i>	A pointer to a <code>GStatus</code> to receive the status byte.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

[GInterrupt\(\)](#) will block until an interrupt is received, or the function times out.

Note

If this function is called with a timeout of zero, a non-blocking read is performed. If interrupt data is waiting in the interrupt queue, the oldest byte will be popped off the queue. If there is no interrupt data queued, but there is data waiting in the socket or PCI FIFO, one read will be performed to process the waiting data. If new data is still not found after these two attempts, `G_GCLIB_NON_BLOCKING_READ_EMPTY` will be returned.

See `x_ginterrupt.cpp` for an example. See `x_nonblocking.cpp` for an example of non-blocking usage.

Referenced by `check_interrupts()`, and `motion_complete()`.

10.1.2.17 GIpRequests()

```
GReturn GCALL GIpRequests (
    GCStringOut requests,
    GSize requests_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_IPREQUEST](#) or [G_UTIL_IPREQUEST](#) to provide a list of all Galil controllers requesting IP addresses via BOOT-P or DHCP.

Parameters

<i>requests</i>	The buffer to hold the list of requesting controllers. Data will be null terminated, even if the data must be truncated to do so. See below for more information.
<i>requests_len</i>	The length of the requests buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

[GlpRequests\(\)](#) will block up to 5 seconds while listening for requests.

If [gcaps](#) is available, the listing will come from the server via [G_UTIL_GCAPS_IPREQUEST](#). In the absence of the server, gclib will use [G_UTIL_IPREQUEST](#) to generate the list. [GlpRequests\(\)](#) will take up to 1 second to look for [gcaps](#). When not using [gcaps](#), Linux/OS X users must be root to use [GlpRequests\(\)](#) and have UDP access to bind and listen on port 67.

Each line of the returned data will be of the form *model, serial_number, MAC_address, network_adapter_name, network_adapter_ip_address, remembered_ip_assignment*. See [GAssign\(\)](#) for more information about remembered IP assignments. The following is an example output.

```
DMC2000, 34023, 00:50:4C:00:84:E7, enp5s0, 192.168.42.92, 192.168.42.200
DMC2105, 7, 00:50:4C:58:00:07, enp5s0, 192.168.42.92, 0.0.0.0
DMC2105, 13, 00:50:4C:58:00:0D, enp5s0, 192.168.42.92, 0.0.0.0
```

See [x_examples.cpp](#) for an example.

Definition at line 106 of file [gclibo.c](#).

References [G_NO_ERROR](#), [G_UTIL_GCAPS_IPREQUEST](#), [G_UTIL_IPREQUEST](#), [GSleep\(\)](#), and [GUtility\(\)](#).

Referenced by [ip_assigner\(\)](#).

10.1.2.18 GListServers()

```
GReturn GCALL GListServers (
    GCStringOut servers,
    GSize servers_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_LIST_SERVERS](#) to provide a list of all available gcaps services on the local network.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>servers</i>	The buffer to hold the list of available gcaps servers
<i>servers_len</i>	The length of the servers buffer

This function is used to find a list of available gcaps servers that have made themselves "Discoverable". The list of available servers are separated by a newline '\n' character.

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 169 of file gclibo.c.

References `G_GCAPS_OPEN_ERROR`, `G_NO_ERROR`, `G_UTIL_GCAPS_LIST_SERVERS`, and `GUtility()`.

10.1.2.19 GMessage()

```
GCLIB_DLL_EXPORTED GReturn GCALL GMessage (
    GCon g,
    GCStringOut buffer,
    GSize buffer_len )
```

Provides access to unsolicited messages from the controller.

To use this function, `-s MG` must be used in the [GOpen\(\)](#) `address` string to subscribe to messages. Unsolicited bytes must be flagged by the high-bit setting, `CW 1`. The driver will automatically set this when subscribing to messages. The user should not overwrite this setting.

Unsolicited messages are data generated by the controller that are not in response to a command, a data record, or an interrupt. Examples follow.

1. Data generated by the `MG` command from embedded code. `MG` sent from the host is solicited.
2. Any command in an embedded program that returns data, e.g. `TP, RP, var=?`
3. A run time error in an embedded program, e.g. `?55 i=var`

Note

Messages are unframed byte streams. There is no guarantee that the user will get complete messages or single messages in a call to [GMessage\(\)](#).

Parameters

<i>g</i>	Connection's handle.
<i>buffer</i>	The buffer to write the message data. The buffer will be null terminated.
<i>buffer_len</i>	The length of the user's buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

[GMessage\(\)](#) will block until a message is received, or the function times out.

Note

If this function is called with a timeout of zero, a non-blocking read is performed. If message data has been processed since the last time the function was called, this data will be returned. If there is no processed message data, but there is data waiting in the socket or PCI FIFO, one read will be performed to process the waiting data. If new data is still not found after these two attempts, `G_GCLIB_NON_BLOCKING_READ_←EMPTY` will be returned.

Warning

When sending message streams through [gcaps](#), the following non-printable bytes are illegal, `$00-$07` and `$10-$17`. These bytes may be routed to a third party device such as an HMI or display panel. See `MG` and `CF`.

See `x_gmessage.cpp` for an example. See `x_nonblocking.cpp` for an example of non-blocking usage.

Referenced by `message()`.

10.1.2.20 GMotionComplete()

```
GReturn GCALL GMotionComplete (
    GCon g,
    GCStringIn axes )
```

Blocking call that returns once all axes specified have completed their motion.

Note

This function uses a profiled motion indicator, not the position of the encoder. E.G. see the difference between AM (profiled) and MC (encoder-based).

Although using the `_BGm` operand is the most generally compatible method, there are higher-performance ways to check for motion complete by using the data record, or interrupts. See examples `x_dr_motioncomplete()` and `x_ei_motioncomplete()`.

Parameters

<i>g</i>	Connection's handle.
<i>axes</i>	A null-terminated string containing a multiple-axes mask. Every character in the string should be a valid argument to <code>MG_BGm</code> , i.e. XYZWABCEFGHST.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gmotioncomplete.cpp` for an example.

Definition at line 300 of file `gclibo.c`.

References `G_NO_ERROR`, and `GWaitForBool()`.

Referenced by `contour()`, `jog()`, `position_tracking()`, and `vector()`.

10.1.2.21 GOpen()

```
GCLIB_DLL_EXPORTED GReturn GCALL GOpen (
    GCStringIn address,
    GCon * g )
```

Open a connection to a Galil Controller.

Parameters

<i>address</i>	Null-terminated address string. See table below.
<i>g</i>	Pointer to user's <code>GCon</code> variable. On success, the library will fill the user's variable with the handle to use for the rest of the connection. A valid <code>g</code> value is nonzero.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

address switch	Meaning	Arguments (default), other options	Examples
<code>--address</code>	Simple address to hardware	<i>IP address, PCI, COM port</i>	<code>--address COM1</code>
<code>-a</code>	shorthand for <code>--address</code>	See <i>Address Ranges</i> below	<code>-a GALILPCI1</code>
{no switch}	<code>--address</code> is implicit for any lone token		<code>192.168.0.42</code>

address switch	Meaning	Arguments (default), other options	Examples
--baud	Baud rate	(115200), <i>valid baud...</i>	COM2 --baud 19200
-b	shorthand for --baud		COM3 -b 38400
--command	Command-and-response socket protocol	(TCP), UDP	192.168.0.42 --command TCP
-c	shorthand for --command		192.168.0.42 -c UDP
--direct	Connect directly to hardware instead of via gcaps		-a GALILPCI2 --direct
-d	shorthand for --direct		GALILPCI2 -d
--subscribe	Subscribe to messages, data records, and/or interrupts	(NONE), MG, DR, EI, ALL	192.168.0.42 --subscribe MG
-s	shorthand for --subscribe		192.168.0.42 -s DR -s EI
--timeout	timeout in ms	(5000), <i>0-65535</i>	192.168.0.42 --timeout 5000
-t	shorthand for --timeout		GALILPCI2 -t 500
--unsolicited	Unsolicited socket protocol	(UDP), NONE	192.168.0.42 --unsolicited NONE
-u	shorthand for --unsolicited		192.168.1.42 -u UDP
The following address switches are deprecated and will be unavailable starting July 1st, 2020.			
--p1	Primary port for command-and-response traffic	(23), <i>valid port number</i>	192.168.0.42 --p1 5000
--p2	Secondary port for unsolicited traffic	(60007), <i>valid port number</i>	192.168.0.42 --p2 5000

Operating System	Address Range	Notes
Windows	COM1 - COM256	RS232 and USB-to-serial
Linux	/dev/ttyS0 - /dev/ttyS255	RS232
Linux	/dev/ttyUSB0 - /dev/ttyUSB255	USB-to-serial, e.g. DMC-4103
Windows	GALILPCI1 - GALILPCI8	PCI
Linux	/dev/galilpci0 - /dev/galilpci7	PCI

See `x_examples.cpp` for an example.

When connecting to a network device, if the command-and-response socket is opened successfully but the unsolicited socket fails, `GOpen()` will still complete successfully. This allows connection to a Galil controller when only one Ethernet handle is available. Unsolicited traffic will not be accessible in this case.

10.1.2.22 GProgramDownload()

```
GCLIB_DLL_EXPORTED GReturn GCALL GProgramDownload (
    GCon g,
    GCStringIn program,
    GCStringIn preprocessor )
```

Downloads a program to the controller's program buffer.

Parameters

<i>g</i>	Connection's handle.
<i>program</i>	Null-terminated program for download.
<i>preprocessor</i>	Options string for preprocessing the program before sending it to the controller. Null allows the library to use defaults for the download. See the Program Preprocessor documentation for options.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_programs.cpp` for an example.

Referenced by `GProgramDownloadFile()`, `GSetupDownloadFile()`, `message()`, and `record_position()`.

10.1.2.23 GProgramDownloadFile()

```
GReturn GCALL GProgramDownloadFile (
    GCon g,
    GCStringIn file_path,
    GCStringIn preprocessor )
```

Program download from file.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the program file.
<i>preprocessor</i>	Options string for preprocessing the program before sending it to the controller. See GProgramDownload() .

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_programs.cpp` for an example.

Definition at line 387 of file `gclibo.c`.

References `G_BAD_FILE`, `G_BAD_FULL_MEMORY`, `G_NO_ERROR`, and `GProgramDownload()`.

10.1.2.24 GProgramUpload()

```
GCLIB_DLL_EXPORTED GReturn GCALL GProgramUpload (
    GCon g,
    GBufOut buffer,
    GSize buffer_len )
```

Uploads a program from the controller's program buffer.

Parameters

<i>g</i>	Connection's handle.
<i>buffer</i>	Buffer to receive the controller's program. The data will be null terminated unless function returns <code>G_BAD_LOST_DATA</code> due to the buffer being too small to hold the data.
<i>buffer_len</i>	The length of the receive buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_programs.cpp` for an example.
Referenced by `GProgramUploadFile()`.

10.1.2.25 GProgramUploadFile()

```
GReturn GCALL GProgramUploadFile (
    GCon g,
    GCStringIn file_path )
```

Program upload to file.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the program file, file will be overwritten if it exists.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_programs.cpp` for an example.
Definition at line 430 of file `gclibo.c`.
References `G_BAD_FILE`, `G_BAD_FULL_MEMORY`, `G_NO_ERROR`, `GProgramUpload()`, and `MAXPROG`.

10.1.2.26 GPublishServer()

```
GReturn GCALL GPublishServer (
    GCStringIn name,
    GOption publish,
    GOption save )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_PUBLISH_SERVER](#) to publish local gcaps server to the local network.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>name</i>	The name of the server to publish or remove
<i>publish</i>	Option to publish or remove server from network
<i>save</i>	Option to save this configuration for future reboots

This function is used to make your local gcaps server "Discoverable" or "Invisible"
publish Option:

Set to 1 to publish server to the network and make "Discoverable"

Set to 0 to remove server from the network and make "Invisible"

save Option:

Set to 1 to save the configuration for future reboots of the server

Set to 0 to use this configuration once, and not overwrite previous server settings

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 189 of file gclibo.c.

References `G_GCAPS_OPEN_ERROR`, `G_NO_ERROR`, `G_UTIL_GCAPS_PUBLISH_SERVER`, and `GUtility()`.

Referenced by `remote_server()`.

10.1.2.27 GRead()

```
GCLIB_DLL_EXPORTED GReturn GCALL GRead (
    GCon g,
    GBufOut buffer,
    GSize buffer_len,
    GSize * bytes_read )
```

Performs a read on the connection.

Parameters

<i>g</i>	Connection's handle.
<i>buffer</i>	The user's read buffer.
<i>buffer_len</i>	The length of the user's read buffer.
<i>bytes_read</i>	Pointer to a GSize which will be filled with the number of bytes read upon return.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Warning

This function is deprecated and will be removed in a future gclib version. Please contact Galil for needs not covered by the other gclib functions.

Unsolicited messages may be returned in the read data. The high bit of each message byte will be set unless the user changes the CW setting. Interrupts and Data Records are always filtered from a read.

See `x_gread_gwrite.cpp` for an example.

10.1.2.28 GRecord()

```
GCLIB_DLL_EXPORTED GReturn GCALL GRecord (
    GCon g,
    union GDataRecord * record,
    GOption method )
```

Provides a fresh copy of the controller's data record. Data is cast into a union, [GDataRecord](#).

Parameters

<i>g</i>	Connection's handle.
<i>record</i>	A pointer to the user's DataRecord union to hold the copy.
<i>method</i>	Determines the method for acquiring the data. <ul style="list-style-type: none"> • <code>G_QR</code>: QR is used via command-and-response. • <code>G_DR</code>: DR is used for asynchronous acquisition.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

When using `G_DR`, the asynchronous data record must already be set up.

- `-s DR` must be used in the `GOpen()` `address` string to subscribe to records. The driver will automatically set the second argument of `DR`, where applicable.
- `GRecordRate()` should be issued to set `DR` to an appropriate interval, `n`. The interval must be no faster than the rate at which `GRecord()` is called.

`GRecord()` will block until the data record is received, or the transaction times out.

Note

If this function is called with a timeout of zero and the `G_DR` method, a non-blocking read is performed. If a data record has been processed since the last time the function was called, this data will be returned. If there is not a processed data record, but there is data waiting in the socket or PCI FIFO, one read will be performed to process the waiting data. If new data is still not found after these two attempts, `G_GCLIB_↔NON_BLOCKING_READ_EMPTY` will be returned.

See `x_grecord.cpp` for an example. See `x_nonblocking.cpp` for an example of non-blocking usage.

10.1.2.29 GRecordRate()

```
GReturn GCALL GRecordRate (
    GCon g,
    double period_ms )
```

Sets the asynchronous data record to a user-specified period via `DR`.

Takes `TM` and product type into account and sets the `DR` period to the period requested by the user, if possible.

Parameters

<i>g</i>	Connection's handle.
<i>period_ms</i>	Period, in milliseconds, to set up for the asynchronous data record.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_grecord.cpp` for an example.

Definition at line 342 of file `gclibo.c`.

References `G_NO_ERROR`, `G_SMALL_BUFFER`, `GCmd()`, `GCmdD()`, and `GCmdT()`.

10.1.2.30 GRemoteConnections()

```
GReturn GCALL GRemoteConnections (
    GCStringOut connections,
    GSize connections_length )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_REMOTE_CONNECTIONS](#) to get a list of remote addresses connected to the local server.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>connections</i>	The buffer to hold the list of remote IP addresses currently connected to your hardware
<i>connections_len</i>	The length of the connections buffer

This function is used to find a list of IP Addresses of machines that currently have open connections to your local hardware. If another user sets your local server as their active server, and then opens a connection to your hardware, their IP Address will appear in this list.

The list of IP addresses are separated by a newline '\n' character.

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 217 of file gclibo.c.

References `G_GCAPS_OPEN_ERROR`, `G_NO_ERROR`, `G_UTIL_GCAPS_REMOTE_CONNECTIONS`, and `GUtility()`.

10.1.2.31 GServerStatus()

```
GReturn GCALL GServerStatus (
    GCStringOut status,
    GSize status_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SERVER_STATUS](#) to get information on the local server name and if it is published to the local network.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>status</i>	The buffer to hold the status of the local gcaps server
<i>status_len</i>	The length of the status buffer

This function is used to find the status of your local gcaps server. Use this function to determine the name your server is currently using, and whether or not your gcaps server is currently set to "Discoverable" or "Invisible"

The status buffer will be filled in the form of "[Server Name], [Discoverable]"

For example, for a server with the name "Example Server" that is set to "Discoverable", the status buffer would contain "Example Server, true".

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 149 of file gclibo.c.

References `G_GCAPS_OPEN_ERROR`, `G_NO_ERROR`, `G_UTIL_GCAPS_SERVER_STATUS`, and `GUtility()`.

10.1.2.32 GSetServer()

```
GReturn GCALL GSetServer (
    GCStringIn server_name )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SET_SERVER](#) to set the new active server.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>server_name</i>	The name of the server to set as your new active server.
--------------------	--

Use this function in conjunction with [GListServers\(\)](#). Choose a name received from [GListServers\(\)](#) to set as your new active server.

After setting a new active server, all gclib calls will route through that new active server, unless explicitly noted otherwise.

To set your active server back to your local server, simply pass "Local" to [GSetServer\(\)](#):

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 128 of file gclibo.c.

References [G_GCAPS_OPEN_ERROR](#), [G_NO_ERROR](#), [G_UTIL_GCAPS_SET_SERVER](#), and [GUtility\(\)](#).

10.1.2.33 GSetupDownloadFile()

```
GCLIB_DLL_EXPORTED GReturn GCALL GSetupDownloadFile (
    GCon g,
    GCStringIn file_path,
    GOption options,
    GCStringOut info,
    GSize info_len )
```

Download a saved controller configuration from a file.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the gcb file.
<i>options</i>	Bit mask to determine what configuration data to download. See below for all options.
<i>info</i>	Optional pointer to a buffer to store the controller info. If no info is needed, specify as NULL.
<i>info_len</i>	Length of optional info buffer. If no info is needed, specify as NULL.

Returns

The success status or error code of the function. If the options parameter is set to 0, the return value will be a bit mask indicating which sectors in the specified GCB are not empty. Otherwise, see [gclib_errors.h](#) for possible error values.

Note

By default, [GSetupDownloadFile\(\)](#) will stop immediately if an error is encountered downloading data. This can be overridden in the options parameter. For example, you may want to override the error if you have a backup from an 8-axis controller and want to restore the parameters for the first 4 axes to a 4-axis controller.

If both info and info_len are not NULL, the controller information will be provided regardless of the options parameter. The options parameter is a bit mask. If options is set to 0, [GSetupDownloadFile\(\)](#) will return a bit mask indicating which sectors in the specified GCB are not empty. The following contains a list of all currently available options:

Bit	Value	Function	Description
1	0x0002	Restore parameters	KPA, KIA, KDA, etc...

Bit	Value	Function	Description
3	0x0008	Restore variables	Variables are listed by the LV command
4	0x0010	Restore arrays	Arrays are listed by the LA command
5	0x0020	Restore program	The program is listed by the LS command
31	0x8000	Ignore errors	Ignore invalid parameter errors and continue restoring data. GSetupDownloadFile() will still stop immediately if a connection issue or other fatal error is encountered

Usage example:

```
GCon g;
GOption opt = 0;
GCStringOut info;
GSize info_len = 4096;
GReturn rc = GOpen("192.168.0.50", &g);
if (rc) return rc;
// Call GSetupDownloadFile() with options set to 0 so we can get the non-empty sector bit mask
opt = GSetupDownloadFile(g, "C:\\path\\to\\gcb\\file.gcb", 0, NULL, NULL);
info = (GCStringOut)malloc(sizeof(GCStringOut) * info_len);
// Call GSetupDownloadFile() with the bit mask returned in the previous function call
rc = GSetupDownloadFile(g, "C:\\path\\to\\gcb\\file.gcb", opt, info, info_len);
printf("Info:\n\n%s", info);
GClose(g);
free(info);
return rc;
```

Definition at line 476 of file arrays.c.

References [G_BAD_FILE](#), [G_NO_ERROR](#), [GProgramDownload\(\)](#), [H_ArrayDownloadFromMemory\(\)](#), [H_DownloadData\(\)](#), and [H_FindSector\(\)](#).

10.1.2.34 GSleep()

```
void GCALL GSleep (
    unsigned int timeout_ms )
```

Uses [GUtility\(\)](#) and [G_UTIL_SLEEP](#) to provide a blocking sleep call which can be useful for timing-based chores.

Parameters

<i>timeout_ms</i>	The timeout, in milliseconds, to block before returning.
-------------------	--

See [GWaitForBool\(\)](#) for an example.

Definition at line 24 of file gclibo.c.

References [G_UTIL_SLEEP](#), and [GUtility\(\)](#).

Referenced by [GlpRequests\(\)](#), [GWaitForBool\(\)](#), [record_position\(\)](#), and [vector\(\)](#).

10.1.2.35 GTimeout()

```
GReturn GCALL GTimeout (
    GCon g,
    short timeout_ms )
```

Uses [GUtility\(\)](#) and [G_UTIL_TIMEOUT_OVERRIDE](#) to set the library timeout.

Parameters

<i>g</i>	Connection's handle.
<i>timeout_ms</i>	The value to be used for the timeout. Use G_USE_INITIAL_TIMEOUT to set the timeout back to the initial GOpen() value, <code>--timeout</code> .

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` and `x_gread_gwrite.cpp` for examples.

Definition at line 65 of file `gclibo.c`.

References `G_UTIL_TIMEOUT_OVERRIDE`, and `GUtility()`.

Referenced by `motion_complete()`.

10.1.2.36 GUtility()

```
GCLIB_DLL_EXPORTED GReturn GCALL GUtility (
    GCon g,
    GOption request,
    GMemory memory1,
    GMemory memory2 )
```

Provides read/write access to driver settings and convenience features based on the request variable.

Note

The open source library, [gclibo.h](#), has wrappers for most of these utilities.

Parameters

<i>g</i>	Connection's handle.
<i>request</i>	Defines the request. Input/Output and type of memory are implicit in the value of request. The following lists the supported request values.

- [G_UTIL_TIMEOUT](#) Read initial timeout value, as specified in [GOpen\(\)](#) via `--timeout` switch.
 - `memory1` is output and must be an `unsigned short*`.
 - `memory2` is ignored, use null.
- [G_UTIL_TIMEOUT_OVERRIDE](#) See [GTimeout\(\)](#). Write/Read override timeout value.
 - `memory1` is input. If nonnull, value must be a `short*` holding the override, in milliseconds, for the timeout. Write `G_USE_INITIAL_TIMEOUT` to use initial timeout. If null, no write occurs.
 - `memory2` is output. If nonnull, value must be a `short*` which will be filled with the current override. `G_USE_INITIAL_TIMEOUT` indicates initial timeout used. If null, no read occurs. `memory2` is processed before 'memory1'.
- [G_UTIL_VERSION](#) See [GVersion\(\)](#). Returns the library version. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is output, and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
 - `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_INFO](#) See [GInfo\(\)](#). Returns information about the connection.
 - `memory1` is output and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
 - `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_SLEEP](#) See [GSleep\(\)](#). Platform-independent, non-busy, sleep. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is input and must be an `unsigned int*`, units are milliseconds.
 - `memory2` is ignored, use null.

- [G_UTIL_ADDRESSES](#) see [GAddresses\(\)](#). Provides a \n delimited listing of all available IP addresses, PCI addresses, and COM ports. A valid connection (g) is not necessary, i.e. g may be null. The suffix -d will be appended to each address to indicate these addresses are available via direct connection. See [G_UTIL_↔GCAPS_ADDRESSES](#) for addresses through [gcaps](#).
 - memory1 is output and must be a char*. Data will be null terminated, even if the data must be truncated to do so.
 - memory2 is input and must be an unsigned int* holding the length of the buffer in memory1.
- [G_UTIL_IPREQUEST](#) see [GIpRequests\(\)](#). Listens and returns a \n delimited listing of Galil MAC addresses sending BOOT-P or DHCP requests. The function will listen, and block, for roughly 5 seconds. A valid connection (g) is not necessary, i.e. g may be null.
 - memory1 is output and must be a char*. Data will be null terminated, even if the data must be truncated to do so.
 - memory2 is input and must be an unsigned int* holding the length of the buffer in memory1.
- [G_UTIL_ASSIGN](#) see [GAssign\(\)](#). Provides a method to assign an IP address given a Galil MAC address. A valid connection (g) is not necessary, i.e. g may be null.
 - memory1 is input and must be a char* containing the null terminated address that is to be assigned. e.g. "192.168.0.43".
 - memory2 is input and must be a char* containing the null terminated controller MAC address. e.g. "00:50:4C:20:01:23".
- [G_UTIL_DEVICE_INITIALIZE](#) Provides a method to reinitialize a connection after a reset, e.g. an RS command. Depending on the device type, the appropriate commands will be sent to configure the communication bus for optimal performance.
 - memory1 is ignored, use null.
 - memory2 is ignored, use null.
- [G_UTIL_PING](#) Uses ICMP ping to determine if an IP address is reachable and assigned. A valid connection (g) is not necessary, i.e. g may be null.
 - memory1 is input and must be a char* containing the null terminated address that is to be pinged. e.g. "192.168.0.43".
 - memory2 is output and must be an int*. The value will be set to zero if the ping times out, and nonzero if a ping reply is returned.
- [G_UTIL_ERROR_CONTEXT](#) More error detail for the last error on [GCon](#), where available. The internal error message is cleared upon read.
 - memory1 is output and must be a char*. Data will be null terminated, even if the data must be truncated to do so.
 - memory2 is input and must be an unsigned int* holding the length of the buffer in memory1.

The following request values are for use with a @ref gcaps server.

- [G_UTIL_GCAPS_VERSION](#) see [GVersion\(\)](#). Returns the [gcaps](#) server version. A valid connection (g) is not necessary, i.e. g may be null. This operation will connect to the server to determine the version.
 - memory1 is output and must be a char*. Data will be null terminated, even if the data must be truncated to do so.
 - memory2 is input and must be an unsigned int* holding the length of the buffer in memory1.
- [G_UTIL_GCAPS_ADDRESSES](#) see [GAddresses\(\)](#). Provides a \n delimited listing of all available IP addresses, PCI addresses, and COM ports as available from the [gcaps](#) server. A valid connection (g) is not necessary, i.e. g may be null.
 - memory1 is output and must be a char*. Data will be null terminated, even if the data must be truncated to do so.

- `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_GCAPS_IPREQUEST](#) see [GIpRequests\(\)](#). Connects to [gcaps](#) and returns a `\n` delimited listing of Galil MAC addresses sending BOOT-P or DHCP requests. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is output and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
 - `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_GCAPS_ASSIGN](#) see [GAssign\(\)](#). Provides a method to assign an IP address through [gcaps](#) given a Galil MAC address. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is input and must be a `char*` containing the null terminated address that is to be assigned. e.g. "192.168.0.43".
 - `memory2` is input and must be a `char*` containing the null terminated controller MAC address. e.g. "00:50:4C:20:01:23".
- [G_UTIL_GCAPS_PING](#) Uses ICMP ping to determine if an IP address is reachable and assigned. Ping sent from the [gcaps](#) server. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is input and must be a `char*` containing the null terminated address that is to be pinged. e.g. "192.168.0.43".
 - `memory2` is output and must be an `int*`. The value will be set to zero if the ping times out, and nonzero if a ping reply is returned.

Parameters

<i>memory1</i>	An untyped pointer to data required for request. The data type is defined by the request variable.
<i>memory2</i>	An untyped pointer to data required for request. The data type is defined by the request variable.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See the following functions from `gclibo`, the open source portion, for implementation of several [GUtility\(\)](#) requests.:

- [GAddresses\(\)](#)
- [GAssign\(\)](#)
- [GInfo\(\)](#)
- [GIpRequests\(\)](#)
- [GSleep\(\)](#)
- [GTimeout\(\)](#)
- [GVersion\(\)](#)

Referenced by `commands()`, `error()`, `GAddresses()`, `GAssign()`, `GInfo()`, `GIpRequests()`, `GListServers()`, `GPublishServer()`, `GRemoteConnections()`, `GServerStatus()`, `GSetServer()`, `GSleep()`, `GTimeout()`, `GVersion()`, and `message()`.

10.1.2.37 GVersion()

```
GReturn GCALL GVersion (
    GCStringOut ver,
    GSize ver_len )
```

Uses [GUtility\(\)](#), [G_UTIL_VERSION](#) and [G_UTIL_GCAPS_VERSION](#) to provide the library and [gcaps](#) version numbers.

Parameters

<i>ver</i>	Buffer to hold the output string. Buffer will be null terminated, even if the data must be truncated to do so.
<i>ver_len</i>	Length of buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

The version number of gclib is provided first. If the [gcaps](#) server can be found, its version will be provided after a space.

Example with gcaps version.

```
154.190.329 1.0.0.82
```

Example with gclib version only.

```
154.190.329
```

Note

[GVersion\(\)](#) will take up to 1 second to look for [gcaps](#).

See `x_examples.cpp` for an example.

Definition at line 29 of file `gclibo.c`.

References `G_NO_ERROR`, `G_UTIL_GCAPS_VERSION`, `G_UTIL_VERSION`, and `GUtility()`.

10.1.2.38 GWaitForBool()

```
GReturn GCALL GWaitForBool (
    GCon g,
    GCStringIn predicate,
    int trials )
```

Blocking call that returns when the controller evaluates the predicate as true.

Polls the message command (MG) to check the value of predicate. Polling will continue until the controller responds with a nonzero value or the number of polling trials is reached.

The amount of time until the function fails with [G_GCLIB_POLLING_FAILED](#) is roughly (trials * [POLLINGINTERVAL](#)) milliseconds.

Parameters

<i>g</i>	Connection's handle.
<i>predicate</i>	A null-terminated string containing the predicate to be polled. The predicate will be enclosed in parentheses and used in the command <code>MG (predicate)</code> to return the value.
<i>trials</i>	The number of polling cycles to perform looking for a nonzero value. Use -1 to poll indefinitely.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [GMotionComplete\(\)](#) for an example.

Definition at line 318 of file `gclibo.c`.

References `G_GCLIB_POLLING_FAILED`, `G_LINE_BUFFER`, `G_NO_ERROR`, `G_SMALL_BUFFER`, `GCommand()`, `GSleep()`, and `POLLINGINTERVAL`.

Referenced by `GMotionComplete()`.

10.1.2.39 GWrite()

```
GCLIB_DLL_EXPORTED GReturn GCALL GWrite (
    GCon g,
    GBufIn buffer,
    GSize buffer_len )
```

Performs a write on the connection.

Parameters

<i>g</i>	Connection's handle.
<i>buffer</i>	The user's write buffer. To send a Galil command, a terminating carriage return is usually required.
<i>buffer_len</i>	The length of the data in the buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values. If `G_NO_ERROR` is returned, all bytes were written.

Warning

This function is deprecated and will be removed in a future gclib version. Please contact Galil for needs not covered by the other gclib functions.

See `x_gread_gwrite.cpp` for an example.

10.2 C#/VB examples**10.2.1 Description**

Files included in the C# [Examples](#).

Files

- file [commands.cs](#)
- file [commands_example.cs](#)
- file [contour.cs](#)
- file [contour_example.cs](#)
- file [examples.cs](#)
- file [ip_assigner.cs](#)
- file [ip_assigner_example.cs](#)
- file [jog.cs](#)
- file [jog_example.cs](#)
- file [message.cs](#)
- file [message_example.cs](#)
- file [motion_complete.cs](#)
- file [motion_complete_example.cs](#)

- file [position_tracking.cs](#)
- file [position_tracking_example.cs](#)
- file [record_position.cs](#)
- file [record_position_example.cs](#)
- file [Remote_Client.cs](#)
- file [remote_client_example.cs](#)
- file [Remote_Server.cs](#)
- file [remote_server_example.cs](#)
- file [vector_mode.cs](#)
- file [vector_mode_example.cs](#)

Data Structures

- class [Commands_Example](#)
Demonstrates various uses of [GCommand\(\)](#) and basic controller queries.
- class [Contour_Example](#)
Record user's training and plays back training through contour mode.
- class [Examples](#)
Provides a class of shared constants and methods for gclib's example projects.
- class [IP_Assigner_Example](#)
Assigns controller an IP Address given a serial number and a 1 byte address.
- class [Jog_Example](#)
Accepts user-input at the command line to control the speed of the controller in Jog mode.
- class [Message_Example](#)
Demonstrates how to handle and interpret messages from the controller.
- class [Motion_Complete_Example](#)
Uses controller interrupts to detect when motion is complete.
- class [Position_Tracking_Example](#)
Places controller into position tracking mode. Accepts user-defined positional values at the command line.
- class [Record_Position_Example](#)
Takes two file paths at the command line to hold positional data for Axis A and Axis B. Positional data is saved to the two files until an analog input value changes.
- class [Remote_Client_Example](#)
Demonstrates various uses of [GListServers\(\)](#) and [GSetServer\(\)](#)
- class [Remote_Server_Example](#)
Demonstrates various uses of [GPublishServer\(\)](#)
- class [Vector_Mode_Example](#)
Takes a path to a file at the command line holding vector commands for the controller. The controller is placed into vector mode and commands are read from the file and sent to the controller.

Functions

- static int [Commands](#) (gclib gclib)
Demonstrates various uses of [GCommand\(\)](#) and basic controller queries.
- static int [Contour](#) (gclib gclib, string fileA, string fileB)
Record user's training and plays back training through contour mode.
- static int [IP_Assigner](#) (gclib gclib, string serial_num, byte address)
Assigns controller an IP Address given a serial number and a 1 byte address.
- static int [Jog](#) (gclib gclib)
Puts controller into Jog Mode and accepts user input to adjust the speed.
- static int [Message](#) (gclib gclib)
Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.
- static int [Motion_Complete](#) (gclib gclib)

- Uses interrupts to track when the motion of controller is completed.*
- static int [Position_Tracking](#) (gclib gclib, int speed)
Puts controller into Position Tracking Mode and accepts user-entered positions.
- static int [Record_Position](#) (gclib gclib, string fileA, string fileB)
Record user's training and saves to a text file.
- static int [Remote_Client](#) ()
Accepts user input to publish to list and connect to available servers.
- static int [Remote_Server](#) (string server_name)
Accepts user input to publish or remove local gcaps server from the network.
- static int [Vector_Mode](#) (gclib gclib, string file)
Puts controller into Vector Mode and accepts a file defining vector points.

10.2.2 Function Documentation

10.2.2.1 Commands()

```
static int Commands (
    gclib gclib ) [inline], [static]
```

Demonstrates various uses of [GCommand\(\)](#) and basic controller queries.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
--------------	---

Returns

The success status or error code of the function.

See [commands_example.cs](#) for an example.

For VB.NET, see definition in file [commands.vb](#)

Definition at line 28 of file commands.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Commands_Example.Main().

10.2.2.2 Contour()

```
static int Contour (
    gclib gclib,
    string fileA,
    string fileB ) [inline], [static]
```

Record user's training and plays back training through contour mode.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
<i>fileA</i>	A Path to a text file where training for Axis A will be recorded.
<i>fileB</i>	A Path to a text file where training for Axis B will be recorded.

Returns

The success status or error code of the function.

See [contour_example.cs](#) for an example.

For VB.NET, see definition in file [contour.vb](#)

Definition at line 32 of file `contour.cs`.

References `Examples.GALIL_EXAMPLE_ERROR`, `Examples.GALIL_EXAMPLE_OK`, and `Examples.Record_↔Position()`.

Referenced by `Contour_Example.Main()`.

10.2.2.3 IP_Assigner()

```
static int IP_Assigner (
    gclib gclib,
    string serial_num,
    byte address ) [inline], [static]
```

Assigns controller an IP Address given a serial number and a 1 byte address.

Parameters

<i>gclib</i>	A gclib object.
<i>serial_num</i>	The serial number of a Galil controller.
<i>address</i>	A 1 byte value to be added to the new IP Address.

Returns

The success status or error code of the function.

This function will listen on the network for controllers requesting an IP Address.

If a detected controller matches the serial number provided by the user, a new IP Address will be assigned based on the first 3 bytes of the detected IP Address combined with the user defined 1 byte address.

See [ip_assigner_example.cs](#) for an example.

For VB.NET, see definition in file [ip_assigner.vb](#)

Definition at line 36 of file `ip_assigner.cs`.

References `Examples.GALIL_EXAMPLE_ERROR`, and `Examples.GALIL_EXAMPLE_OK`.

Referenced by `IP_Assigner_Example.Main()`.

10.2.2.4 Jog()

```
static int Jog (
    gclib gclib ) [inline], [static]
```

Puts controller into Jog Mode and accepts user input to adjust the speed.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
--------------	---

Returns

The success status or error code of the function.

Key	Usage
q	Quit Jogging
a	-2000 counts / second
s	-500 counts / second
d	+500 counts / second
f	+2000 counts / second
r	Direction Reversal

See [jog_example.cs](#) for an example.

For VB.NET, see definition in file [jog.vb](#)

Definition at line 35 of file jog.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Jog_Example.Main().

10.2.2.5 Message()

```
static int Message (
    gclib gclib ) [inline], [static]
```

Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
--------------	---

Returns

The success status or error code of the function.

See [message_example.cs](#) for an example.

For VB.NET, see definition in file [message.vb](#)

Definition at line 27 of file message.cs.

References Examples.GALIL_EXAMPLE_OK, and message().

Referenced by Message_Example.Main().

10.2.2.6 Motion_Complete()

```
static int Motion_Complete (
    gclib gclib ) [inline], [static]
```

Uses interrupts to track when the motion of controller is completed.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
--------------	---

Returns

The success status or error code of the function.

See [motion_complete_example.cs](#) for an example.

For VB.NET, see definition in file [motion_complete.vb](#)

Definition at line 26 of file motion_complete.cs.

References Examples.GALIL_EXAMPLE_ERROR, and Examples.GALIL_EXAMPLE_OK.

Referenced by Motion_Complete_Example.Main().

10.2.2.7 Position_Tracking()

```
static int Position_Tracking (
    gclib gclib,
    int speed ) [inline], [static]
```

Puts controller into Position Tracking Mode and accepts user-entered positions.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
<i>speed</i>	Optional speed of the controller in Position Tracking Mode. Default value of 5000

Returns

The success status or error code of the function.

See [position_tracking_example.cs](#) for an example.

For VB.NET, see definition in file [position_tracking.vb](#)

Definition at line 28 of file position_tracking.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Position_Tracking_Example.Main().

10.2.2.8 Record_Position()

```
static int Record_Position (
    gclib gclib,
    string fileA,
    string fileB ) [inline], [static]
```

Record user's training and saves to a text file.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
<i>fileA</i>	A Path to a text file where training for Axis A will be recorded.
<i>fileB</i>	A Path to a text file where training for Axis B will be recorded.

Returns

The success status or error code of the function.

See [record_position_example.cs](#) for an example.

For VB.NET, see definition in file [record_position.vb](#)

Definition at line 32 of file record_position.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Examples.Contour(), and Record_Position_Example.Main().

10.2.2.9 Remote_Client()

```
static int Remote_Client ( ) [inline], [static]
```

Accepts user input to publish to list and connect to available servers.

Returns

The success status or error code of the function.

Key	Usage
q	Quit
s	List available servers on then network
h	List available hardware on the current server
0-9	Connect to server instance by number
l	Connect back to local server

See [remote_client_example.cs](#) for an example.

For VB.NET, see definition in file [remote_client.vb](#)

Definition at line 33 of file Remote_Client.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Remote_Client_Example.Main().

10.2.2.10 Remote_Server()

```
static int Remote_Server (
    string server_name ) [inline], [static]
```

Accepts user input to publish or remove local gcaps server from the network.

Parameters

<i>server_name</i>	The name to publish local gcaps server under.
--------------------	---

Returns

The success status or error code of the function.

Key	Usage
q	Quit
p	Publish this server to the network
r	Remove this server from the network

See [remote_server_example.cs](#) for an example.

For VB.NET, see definition in file [remote_server.vb](#)

Definition at line 32 of file Remote_Server.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Remote_Server_Example.Main().

10.2.2.11 Vector_Mode()

```
static int Vector_Mode (
    gclib gclib,
    string file ) [inline], [static]
```

Puts controller into Vector Mode and accepts a file defining vector points.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
<i>file</i>	A path to a file with stored vector commands.

Returns

The success status or error code of the function.

Example text file:

```
VP -2219,-2667
VP -2523,-2832
VP 2844,-1425
VP 728,1971
VP 2127,183
VP -997,688
VP 725,-1893
VP 527,2899
VP -37,2523
VP 1277,1425
```

VP 857,2388
 VP 1096,-1694
 CR 1000,0,90

See [vector_mode_example.cs](#) for an example.

For VB.NET, see definition in file [vector_mode.vb](#)

Definition at line 45 of file [vector_mode.cs](#).

References [Examples.GALIL_EXAMPLE_OK](#).

Referenced by [Vector_Mode_Example.Main\(\)](#).

10.3 C++ examples

10.3.1 Description

Files included in the C++ examples.

Files

- file [commands.cpp](#)
- file [commands_example.cpp](#)
- file [contour.cpp](#)
- file [contour_example.cpp](#)
- file [examples.h](#)
- file [ip_assigner.cpp](#)
- file [ip_assigner_example.cpp](#)
- file [jog.cpp](#)
- file [jog_example.cpp](#)
- file [message.cpp](#)
- file [message_example.cpp](#)
- file [motion_complete.cpp](#)
- file [motion_complete_example.cpp](#)
- file [position_tracking.cpp](#)
- file [position_tracking_example.cpp](#)
- file [record_position.cpp](#)
- file [record_position_example.cpp](#)
- file [remote_client.cpp](#)
- file [remote_server_example.cpp](#)
- file [remote_server.cpp](#)
- file [remote_server_example.cpp](#)
- file [vector.cpp](#)
- file [vector_example.cpp](#)

Macros

- `#define _CRT_SECURE_NO_WARNINGS`
- `#define GALIL_EXAMPLE_OK 0`
- `#define GALIL_EXAMPLE_ERROR -100`
- `#define G_LASTINDEX 999`

Typedefs

- `typedef std::vector< string > tokens`

Functions

- [GReturn commands](#) (GCon g)
Demonstrates various uses of [GCommand\(\)](#) and [GUtility\(\)](#).
- `int main` (int argc, char *argv[])
Main function for Commands Example.
- `bool load_buf` (GCon g, const [std::vector](#)< int > &positions_A, const [std::vector](#)< int > &positions_B, int capacity, int &cmd)
Loads contour buffer with commands from the given text file.
- `std::vector< int > csv_to_vector` (ifstream &is)
Converts a file of comma separated values to a vector.
- [GReturn contour](#) (GCon g, char *fileA, char *fileB)
Record user's training and plays back training through contour mode.
- `void e` (GReturn rc)
A trivial, C++ style return code check used in Galil's examples and demos.
- `void error` (GCon g, GReturn rc)
An example of error handling and debugging information.
- `int pause` ()
Pauses console apps for a user key stroke.
- [GReturn position_tracking](#) (GCon g, int speed=5000)
Puts controller into Position Tracking Mode and accepts user-entered positions.
- [GReturn jog](#) (GCon g)
Puts controller into Jog Mode and accepts user input to adjust the speed.
- [GReturn vector](#) (GCon g, char *file)
Puts controller into Vector Mode and accepts a file defining vector points.
- [GReturn ip_assigner](#) (char *serial_num, int address)
Assigns controller an IP Address given a serial number and a 1 byte address.
- [GReturn motion_complete](#) (GCon g)
Uses interrupts to track when the motion of controller is completed.
- [GReturn message](#) (GCon g)
Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.
- [GReturn record_position](#) (GCon g, char *fileA, char *fileB)
Record user's training and saves to a text file.
- [GReturn remote_server](#) (const char *server_name)
Publishes local gcaps server to the network.
- [GReturn remote_client](#) ()
Lists available remote servers and allows connection to remote server.
- `tokens string_split` (const string &str, const string &token)
Splits a string into a vector based on a token.
- `int check_interrupts` (GCon g, [GCStringIn](#) axes)
Monitors interrupt status on the given axes and returns when interrupts are fired.
- `void write_array_to_file` (GCon g, ofstream &os, const char *array_name, int previous_rd, int rd)
Grabs data from array on controller and writes it to the given text file.
- `void print_client_message` (const char *message)
- `void print_servers_list` (const [std::vector](#)< [std::string](#) > &server_list)
- `void servers_to_list` ([std::vector](#)< [std::string](#) > &server_list, [std::string](#) servers)
- `void print_server_message` (const char *message)
- `bool load_buffer` (GCon g, ifstream &fs, int capacity)

10.3.2 Function Documentation

10.3.2.1 commands()

```
GReturn commands (
    GCon g )
```

Demonstrates various uses of [GCommand\(\)](#) and [GUtility\(\)](#).

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [commands_example.cpp](#) for an example.

Definition at line 16 of file `commands.cpp`.

References [e\(\)](#), [G_SMALL_BUFFER](#), [G_UTIL_ERROR_CONTEXT](#), [GCmd\(\)](#), [GCmdD\(\)](#), [GCmdI\(\)](#), [GCmdT\(\)](#), [GCommand\(\)](#), and [GUtility\(\)](#).

10.3.2.2 contour()

```
GReturn contour (
    GCon g,
    char * fileA,
    char * fileB )
```

Record user's training and plays back training through contour mode.

Parameters

<i>g</i>	Connection's handle.
<i>fileA</i>	A Path to a text file where training for Axis A will be recorded.
<i>fileB</i>	A Path to a text file where training for Axis B will be recorded.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [contour_example.cpp](#) for an example.

Definition at line 20 of file `contour.cpp`.

References [csv_to_vector\(\)](#), [e\(\)](#), [G_SMALL_BUFFER](#), [GCmd\(\)](#), [GMotionComplete\(\)](#), and [record_position\(\)](#).

10.3.2.3 e()

```
void e (
    GReturn rc ) [inline]
```

A trivial, C++ style return code check used in Galil's examples and demos.

Throws [GReturn](#) if return value is not [G_NO_ERROR](#). See [Commands_Example.cpp](#) for example usage and [catch\(\)](#) handler.

Definition at line 33 of file `examples.h`.

References [G_NO_ERROR](#).

Referenced by [check_interrupts\(\)](#), [commands\(\)](#), [contour\(\)](#), [H_ArrayDownloadFromMemory\(\)](#), [ip_assigner\(\)](#), [jog\(\)](#), [load_buf\(\)](#), [load_buffer\(\)](#), [message\(\)](#), [motion_complete\(\)](#), [position_tracking\(\)](#), [record_position\(\)](#), [remote_server\(\)](#), [vector\(\)](#), and [write_array_to_file\(\)](#).

10.3.2.4 ip_assigner()

```
GReturn ip_assigner (
```

```
char * serial_num,
int address )
```

Assigns controller an IP Address given a serial number and a 1 byte address.

Parameters

<i>serial_num</i>	Serial Number of the controller.
<i>address</i>	A 1 byte address that defines the last byte of the IP Address.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [ip_assigner_example.cpp](#) for an example.

This function will listen on the network for controllers requesting an IP Address. If a detected controller matches the serial number provided by the user, a new IP Address will be assigned based on the first 3 bytes of the detected IP Address combined with the user defined 1 byte address.

Definition at line 26 of file `ip_assigner.cpp`.

References `e()`, `G_SMALL_BUFFER`, `GlpRequests()`, and `string_split()`.

10.3.2.5 jog()

```
GReturn jog (
    GCon g )
```

Puts controller into Jog Mode and accepts user input to adjust the speed.

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [jog_example.cpp](#) for an example.

Key	Usage
q	Quit Jogging
a	-2000 counts / second
s	-500 counts / second
d	+500 counts / second
f	+2000 counts / second
r	Direction Reversal

Definition at line 29 of file `jog.cpp`.

References `e()`, `G_CONNECTION_NOT_ESTABLISHED`, `G_SMALL_BUFFER`, `GCmd()`, and `GMotionComplete()`.

10.3.2.6 load_buffer()

```
bool load_buffer (
    GCon g,
    ifstream & fs,
    int capacity )
```

Loads vector buffer with commands from the given text file.

Returns false when there are no more lines in the text file

Definition at line 88 of file vector.cpp.
 References `e()`, and `GCmd()`.
 Referenced by `vector()`.

10.3.2.7 `main()`

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file `commands_example.cpp`.

References `G_SMALL_BUFFER`, and `pause()`.

10.3.2.8 `message()`

```
GReturn message (
    GCon g )
```

Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.

Parameters

<code>g</code>	Connection's handle.
----------------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [message_example.cpp](#) for an example.

Definition at line 14 of file `message.cpp`.

References `e()`, `G_NO_ERROR`, `G_SMALL_BUFFER`, `G_UTIL_GCAPS_KEEPALIVE`, `GCmd()`, `GMessage()`, `GProgramDownload()`, and `GUtility()`.
 Referenced by `Examples::Message()`.

10.3.2.9 `motion_complete()`

```
GReturn motion_complete (
    GCon g )
```

Uses interrupts to track when the motion of controller is completed.

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [motion_complete_example.cpp](#) for an example.

Definition at line 18 of file `motion_complete.cpp`.

References `check_interrupts()`, `e()`, `G_NO_ERROR`, `G_SMALL_BUFFER`, `G_UNSUPPORTED_FUNCTION`, `GCmd()`, `GCmdT()`, `GCommand()`, `GInterrupt()`, and `GTimeout()`.

10.3.2.10 `position_tracking()`

```
GReturn position_tracking (
    GCon g,
    int speed = 5000 )
```

Puts controller into Position Tracking Mode and accepts user-entered positions.

Parameters

<i>g</i>	Connection's handle.
<i>speed</i>	Optional speed of the controller in Position Tracking Mode. Default value of 5000.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [position_tracking_example.cpp](#) for an example.

Definition at line 15 of file `position_tracking.cpp`.

References `e()`, `G_CONNECTION_NOT_ESTABLISHED`, `G_SMALL_BUFFER`, `GCmd()`, and `GMotionComplete()`.

10.3.2.11 `record_position()`

```
GReturn record_position (
    GCon g,
    char * fileA,
    char * fileB )
```

Record user's training and saves to a text file.

Parameters

<i>g</i>	Connection's handle.
<i>fileA</i>	A Path to a text file where training for Axis A will be recorded.
<i>fileB</i>	A Path to a text file where training for Axis B will be recorded.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [record_position_example.cpp](#) for an example.

Definition at line 20 of file `record_position.cpp`.

References `e()`, `GCmd()`, `GCmdI()`, `GProgramDownload()`, `GSleep()`, and `write_array_to_file()`.

Referenced by `contour()`.

10.3.2.12 remote_client()

GReturn `remote_client ()`

Lists available remote servers and allows connection to remote server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `remote_client_example` for an example.

Key	Usage
q	Quit
s	List available servers on then network
h	List available hardware on the current server
0-9	Connect to server instance by number
l	Connect back to local server

Definition at line 89 of file `remote_client.cpp`.

References `G_SMALL_BUFFER`.

10.3.2.13 remote_server()

GReturn `remote_server (`
 `const char * server_name)`

Publishes local gcaps server to the network.

Parameters

<i>Name</i>	to publish server under.
-------------	--------------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `remote_server_example` for an example.

Key	Usage
q	Quit
p	Publish this server to the network
r	Remove this server from the network

Definition at line 39 of file `remote_server.cpp`.

References `e()`, `G_SMALL_BUFFER`, and `GPublishServer()`.

10.3.2.14 vector()

```
GReturn vector (
    GCon g,
    char * file )
```

Puts controller into Vector Mode and accepts a file defining vector points.

Parameters

<i>g</i>	Connection's handle.
<i>file</i>	A Path to a file that defines vector commands.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [vector_example.cpp](#) for an example.

Example text file:

```
VP -2219,-2667
VP -2523,-2832
VP 2844,-1425
VP 728,1971
VP 2127,183
VP -997,688
VP 725,-1893
VP 527,2899
VP -37,2523
VP 1277,1425
VP 857,2388
VP 1096,-1694
CR 1000,0,90
```

Definition at line 36 of file vector.cpp.

References [e\(\)](#), [G_BAD_FILE](#), [G_CONNECTION_NOT_ESTABLISHED](#), [GCmd\(\)](#), [GCmdI\(\)](#), [GMotionComplete\(\)](#), [GSleep\(\)](#), and [load_buffer\(\)](#).

Chapter 11

Namespace Documentation

11.1 examples Namespace Reference

Data Structures

- class [Examples](#)
Provides a class of shared constants and methods for gclib's example projects.
- class [Commands_Example](#)
Demonstrates various uses of [GCommand\(\)](#) and basic controller queries.
- class [Contour_Example](#)
Record user's training and plays back training through contour mode.
- class [IP_Assigner_Example](#)
Assigns controller an IP Address given a serial number and a 1 byte address.
- class [Jog_Example](#)
Accepts user-input at the command line to control the speed of the controller in Jog mode.
- class [Message_Example](#)
Demonstrates how to handle and interpret messages from the controller.
- class [Motion_Complete_Example](#)
Uses controller interrupts to detect when motion is complete.
- class [Position_Tracking_Example](#)
Places controller into position tracking mode. Accepts user-defined positional values at the command line.
- class [Record_Position_Example](#)
Takes two file paths at the command line to hold positional data for Axis A and Axis B. Positional data is saved to the two files until an analog input value changes.
- class [Remote_Client_Example](#)
Demonstrates various uses of [GListServers\(\)](#) and [GSetServer\(\)](#)
- class [Remote_Server_Example](#)
Demonstrates various uses of [GPublishServer\(\)](#)
- class [Vector_Mode_Example](#)
Takes a path to a file at the command line holding vector commands for the controller. The controller is placed into vector mode and commands are read from the file and sent to the controller.

Chapter 12

Data Structure Documentation

12.1 Commands_Example Class Reference

Demonstrates various uses of [GCommand\(\)](#) and basic controller queries.

Static Public Member Functions

- static int [Main](#) (string[] args)
Main function for the commands example.

12.1.1 Detailed Description

Demonstrates various uses of [GCommand\(\)](#) and basic controller queries.
The first argument should be the IP Address of a Galil controller.
For VB.NET, see definition in file [commands_example.vb](#)
Definition at line 23 of file [commands_example.cs](#).

12.1.2 Member Function Documentation

12.1.2.1 Main()

```
static int Main (  
    string[] args ) [inline], [static]
```

Main function for the commands example.

Parameters

<i>args</i>	An array of command line arguments.
-------------	-------------------------------------

Returns

The success status or error code of the function.

The first argument should be the IP Address of a Galil controller.

Definition at line 31 of file [commands_example.cs](#).

References [Examples.Commands\(\)](#), [Examples.GALIL_EXAMPLE_ERROR](#), [Examples.GALIL_EXAMPLE_OK](#), and [Examples.PrintError\(\)](#).

The documentation for this class was generated from the following file:

- [commands_example.cs](#)

12.2 Contour_Example Class Reference

Record user's training and plays back training through contour mode.

Static Public Member Functions

- static int [Main](#) (string[] args)
Main function for the contour example.

12.2.1 Detailed Description

Record user's training and plays back training through contour mode.

The first argument should be the IP Address of a Galil controller.

The second argument should be a path to a csv file holding positional data for the A axis.

The third argument should be a path to a csv file holding positional data for the B axis.

For VB.NET, see definition in file [contour_example.vb](#)

Definition at line 27 of file contour_example.cs.

12.2.2 Member Function Documentation

12.2.2.1 Main()

```
static int Main (
    string[] args ) [inline], [static]
```

Main function for the contour example.

Parameters

<i>args</i>	An array of command line arguments.
-------------	-------------------------------------

Returns

The success status or error code of the function.

The first argument should be the IP Address of a Galil controller.

The second argument should be a path to a text file where training for Axis A will be recorded.

The third argument should be a path to a text file where training for Axis B will be recorded..

Definition at line 39 of file contour_example.cs.

References [Examples.Contour\(\)](#), [Examples.GALIL_EXAMPLE_ERROR](#), [Examples.GALIL_EXAMPLE_OK](#), and [Examples.PrintError\(\)](#).

The documentation for this class was generated from the following file:

- [contour_example.cs](#)

12.3 Examples Class Reference

Provides a class of shared constants and methods for gclib's example projects.

Static Public Member Functions

- static int [Commands](#) (gclib gclib)
Demonstrates various uses of [GCommand\(\)](#) and basic controller queries.
- static int [Contour](#) (gclib gclib, string fileA, string fileB)
Record user's training and plays back training through contour mode.
- static void [PrintError](#) (gclib gclib, Exception ex)

Prints the exception to the console and queries the controller for the most recent error message.

- static int [IP_Assigner](#) (gclib gclib, string serial_num, byte address)
Assigns controller an IP Address given a serial number and a 1 byte address.
- static int [Jog](#) (gclib gclib)
Puts controller into Jog Mode and accepts user input to adjust the speed.
- static int [Message](#) (gclib gclib)
Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.
- static int [Motion_Complete](#) (gclib gclib)
Uses interrupts to track when the motion of controller is completed.
- static int [Position_Tracking](#) (gclib gclib, int speed)
Puts controller into Position Tracking Mode and accepts user-entered positions.
- static int [Record_Position](#) (gclib gclib, string fileA, string fileB)
Record user's training and saves to a text file.
- static int [Remote_Client](#) ()
Accepts user input to publish to list and connect to available servers.
- static int [Remote_Server](#) (string server_name)
Accepts user input to publish or remove local gcaps server from the network.
- static int [Vector_Mode](#) (gclib gclib, string file)
Puts controller into Vector Mode and accepts a file defining vector points.

Static Public Attributes

- const int [GALIL_EXAMPLE_OK](#) = 0
Examples success code.
- const int [GALIL_EXAMPLE_ERROR](#) = -100
Examples error code.

12.3.1 Detailed Description

Provides a class of shared constants and methods for gclib's example projects.
For VB.NET, see definition in file [examples.vb](#)
Definition at line 15 of file commands.cs.

12.3.2 Member Function Documentation

12.3.2.1 Commands()

```
static int Commands (
    gclib gclib ) [inline], [static]
```

Demonstrates various uses of [GCommand\(\)](#) and basic controller queries.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
--------------	---

Returns

The success status or error code of the function.

See [commands_example.cs](#) for an example.
For VB.NET, see definition in file [commands.vb](#)
Definition at line 28 of file commands.cs.

References Examples.GALIL_EXAMPLE_OK.
Referenced by Commands_Example.Main().

12.3.2.2 Contour()

```
static int Contour (
    gclib gclib,
    string fileA,
    string fileB ) [inline], [static]
```

Record user's training and plays back training through contour mode.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
<i>fileA</i>	A Path to a text file where training for Axis A will be recorded.
<i>fileB</i>	A Path to a text file where training for Axis B will be recorded.

Returns

The success status or error code of the function.

See [contour_example.cs](#) for an example.

For VB.NET, see definition in file [contour.vb](#)

Definition at line 32 of file contour.cs.

References Examples.GALIL_EXAMPLE_ERROR, Examples.GALIL_EXAMPLE_OK, and Examples.Record_↵
Position().

Referenced by Contour_Example.Main().

12.3.2.3 IP_Assigner()

```
static int IP_Assigner (
    gclib gclib,
    string serial_num,
    byte address ) [inline], [static]
```

Assigns controller an IP Address given a serial number and a 1 byte address.

Parameters

<i>gclib</i>	A gclib object.
<i>serial_num</i>	The serial number of a Galil controller.
<i>address</i>	A 1 byte value to be added to the new IP Address.

Returns

The success status or error code of the function.

This function will listen on the network for controllers requesting an IP Address.

If a detected controller matches the serial number provided by the user, a new IP Address will be assigned based on the first 3 bytes of the detected IP Address combined with the user defined 1 byte address.

See [ip_assigner_example.cs](#) for an example.

For VB.NET, see definition in file [ip_assigner.vb](#)

Definition at line 36 of file ip_assigner.cs.

References Examples.GALIL_EXAMPLE_ERROR, and Examples.GALIL_EXAMPLE_OK.

Referenced by IP_Assigner_Example.Main().

12.3.2.4 Jog()

```
static int Jog (
    gclib gclib ) [inline], [static]
```

Puts controller into Jog Mode and accepts user input to adjust the speed.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
--------------	---

Returns

The success status or error code of the function.

Key	Usage
q	Quit Jogging
a	-2000 counts / second
s	-500 counts / second
d	+500 counts / second
f	+2000 counts / second
r	Direction Reversal

See [jog_example.cs](#) for an example.

For VB.NET, see definition in file [jog.vb](#)

Definition at line 35 of file jog.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Jog_Example.Main().

12.3.2.5 Message()

```
static int Message (
    gclib gclib ) [inline], [static]
```

Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
--------------	---

Returns

The success status or error code of the function.

See [message_example.cs](#) for an example.

For VB.NET, see definition in file [message.vb](#)

Definition at line 27 of file message.cs.

References Examples.GALIL_EXAMPLE_OK, and message().

Referenced by Message_Example.Main().

12.3.2.6 Motion_Complete()

```
static int Motion_Complete (
    gclib gclib ) [inline], [static]
```

Uses interrupts to track when the motion of controller is completed.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
--------------	---

Returns

The success status or error code of the function.

See [motion_complete_example.cs](#) for an example.

For VB.NET, see definition in file [motion_complete.vb](#)

Definition at line 26 of file motion_complete.cs.

References Examples.GALIL_EXAMPLE_ERROR, and Examples.GALIL_EXAMPLE_OK.

Referenced by Motion_Complete_Example.Main().

12.3.2.7 Position_Tracking()

```
static int Position_Tracking (
    gclib gclib,
    int speed ) [inline], [static]
```

Puts controller into Position Tracking Mode and accepts user-entered positions.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
<i>speed</i>	Optional speed of the controller in Position Tracking Mode. Default value of 5000

Returns

The success status or error code of the function.

See [position_tracking_example.cs](#) for an example.

For VB.NET, see definition in file [position_tracking.vb](#)

Definition at line 28 of file position_tracking.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Position_Tracking_Example.Main().

12.3.2.8 PrintError()

```
static void PrintError (
    gclib gclib,
    Exception ex ) [inline], [static]
```

Prints the exception to the console and queries the controller for the most recent error message.

Parameters

<i>gclib</i>	The gclib object from where the exception originated.
<i>ex</i>	The exception object caught by the example.

See [commands_example.cs](#) for an example.

Definition at line 39 of file examples.cs.

Referenced by Commands_Example.Main(), Contour_Example.Main(), IP_Assigner_Example.Main(), Jog_Example.Main(), Message_Example.Main(), Motion_Complete_Example.Main(), Position_Tracking_Example.Main(), Record_Position_Example.Main(), and Vector_Mode_Example.Main().

12.3.2.9 Record_Position()

```
static int Record_Position (
    gclib gcLib,
    string fileA,
    string fileB ) [inline], [static]
```

Record user's training and saves to a text file.

Parameters

<i>gcLib</i>	A gcLib object with a valid connection.
<i>fileA</i>	A Path to a text file where training for Axis A will be recorded.
<i>fileB</i>	A Path to a text file where training for Axis B will be recorded.

Returns

The success status or error code of the function.

See [record_position_example.cs](#) for an example.

For VB.NET, see definition in file [record_position.vb](#)

Definition at line 32 of file record_position.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Examples.Contour(), and Record_Position_Example.Main().

12.3.2.10 Remote_Client()

```
static int Remote_Client ( ) [inline], [static]
```

Accepts user input to publish to list and connect to available servers.

Returns

The success status or error code of the function.

Key	Usage
q	Quit
s	List available servers on then network
h	List available hardware on the current server
0-9	Connect to server instance by number
l	Connect back to local server

See [remote_client_example.cs](#) for an example.

For VB.NET, see definition in file [remote_client.vb](#)

Definition at line 33 of file Remote_Client.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Remote_Client_Example.Main().

12.3.2.11 Remote_Server()

```
static int Remote_Server (
    string server_name ) [inline], [static]
```

Accepts user input to publish or remove local gcaps server from the network.

Parameters

<i>server_name</i>	The name to publish local gcaps server under.
--------------------	---

Returns

The success status or error code of the function.

Key	Usage
q	Quit
p	Publish this server to the network
r	Remove this server from the network

See [remote_server_example.cs](#) for an example.

For VB.NET, see definition in file [remote_server.vb](#)

Definition at line 32 of file Remote_Server.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Remote_Server_Example.Main().

12.3.2.12 Vector_Mode()

```
static int Vector_Mode (
    gclib gclib,
    string file ) [inline], [static]
```

Puts controller into Vector Mode and accepts a file defining vector points.

Parameters

<i>gclib</i>	A gclib object with a valid connection.
<i>file</i>	A path to a file with stored vector commands.

Returns

The success status or error code of the function.

Example text file:

```
VP -2219,-2667
VP -2523,-2832
VP 2844,-1425
VP 728,1971
VP 2127,183
VP -997,688
VP 725,-1893
VP 527,2899
VP -37,2523
VP 1277,1425
VP 857,2388
VP 1096,-1694
CR 1000,0,90
```

See [vector_mode_example.cs](#) for an example.

For VB.NET, see definition in file [vector_mode.vb](#)

Definition at line 45 of file vector_mode.cs.

References Examples.GALIL_EXAMPLE_OK.

Referenced by Vector_Mode_Example.Main().

The documentation for this class was generated from the following files:

- [commands.cs](#)
- [examples.cs](#)
- [contour.cs](#)
- [ip_assigner.cs](#)

- [jog.cs](#)
- [message.cs](#)
- [motion_complete.cs](#)
- [position_tracking.cs](#)
- [record_position.cs](#)
- [Remote_Client.cs](#)
- [Remote_Server.cs](#)
- [vector_mode.cs](#)

12.4 GDataRecord Union Reference

Data record union, containing all structs and a generic byte array accessor.

```
#include <gclib_record.h>
```

Data Fields

- struct [GDataRecord4000 dmc4000](#)
The DMC-4000 data record.
- struct [GDataRecord4000 dmc4103](#)
The DMC-4103 data record.
- struct [GDataRecord4000 dmc50000](#)
The DMC-50000 data record.
- struct [GDataRecord52000 dmc52000](#)
The DMC-52000 data record.
- struct [GDataRecord30000 dmc30000](#)
The DMC-30000 data record.
- struct [GDataRecord2103 dmc2103](#)
The DMC-21x3 data record.
- struct [GDataRecord1806 dmc1806](#)
The DMC-1806 data record.
- struct [GDataRecord1802 dmc1802](#)
The DMC-1802 data record.
- struct [GDataRecord47000_ENC rio47000](#)
The RIO-471xx & 472xx data record, including encoder support.
- struct [GDataRecord47300_ENC rio47300](#)
The RIO 473xx data record, including encoder support.
- struct [GDataRecord47300_24EX rio47300_24ex](#)
The RIO 473xx data record, with 24EXOUT/24EXIN support.
- struct [GDataRecord47162 rio47162](#)
The RIO 47162 data record.
- unsigned char [byte_array \[GALILDATARECORDMAXLENGTH\]](#)
Generic byte array for offsets.

12.4.1 Detailed Description

Data record union, containing all structs and a generic byte array accessor.

Named structs can be used to access typed data by name. Offsets into the data record can also be used by referencing the member `byte_array`.

```
//Getting the sample counter for the DMC-4000.
cout << data_record->dmc4000.sample_number << '\n'; //access by 4000 product
cout << * ((unsigned short *) (data_record->byte_array + 4)) << '\n'; //access by pointer arithmetic
```

Definition at line 1082 of file `gclib_record.h`.

The documentation for this union was generated from the following file:

- [gclib_record.h](#)

12.5 GDataRecord1802 Struct Reference

```
#include <gclib_record.h>
```

Data Fields

- UW [sample_number](#)
sample number.
- UB [input_bank_0](#)
general input bank 0 (inputs 1-8).
- UB [input_bank_1](#)
general input bank 1 (inputs 9-16).
- UB [input_bank_2](#)
general input bank 2 (inputs 17-24).
- UB [input_bank_3](#)
general input bank 3 (inputs 25-32).
- UB [input_bank_4](#)
general input bank 4 (inputs 33-40).
- UB [input_bank_5](#)
general input bank 5 (inputs 41-48).
- UB [input_bank_6](#)
general input bank 6 (inputs 49-56).
- UB [input_bank_7](#)
general input bank 7 (inputs 57-64).
- UB [input_bank_8](#)
general input bank 8 (inputs 65-72).
- UB [input_bank_9](#)
general input bank 9 (inputs 73-80).
- UB [output_bank_0](#)
general output bank 0 (outputs 1-8).
- UB [output_bank_1](#)
general output bank 1 (outputs 9-16).
- UB [output_bank_2](#)
general output bank 2 (outputs 17-24).
- UB [output_bank_3](#)
general output bank 3 (outputs 25-32).
- UB [output_bank_4](#)
general output bank 4 (outputs 33-40).
- UB [output_bank_5](#)
general output bank 5 (outputs 41-48).
- UB [output_bank_6](#)
general output bank 6 (outputs 49-56).
- UB [output_bank_7](#)
general output bank 7 (outputs 57-64).
- UB [output_bank_8](#)
general output bank 8 (outputs 65-72).
- UB [output_bank_9](#)
general output bank 9 (outputs 73-80).
- UB [error_code](#)
error code.
- UB [general_status](#)

- general status*
- UW [s_plane_segment_count](#)
segment count of coordinated move for S plane.
- UW [s_plane_move_status](#)
coordinated move status for S plane.
- SL [s_distance](#)
distance traveled in coordinated move for S plane.
- UW [t_plane_segment_count](#)
segment count of coordinated move for T plane.
- UW [t_plane_move_status](#)
Coordinated move status for T plane.
- SL [t_distance](#)
distance traveled in coordinated move for T plane.
- UW [axis_a_status](#)
A axis status.
- UB [axis_a_switches](#)
A axis switches.
- UB [axis_a_stop_code](#)
A axis stop code.
- SL [axis_a_reference_position](#)
A axis reference position.
- SL [axis_a_motor_position](#)
A axis motor position.
- SL [axis_a_position_error](#)
A axis position error.
- SL [axis_a_aux_position](#)
A axis auxiliary position.
- SL [axis_a_velocity](#)
A axis velocity.
- SW [axis_a_torque](#)
A axis torque.
- UB [axis_a_reserved_0](#)
Reserved.
- UB [axis_a_reserved_1](#)
Reserved.
- UW [axis_b_status](#)
B axis status.
- UB [axis_b_switches](#)
B axis switches.
- UB [axis_b_stop_code](#)
B axis stop code.
- SL [axis_b_reference_position](#)
B axis reference position.
- SL [axis_b_motor_position](#)
B axis motor position.
- SL [axis_b_position_error](#)
B axis position error.
- SL [axis_b_aux_position](#)
B axis auxiliary position.
- SL [axis_b_velocity](#)
B axis velocity.

- SW [axis_b_torque](#)
B axis torque.
- UB [axis_b_reserved_0](#)
Reserved.
- UB [axis_b_reserved_1](#)
Reserved.
- UW [axis_c_status](#)
C axis status.
- UB [axis_c_switches](#)
C axis switches.
- UB [axis_c_stop_code](#)
C axis stop code.
- SL [axis_c_reference_position](#)
C axis reference position.
- SL [axis_c_motor_position](#)
C axis motor position.
- SL [axis_c_position_error](#)
C axis position error.
- SL [axis_c_aux_position](#)
C axis auxiliary position.
- SL [axis_c_velocity](#)
C axis velocity.
- SW [axis_c_torque](#)
C axis torque.
- UB [axis_c_reserved_0](#)
Reserved.
- UB [axis_c_reserved_1](#)
Reserved.
- UW [axis_d_status](#)
D axis status.
- UB [axis_d_switches](#)
D axis switches.
- UB [axis_d_stop_code](#)
D axis stop code.
- SL [axis_d_reference_position](#)
D axis reference position.
- SL [axis_d_motor_position](#)
D axis motor position.
- SL [axis_d_position_error](#)
D axis position error.
- SL [axis_d_aux_position](#)
D axis auxiliary position.
- SL [axis_d_velocity](#)
D axis velocity.
- SW [axis_d_torque](#)
D axis torque.
- UB [axis_d_reserved_0](#)
Reserved.
- UB [axis_d_reserved_1](#)
Reserved.

12.5.1 Detailed Description

Data record struct for DMC-1802 controllers.

The 18x2 Data record is the Same as 2103 except the following.

1. No header bytes. Software removes it from QR.
2. No analog in axis data.

Definition at line 727 of file `gclib_record.h`.

The documentation for this struct was generated from the following file:

- [gclib_record.h](#)

12.6 GDataRecord1806 Struct Reference

Data record struct for DMC-1806 controller.

```
#include <gclib_record.h>
```

Data Fields

- UW [sample_number](#)
sample number.
- UB [input_bank_0](#)
general input bank 0 (inputs 1-8).
- UB [input_bank_1](#)
general input bank 1 (inputs 9-16).
- UB [input_bank_2](#)
general input bank 2 (inputs 17-24).
- UB [input_bank_3](#)
general input bank 3 (inputs 25-32).
- UB [input_bank_4](#)
general input bank 4 (inputs 33-40).
- UB [input_bank_5](#)
general input bank 5 (inputs 41-48).
- UB [input_bank_6](#)
general input bank 6 (inputs 49-56).
- UB [input_bank_7](#)
general input bank 7 (inputs 57-64).
- UB [input_bank_8](#)
general input bank 8 (inputs 65-72).
- UB [input_bank_9](#)
general input bank 9 (inputs 73-80).
- UB [output_bank_0](#)
general output bank 0 (outputs 1-8).
- UB [output_bank_1](#)
general output bank 1 (outputs 9-16).
- UB [output_bank_2](#)
general output bank 2 (outputs 17-24).
- UB [output_bank_3](#)
general output bank 3 (outputs 25-32).
- UB [output_bank_4](#)
general output bank 4 (outputs 33-40).
- UB [output_bank_5](#)

- general output bank 5 (outputs 41-48).*
- UB [output_bank_6](#)
 - general output bank 6 (outputs 49-56).*
- UB [output_bank_7](#)
 - general output bank 7 (outputs 57-64).*
- UB [output_bank_8](#)
 - general output bank 8 (outputs 65-72).*
- UB [output_bank_9](#)
 - general output bank 9 (outputs 73-80).*
- SW [reserved_0](#)
 - Reserved.*
- SW [reserved_2](#)
 - Reserved.*
- SW [reserved_4](#)
 - Reserved.*
- SW [reserved_6](#)
 - Reserved.*
- SW [reserved_8](#)
 - Reserved.*
- SW [reserved_10](#)
 - Reserved.*
- SW [reserved_12](#)
 - Reserved.*
- SW [reserved_14](#)
 - Reserved.*
- UB [reserved_16](#)
 - Reserved.*
- UB [reserved_17](#)
 - Reserved.*
- UB [reserved_18](#)
 - Reserved.*
- UB [reserved_19](#)
 - Reserved.*
- UB [reserved_20](#)
 - Reserved.*
- UB [reserved_21](#)
 - Reserved.*
- UB [reserved_22](#)
 - Reserved.*
- UB [reserved_23](#)
 - Reserved.*
- UB [error_code](#)
 - error code.*
- UB [thread_status](#)
 - thread status.*
- UL [reserved_24](#)
 - Reserved.*
- UL [contour_segment_count](#)
 - Segment Count for Contour Mode.*
- UW [contour_buffer_available](#)
 - Buffer space remaining, Contour Mode.*

- UW [s_plane_segment_count](#)
segment count of coordinated move for S plane.
- UW [s_plane_move_status](#)
coordinated move status for S plane.
- SL [s_distance](#)
distance traveled in coordinated move for S plane.
- UW [s_plane_buffer_available](#)
Buffer space remaining, S Plane.
- UW [t_plane_segment_count](#)
segment count of coordinated move for T plane.
- UW [t_plane_move_status](#)
Coordinated move status for T plane.
- SL [t_distance](#)
distance traveled in coordinated move for T plane.
- UW [t_plane_buffer_available](#)
Buffer space remaining, T Plane.
- UW [axis_a_status](#)
A axis status.
- UB [axis_a_switches](#)
A axis switches.
- UB [axis_a_stop_code](#)
A axis stop code.
- SL [axis_a_reference_position](#)
A axis reference position.
- SL [axis_a_motor_position](#)
A axis motor position.
- SL [axis_a_position_error](#)
A axis position error.
- SL [axis_a_aux_position](#)
A axis auxiliary position.
- SL [axis_a_velocity](#)
A axis velocity.
- SL [axis_a_torque](#)
A axis torque.
- UW [axis_a_analog_in](#)
A axis analog input.
- UB [axis_a_reserved_0](#)
Reserved.
- UB [axis_a_reserved_1](#)
Reserved.
- SL [axis_a_variable](#)
A User-defined variable (ZA).
- UW [axis_b_status](#)
B axis status.
- UB [axis_b_switches](#)
B axis switches.
- UB [axis_b_stop_code](#)
B axis stop code.
- SL [axis_b_reference_position](#)
B axis reference position.
- SL [axis_b_motor_position](#)

- B axis motor position.*
- SL [axis_b_position_error](#)
 - B axis position error.*
- SL [axis_b_aux_position](#)
 - B axis auxiliary position.*
- SL [axis_b_velocity](#)
 - B axis velocity.*
- SL [axis_b_torque](#)
 - B axis torque.*
- UW [axis_b_analog_in](#)
 - B axis analog input.*
- UB [axis_b_reserved_0](#)
 - Reserved.*
- UB [axis_b_reserved_1](#)
 - Reserved.*
- SL [axis_b_variable](#)
 - B User-defined variable (ZA).*
- UW [axis_c_status](#)
 - C axis status.*
- UB [axis_c_switches](#)
 - C axis switches.*
- UB [axis_c_stop_code](#)
 - C axis stop code.*
- SL [axis_c_reference_position](#)
 - C axis reference position.*
- SL [axis_c_motor_position](#)
 - C axis motor position.*
- SL [axis_c_position_error](#)
 - C axis position error.*
- SL [axis_c_aux_position](#)
 - C axis auxiliary position.*
- SL [axis_c_velocity](#)
 - C axis velocity.*
- SL [axis_c_torque](#)
 - C axis torque.*
- UW [axis_c_analog_in](#)
 - C axis analog input.*
- UB [axis_c_reserved_0](#)
 - Reserved.*
- UB [axis_c_reserved_1](#)
 - Reserved.*
- SL [axis_c_variable](#)
 - C User-defined variable (ZA).*
- UW [axis_d_status](#)
 - D axis status.*
- UB [axis_d_switches](#)
 - D axis switches.*
- UB [axis_d_stop_code](#)
 - D axis stop code.*
- SL [axis_d_reference_position](#)
 - D axis reference position.*

- SL [axis_d_motor_position](#)
D axis motor position.
- SL [axis_d_position_error](#)
D axis position error.
- SL [axis_d_aux_position](#)
D axis auxiliary position.
- SL [axis_d_velocity](#)
D axis velocity.
- SL [axis_d_torque](#)
D axis torque.
- UW [axis_d_analog_in](#)
D axis analog input.
- UB [axis_d_reserved_0](#)
Reserved.
- UB [axis_d_reserved_1](#)
Reserved.
- SL [axis_d_variable](#)
D User-defined variable (ZA).
- UW [axis_e_status](#)
E axis status.
- UB [axis_e_switches](#)
E axis switches.
- UB [axis_e_stop_code](#)
E axis stop code.
- SL [axis_e_reference_position](#)
E axis reference position.
- SL [axis_e_motor_position](#)
E axis motor position.
- SL [axis_e_position_error](#)
E axis position error.
- SL [axis_e_aux_position](#)
E axis auxiliary position.
- SL [axis_e_velocity](#)
E axis velocity.
- SL [axis_e_torque](#)
E axis torque.
- UW [axis_e_analog_in](#)
E axis analog input.
- UB [axis_e_reserved_0](#)
Reserved.
- UB [axis_e_reserved_1](#)
Reserved.
- SL [axis_e_variable](#)
E User-defined variable (ZA).
- UW [axis_f_status](#)
F axis status.
- UB [axis_f_switches](#)
F axis switches.
- UB [axis_f_stop_code](#)
F axis stop code.
- SL [axis_f_reference_position](#)

- F axis reference position.*
- SL [axis_f_motor_position](#)
F axis motor position.
- SL [axis_f_position_error](#)
F axis position error.
- SL [axis_f_aux_position](#)
F axis auxiliary position.
- SL [axis_f_velocity](#)
F axis velocity.
- SL [axis_f_torque](#)
F axis torque.
- UW [axis_f_analog_in](#)
F axis analog input.
- UB [axis_f_reserved_0](#)
Reserved.
- UB [axis_f_reserved_1](#)
Reserved.
- SL [axis_f_variable](#)
F User-defined variable (ZA).
- UW [axis_g_status](#)
G axis status.
- UB [axis_g_switches](#)
G axis switches.
- UB [axis_g_stop_code](#)
G axis stop code.
- SL [axis_g_reference_position](#)
G axis reference position.
- SL [axis_g_motor_position](#)
G axis motor position.
- SL [axis_g_position_error](#)
G axis position error.
- SL [axis_g_aux_position](#)
G axis auxiliary position.
- SL [axis_g_velocity](#)
G axis velocity.
- SL [axis_g_torque](#)
G axis torque.
- UW [axis_g_analog_in](#)
G axis analog input.
- UB [axis_g_reserved_0](#)
Reserved.
- UB [axis_g_reserved_1](#)
Reserved.
- SL [axis_g_variable](#)
G User-defined variable (ZA).
- UW [axis_h_status](#)
H axis status.
- UB [axis_h_switches](#)
H axis switches.
- UB [axis_h_stop_code](#)
H axis stop code.

- SL [axis_h_reference_position](#)
H axis reference position.
- SL [axis_h_motor_position](#)
H axis motor position.
- SL [axis_h_position_error](#)
H axis position error.
- SL [axis_h_aux_position](#)
H axis auxiliary position.
- SL [axis_h_velocity](#)
H axis velocity.
- SL [axis_h_torque](#)
H axis torque.
- UW [axis_h_analog_in](#)
H axis analog input.
- UB [axis_h_reserved_0](#)
Reserved.
- UB [axis_h_reserved_1](#)
Reserved.
- SL [axis_h_variable](#)
H User-defined variable (ZA).

12.6.1 Detailed Description

Data record struct for DMC-1806 controller.

The 18x6 Data record is the same as 4000 except the following.

1. No header bytes. Firmware strips it in DR. Software removes it from QR.
2. No Ethernet status (bytes 42-49).
3. No amplifier status (bytes 52-55).
4. No axis-specific hall input status.

Definition at line 409 of file `gclib_record.h`.

The documentation for this struct was generated from the following file:

- [gclib_record.h](#)

12.7 GDataRecord2103 Struct Reference

Data record struct for DMC-2103 controllers.

```
#include <gclib_record.h>
```

Data Fields

- UB [header_0](#)
1st Byte of Header.
- UB [header_1](#)
2nd Byte of Header.
- UB [header_2](#)
3rd Byte of Header.
- UB [header_3](#)
4th Byte of Header.
- UW [sample_number](#)

- sample number.*
- UB [input_bank_0](#)
 - general input bank 0 (inputs 1-8).*
- UB [input_bank_1](#)
 - general input bank 1 (inputs 9-16).*
- UB [input_bank_2](#)
 - general input bank 2 (inputs 17-24).*
- UB [input_bank_3](#)
 - general input bank 3 (inputs 25-32).*
- UB [input_bank_4](#)
 - general input bank 4 (inputs 33-40).*
- UB [input_bank_5](#)
 - general input bank 5 (inputs 41-48).*
- UB [input_bank_6](#)
 - general input bank 6 (inputs 49-56).*
- UB [input_bank_7](#)
 - general input bank 7 (inputs 57-64).*
- UB [input_bank_8](#)
 - general input bank 8 (inputs 65-72).*
- UB [input_bank_9](#)
 - general input bank 9 (inputs 73-80).*
- UB [output_bank_0](#)
 - general output bank 0 (outputs 1-8).*
- UB [output_bank_1](#)
 - general output bank 1 (outputs 9-16).*
- UB [output_bank_2](#)
 - general output bank 2 (outputs 17-24).*
- UB [output_bank_3](#)
 - general output bank 3 (outputs 25-32).*
- UB [output_bank_4](#)
 - general output bank 4 (outputs 33-40).*
- UB [output_bank_5](#)
 - general output bank 5 (outputs 41-48).*
- UB [output_bank_6](#)
 - general output bank 6 (outputs 49-56).*
- UB [output_bank_7](#)
 - general output bank 7 (outputs 57-64).*
- UB [output_bank_8](#)
 - general output bank 8 (outputs 65-72).*
- UB [output_bank_9](#)
 - general output bank 9 (outputs 73-80).*
- UB [error_code](#)
 - error code.*
- UB [general_status](#)
 - general status*
- UW [s_plane_segment_count](#)
 - segment count of coordinated move for S plane.*
- UW [s_plane_move_status](#)
 - coordinated move status for S plane.*
- SL [s_distance](#)
 - distance traveled in coordinated move for S plane.*

- UW [t_plane_segment_count](#)
segment count of coordinated move for T plane.
- UW [t_plane_move_status](#)
Coordinated move status for T plane.
- SL [t_distance](#)
distance traveled in coordinated move for T plane.
- UW [axis_a_status](#)
A axis status.
- UB [axis_a_switches](#)
A axis switches.
- UB [axis_a_stop_code](#)
A axis stop code.
- SL [axis_a_reference_position](#)
A axis reference position.
- SL [axis_a_motor_position](#)
A axis motor position.
- SL [axis_a_position_error](#)
A axis position error.
- SL [axis_a_aux_position](#)
A axis auxiliary position.
- SL [axis_a_velocity](#)
A axis velocity.
- SW [axis_a_torque](#)
A axis torque.
- UW [axis_a_analog_in](#)
A axis analog input.
- UW [axis_b_status](#)
B axis status.
- UB [axis_b_switches](#)
B axis switches.
- UB [axis_b_stop_code](#)
B axis stop code.
- SL [axis_b_reference_position](#)
B axis reference position.
- SL [axis_b_motor_position](#)
B axis motor position.
- SL [axis_b_position_error](#)
B axis position error.
- SL [axis_b_aux_position](#)
B axis auxiliary position.
- SL [axis_b_velocity](#)
B axis velocity.
- SW [axis_b_torque](#)
B axis torque.
- UW [axis_b_analog_in](#)
B axis analog input.
- UW [axis_c_status](#)
C axis status.
- UB [axis_c_switches](#)
C axis switches.
- UB [axis_c_stop_code](#)

- C axis stop code.*
- SL [axis_c_reference_position](#)
C axis reference position.
- SL [axis_c_motor_position](#)
C axis motor position.
- SL [axis_c_position_error](#)
C axis position error.
- SL [axis_c_aux_position](#)
C axis auxiliary position.
- SL [axis_c_velocity](#)
C axis velocity.
- SW [axis_c_torque](#)
C axis torque.
- UW [axis_c_analog_in](#)
C axis analog input.
- UW [axis_d_status](#)
D axis status.
- UB [axis_d_switches](#)
D axis switches.
- UB [axis_d_stop_code](#)
D axis stop code.
- SL [axis_d_reference_position](#)
D axis reference position.
- SL [axis_d_motor_position](#)
D axis motor position.
- SL [axis_d_position_error](#)
D axis position error.
- SL [axis_d_aux_position](#)
D axis auxiliary position.
- SL [axis_d_velocity](#)
D axis velocity.
- SW [axis_d_torque](#)
D axis torque.
- UW [axis_d_analog_in](#)
D axis analog input.
- UW [axis_e_status](#)
E axis status.
- UB [axis_e_switches](#)
E axis switches.
- UB [axis_e_stop_code](#)
E axis stop code.
- SL [axis_e_reference_position](#)
E axis reference position.
- SL [axis_e_motor_position](#)
E axis motor position.
- SL [axis_e_position_error](#)
E axis position error.
- SL [axis_e_aux_position](#)
E axis auxiliary position.
- SL [axis_e_velocity](#)
E axis velocity.

- SW [axis_e_torque](#)
E axis torque.
- UW [axis_e_analog_in](#)
E axis analog input.
- UW [axis_f_status](#)
F axis status.
- UB [axis_f_switches](#)
F axis switches.
- UB [axis_f_stop_code](#)
F axis stop code.
- SL [axis_f_reference_position](#)
F axis reference position.
- SL [axis_f_motor_position](#)
F axis motor position.
- SL [axis_f_position_error](#)
F axis position error.
- SL [axis_f_aux_position](#)
F axis auxiliary position.
- SL [axis_f_velocity](#)
F axis velocity.
- SW [axis_f_torque](#)
F axis torque.
- UW [axis_f_analog_in](#)
F axis analog input.
- UW [axis_g_status](#)
G axis status.
- UB [axis_g_switches](#)
G axis switches.
- UB [axis_g_stop_code](#)
G axis stop code.
- SL [axis_g_reference_position](#)
G axis reference position.
- SL [axis_g_motor_position](#)
G axis motor position.
- SL [axis_g_position_error](#)
G axis position error.
- SL [axis_g_aux_position](#)
G axis auxiliary position.
- SL [axis_g_velocity](#)
G axis velocity.
- SW [axis_g_torque](#)
G axis torque.
- UW [axis_g_analog_in](#)
G axis analog input.
- UW [axis_h_status](#)
H axis status.
- UB [axis_h_switches](#)
H axis switches.
- UB [axis_h_stop_code](#)
H axis stop code.
- SL [axis_h_reference_position](#)

- H axis reference position.*
- SL [axis_h_motor_position](#)
 - H axis motor position.*
- SL [axis_h_position_error](#)
 - H axis position error.*
- SL [axis_h_aux_position](#)
 - H axis auxiliary position.*
- SL [axis_h_velocity](#)
 - H axis velocity.*
- SW [axis_h_torque](#)
 - H axis torque.*
- UW [axis_h_analog_in](#)
 - H axis analog input.*

12.7.1 Detailed Description

Data record struct for DMC-2103 controllers.

Definition at line 586 of file `gclib_record.h`.

The documentation for this struct was generated from the following file:

- [gclib_record.h](#)

12.8 GDataRecord30000 Struct Reference

Data record struct for DMC-30010 controllers.

```
#include <gclib_record.h>
```

Data Fields

- UB [header_0](#)
 - 1st Byte of Header.*
- UB [header_1](#)
 - 2nd Byte of Header.*
- UB [header_2](#)
 - 3rd Byte of Header.*
- UB [header_3](#)
 - 4th Byte of Header.*
- UW [sample_number](#)
 - sample number.*
- UB [input_bank_0](#)
 - general input bank 0 (inputs 1-8).*
- UB [input_bank_1](#)
 - general input bank 1 (inputs 9-16).*
- UB [output_bank_0](#)
 - general output bank 0 (outputs 1-8).*
- UB [output_bank_1](#)
 - general output bank 1 (outputs 9-16).*
- UB [error_code](#)
 - error code.*
- UB [thread_status](#)
 - thread status.*
- UW [input_analog_2](#)

- Analog input 2. 1 is in axis data, see axis_a_analog_in.*
- UW [output_analog_1](#)
 - Analog output 1.*
- UW [output_analog_2](#)
 - Analog output 2.*
- UL [amplifier_status](#)
 - Amplifier Status.*
- UL [contour_segment_count](#)
 - Segment Count for Contour Mode.*
- UW [contour_buffer_available](#)
 - Buffer space remaining, Contour Mode.*
- UW [s_plane_segment_count](#)
 - segment count of coordinated move for S plane.*
- UW [s_plane_move_status](#)
 - coordinated move status for S plane.*
- SL [s_distance](#)
 - distance traveled in coordinated move for S plane.*
- UW [s_plane_buffer_available](#)
 - Buffer space remaining, S Plane.*
- UW [axis_a_status](#)
 - A axis status.*
- UB [axis_a_switches](#)
 - A axis switches.*
- UB [axis_a_stop_code](#)
 - A axis stop code.*
- SL [axis_a_reference_position](#)
 - A axis reference position.*
- SL [axis_a_motor_position](#)
 - A axis motor position.*
- SL [axis_a_position_error](#)
 - A axis position error.*
- SL [axis_a_aux_position](#)
 - A axis auxiliary position.*
- SL [axis_a_velocity](#)
 - A axis velocity.*
- SL [axis_a_torque](#)
 - A axis torque.*
- UW [axis_a_analog_in](#)
 - A axis analog input.*
- UB [axis_a_halls](#)
 - A Hall Input Status.*
- UB [axis_a_reserved](#)
 - Reserved.*
- SL [axis_a_variable](#)
 - A User-defined variable (ZA).*

12.8.1 Detailed Description

Data record struct for DMC-30010 controllers.

Definition at line 818 of file `gclib_record.h`.

The documentation for this struct was generated from the following file:

- [gclib_record.h](#)

12.9 GDataRecord4000 Struct Reference

Data record struct for DMC-4000 controllers, including 4000, 4200, 4103, and 500x0.

```
#include <gclib_record.h>
```

Data Fields

- UB [header_0](#)
1st Byte of Header.
- UB [header_1](#)
2nd Byte of Header.
- UB [header_2](#)
3rd Byte of Header.
- UB [header_3](#)
4th Byte of Header.
- UW [sample_number](#)
sample number.
- UB [input_bank_0](#)
general input bank 0 (inputs 1-8).
- UB [input_bank_1](#)
general input bank 1 (inputs 9-16).
- UB [input_bank_2](#)
general input bank 2 (inputs 17-24).
- UB [input_bank_3](#)
general input bank 3 (inputs 25-32).
- UB [input_bank_4](#)
general input bank 4 (inputs 33-40).
- UB [input_bank_5](#)
general input bank 5 (inputs 41-48).
- UB [input_bank_6](#)
general input bank 6 (inputs 49-56).
- UB [input_bank_7](#)
general input bank 7 (inputs 57-64).
- UB [input_bank_8](#)
general input bank 8 (inputs 65-72).
- UB [input_bank_9](#)
general input bank 9 (inputs 73-80).
- UB [output_bank_0](#)
general output bank 0 (outputs 1-8).
- UB [output_bank_1](#)
general output bank 1 (outputs 9-16).
- UB [output_bank_2](#)
general output bank 2 (outputs 17-24).
- UB [output_bank_3](#)
general output bank 3 (outputs 25-32).
- UB [output_bank_4](#)
general output bank 4 (outputs 33-40).
- UB [output_bank_5](#)
general output bank 5 (outputs 41-48).
- UB [output_bank_6](#)
general output bank 6 (outputs 49-56).
- UB [output_bank_7](#)

- general output bank 7 (outputs 57-64).*
- UB [output_bank_8](#)
 - general output bank 8 (outputs 65-72).*
- UB [output_bank_9](#)
 - general output bank 9 (outputs 73-80).*
- SW [reserved_0](#)
 - Reserved.*
- SW [reserved_2](#)
 - Reserved.*
- SW [reserved_4](#)
 - Reserved.*
- SW [reserved_6](#)
 - Reserved.*
- SW [reserved_8](#)
 - Reserved.*
- SW [reserved_10](#)
 - Reserved.*
- SW [reserved_12](#)
 - Reserved.*
- SW [reserved_14](#)
 - Reserved.*
- UB [ethernet_status_a](#)
 - Ethernet Handle A Status.*
- UB [ethernet_status_b](#)
 - Ethernet Handle B Status.*
- UB [ethernet_status_c](#)
 - Ethernet Handle C Status.*
- UB [ethernet_status_d](#)
 - Ethernet Handle D Status.*
- UB [ethernet_status_e](#)
 - Ethernet Handle E Status.*
- UB [ethernet_status_f](#)
 - Ethernet Handle F Status.*
- UB [ethernet_status_g](#)
 - Ethernet Handle G Status.*
- UB [ethernet_status_h](#)
 - Ethernet Handle H Status.*
- UB [error_code](#)
 - error code.*
- UB [thread_status](#)
 - thread status*
- UL [amplifier_status](#)
 - Amplifier Status.*
- UL [contour_segment_count](#)
 - Segment Count for Contour Mode.*
- UW [contour_buffer_available](#)
 - Buffer space remaining, Contour Mode.*
- UW [s_plane_segment_count](#)
 - segment count of coordinated move for S plane.*
- UW [s_plane_move_status](#)
 - coordinated move status for S plane.*

- SL [s_distance](#)
distance traveled in coordinated move for S plane.
- UW [s_plane_buffer_available](#)
Buffer space remaining, S Plane.
- UW [t_plane_segment_count](#)
segment count of coordinated move for T plane.
- UW [t_plane_move_status](#)
Coordinated move status for T plane.
- SL [t_distance](#)
distance traveled in coordinated move for T plane.
- UW [t_plane_buffer_available](#)
Buffer space remaining, T Plane.
- UW [axis_a_status](#)
A axis status.
- UB [axis_a_switches](#)
A axis switches.
- UB [axis_a_stop_code](#)
A axis stop code.
- SL [axis_a_reference_position](#)
A axis reference position.
- SL [axis_a_motor_position](#)
A axis motor position.
- SL [axis_a_position_error](#)
A axis position error.
- SL [axis_a_aux_position](#)
A axis auxiliary position.
- SL [axis_a_velocity](#)
A axis velocity.
- SL [axis_a_torque](#)
A axis torque.
- UW [axis_a_analog_in](#)
A axis analog input.
- UB [axis_a_halls](#)
A Hall Input Status.
- UB [axis_a_reserved](#)
Reserved.
- SL [axis_a_variable](#)
A User-defined variable (ZA).
- UW [axis_b_status](#)
B axis status.
- UB [axis_b_switches](#)
B axis switches.
- UB [axis_b_stop_code](#)
B axis stop code.
- SL [axis_b_reference_position](#)
B axis reference position.
- SL [axis_b_motor_position](#)
B axis motor position.
- SL [axis_b_position_error](#)
B axis position error.
- SL [axis_b_aux_position](#)

- B axis auxiliary position.*
- SL [axis_b_velocity](#)
 - B axis velocity.*
- SL [axis_b_torque](#)
 - B axis torque.*
- UW [axis_b_analog_in](#)
 - B axis analog input.*
- UB [axis_b_halls](#)
 - B Hall Input Status.*
- UB [axis_b_reserved](#)
 - Reserved.*
- SL [axis_b_variable](#)
 - B User-defined variable (ZA).*
- UW [axis_c_status](#)
 - C axis status.*
- UB [axis_c_switches](#)
 - C axis switches.*
- UB [axis_c_stop_code](#)
 - C axis stop code.*
- SL [axis_c_reference_position](#)
 - C axis reference position.*
- SL [axis_c_motor_position](#)
 - C axis motor position.*
- SL [axis_c_position_error](#)
 - C axis position error.*
- SL [axis_c_aux_position](#)
 - C axis auxiliary position.*
- SL [axis_c_velocity](#)
 - C axis velocity.*
- SL [axis_c_torque](#)
 - C axis torque.*
- UW [axis_c_analog_in](#)
 - C axis analog input.*
- UB [axis_c_halls](#)
 - C Hall Input Status.*
- UB [axis_c_reserved](#)
 - Reserved.*
- SL [axis_c_variable](#)
 - C User-defined variable (ZA).*
- UW [axis_d_status](#)
 - D axis status.*
- UB [axis_d_switches](#)
 - D axis switches.*
- UB [axis_d_stop_code](#)
 - D axis stop code.*
- SL [axis_d_reference_position](#)
 - D axis reference position.*
- SL [axis_d_motor_position](#)
 - D axis motor position.*
- SL [axis_d_position_error](#)
 - D axis position error.*

- SL [axis_d_aux_position](#)
D axis auxiliary position.
- SL [axis_d_velocity](#)
D axis velocity.
- SL [axis_d_torque](#)
D axis torque.
- UW [axis_d_analog_in](#)
D axis analog input.
- UB [axis_d_halls](#)
D Hall Input Status.
- UB [axis_d_reserved](#)
Reserved.
- SL [axis_d_variable](#)
D User-defined variable (ZA).
- UW [axis_e_status](#)
E axis status.
- UB [axis_e_switches](#)
E axis switches.
- UB [axis_e_stop_code](#)
E axis stop code.
- SL [axis_e_reference_position](#)
E axis reference position.
- SL [axis_e_motor_position](#)
E axis motor position.
- SL [axis_e_position_error](#)
E axis position error.
- SL [axis_e_aux_position](#)
E axis auxiliary position.
- SL [axis_e_velocity](#)
E axis velocity.
- SL [axis_e_torque](#)
E axis torque.
- UW [axis_e_analog_in](#)
E axis analog input.
- UB [axis_e_halls](#)
E Hall Input Status.
- UB [axis_e_reserved](#)
Reserved.
- SL [axis_e_variable](#)
E User-defined variable (ZA).
- UW [axis_f_status](#)
F axis status.
- UB [axis_f_switches](#)
F axis switches.
- UB [axis_f_stop_code](#)
F axis stop code.
- SL [axis_f_reference_position](#)
F axis reference position.
- SL [axis_f_motor_position](#)
F axis motor position.
- SL [axis_f_position_error](#)

- F axis position error.*
- SL [axis_f_aux_position](#)
F axis auxiliary position.
- SL [axis_f_velocity](#)
F axis velocity.
- SL [axis_f_torque](#)
F axis torque.
- UW [axis_f_analog_in](#)
F axis analog input.
- UB [axis_f_halls](#)
F Hall Input Status.
- UB [axis_f_reserved](#)
Reserved.
- SL [axis_f_variable](#)
F User-defined variable (ZA).
- UW [axis_g_status](#)
G axis status.
- UB [axis_g_switches](#)
G axis switches.
- UB [axis_g_stop_code](#)
G axis stop code.
- SL [axis_g_reference_position](#)
G axis reference position.
- SL [axis_g_motor_position](#)
G axis motor position.
- SL [axis_g_position_error](#)
G axis position error.
- SL [axis_g_aux_position](#)
G axis auxiliary position.
- SL [axis_g_velocity](#)
G axis velocity.
- SL [axis_g_torque](#)
G axis torque.
- UW [axis_g_analog_in](#)
G axis analog input.
- UB [axis_g_halls](#)
G Hall Input Status.
- UB [axis_g_reserved](#)
Reserved.
- SL [axis_g_variable](#)
G User-defined variable (ZA).
- UW [axis_h_status](#)
H axis status.
- UB [axis_h_switches](#)
H axis switches.
- UB [axis_h_stop_code](#)
H axis stop code.
- SL [axis_h_reference_position](#)
H axis reference position.
- SL [axis_h_motor_position](#)
H axis motor position.

- SL [axis_h_position_error](#)
H axis position error.
- SL [axis_h_aux_position](#)
H axis auxiliary position.
- SL [axis_h_velocity](#)
H axis velocity.
- SL [axis_h_torque](#)
H axis torque.
- UW [axis_h_analog_in](#)
H axis analog input.
- UB [axis_h_halls](#)
H Hall Input Status.
- UB [axis_h_reserved](#)
Reserved.
- SL [axis_h_variable](#)
H User-defined variable (ZA).

12.9.1 Detailed Description

Data record struct for DMC-4000 controllers, including 4000, 4200, 4103, and 500x0.

Definition at line 35 of file `gclib_record.h`.

The documentation for this struct was generated from the following file:

- [gclib_record.h](#)

12.10 GDataRecord47000_ENC Struct Reference

Data record struct for RIO-471xx and RIO-472xx PLCs. Includes encoder fields.

`#include <gclib_record.h>`

Data Fields

- UB [header_0](#)
1st Byte of Header.
- UB [header_1](#)
2nd Byte of Header.
- UB [header_2](#)
3rd Byte of Header.
- UB [header_3](#)
4th Byte of Header.
- UW [sample_number](#)
Sample number.
- UB [error_code](#)
Error code.
- UB [general_status](#)
General status.
- UW [output_analog_0](#)
Analog output 0.
- UW [output_analog_1](#)
Analog output 1.
- UW [output_analog_2](#)
Analog output 2.

- UW [output_analog_3](#)
Analog output 3.
- UW [output_analog_4](#)
Analog output 4.
- UW [output_analog_5](#)
Analog output 5.
- UW [output_analog_6](#)
Analog output 6.
- UW [output_analog_7](#)
Analog output 7.
- UW [input_analog_0](#)
Analog input 0.
- UW [input_analog_1](#)
Analog input 1.
- UW [input_analog_2](#)
Analog input 2.
- UW [input_analog_3](#)
Analog input 3.
- UW [input_analog_4](#)
Analog input 4.
- UW [input_analog_5](#)
Analog input 5.
- UW [input_analog_6](#)
Analog input 6.
- UW [input_analog_7](#)
Analog input 7.
- UW [output_bank_0](#)
Digital outputs 0-15;.
- UW [input_bank_0](#)
Digital inputs 0-15;.
- UL [pulse_count_0](#)
Pulse counter (see PC).
- SL [zc_variable](#)
ZC User-defined variable (see ZC).
- SL [zd_variable](#)
ZD User-defined variable (see ZD).
- SL [encoder_0](#)
Encoder channel 0. Data only valid for parts with -BISS, -QUAD, or -SSI.
- SL [encoder_1](#)
Encoder channel 1. Data only valid for parts with -BISS, -QUAD, or -SSI.
- SL [encoder_2](#)
Encoder channel 2. Data only valid for parts with -BISS, -QUAD, or -SSI.
- SL [encoder_3](#)
Encoder channel 3. Data only valid for parts with -BISS, -QUAD, or -SSI.

12.10.1 Detailed Description

Data record struct for RIO-471xx and RIO-472xx PLCs. Includes encoder fields.

Definition at line 870 of file `gclib_record.h`.

The documentation for this struct was generated from the following file:

- [gclib_record.h](#)

12.11 GDataRecord47162 Struct Reference

Data record struct for RIO-47162.

```
#include <gclib_record.h>
```

Data Fields

- UB [header_0](#)
1st Byte of Header.
- UB [header_1](#)
2nd Byte of Header.
- UB [header_2](#)
3rd Byte of Header.
- UB [header_3](#)
4th Byte of Header.
- UW [sample_number](#)
Sample number.
- UB [error_code](#)
Error code.
- UB [general_status](#)
General status.
- UW [output_analog_0](#)
Analog output 0.
- UW [output_analog_1](#)
Analog output 1.
- UW [output_analog_2](#)
Analog output 2.
- UW [output_analog_3](#)
Analog output 3.
- UW [output_analog_4](#)
Analog output 4.
- UW [output_analog_5](#)
Analog output 5.
- UW [output_analog_6](#)
Analog output 6.
- UW [output_analog_7](#)
Analog output 7.
- UW [input_analog_0](#)
Analog input 0.
- UW [input_analog_1](#)
Analog input 1.
- UW [input_analog_2](#)
Analog input 2.
- UW [input_analog_3](#)
Analog input 3.
- UW [input_analog_4](#)
Analog input 4.
- UW [input_analog_5](#)
Analog input 5.
- UW [input_analog_6](#)
Analog input 6.
- UW [input_analog_7](#)

- Analog input 7.*
- UB [output_byte_0](#)
 - Digital outputs 0-7.*
- UB [output_byte_1](#)
 - Digital outputs 8-15.*
- UB [output_byte_2](#)
 - Digital outputs 16-23.*
- UB [input_byte_0](#)
 - Digital inputs 0-7.*
- UB [input_byte_1](#)
 - Digital inputs 8-15.*
- UB [input_byte_2](#)
 - Digital inputs 16-23.*
- UB [input_byte_3](#)
 - Digital inputs 24-31.*
- UB [input_byte_4](#)
 - Digital inputs 32-39.*
- UL [pulse_count_0](#)
 - Pulse counter (see PC).*
- SL [zc_variable](#)
 - ZC User-defined variable (see ZC).*
- SL [zd_variable](#)
 - ZD User-defined variable (see ZD).*
- SL [encoder_0](#)
 - Encoder channel 0. Data only valid for parts with -BISS, -QUAD, or -SSI.*
- SL [encoder_1](#)
 - Encoder channel 1. Data only valid for parts with -BISS, -QUAD, or -SSI.*
- SL [encoder_2](#)
 - Encoder channel 2. Data only valid for parts with -BISS, -QUAD, or -SSI.*
- SL [encoder_3](#)
 - Encoder channel 3. Data only valid for parts with -BISS, -QUAD, or -SSI.*

12.11.1 Detailed Description

Data record struct for RIO-47162.

Definition at line 1019 of file `gclib_record.h`.

The documentation for this struct was generated from the following file:

- [gclib_record.h](#)

12.12 GDataRecord47300_24EX Struct Reference

Data record struct for RIO-47300 with 24EX I/O daughter board.

`#include <gclib_record.h>`

Data Fields

- UB [header_0](#)
 - 1st Byte of Header.*
- UB [header_1](#)
 - 2nd Byte of Header.*
- UB [header_2](#)

- 3rd Byte of Header.*
- UB [header_3](#)
- 4th Byte of Header.*
- UW [sample_number](#)
- Sample number.*
- UB [error_code](#)
- Error code.*
- UB [general_status](#)
- General status.*
- UW [output_analog_0](#)
- Analog output 0.*
- UW [output_analog_1](#)
- Analog output 1.*
- UW [output_analog_2](#)
- Analog output 2.*
- UW [output_analog_3](#)
- Analog output 3.*
- UW [output_analog_4](#)
- Analog output 4.*
- UW [output_analog_5](#)
- Analog output 5.*
- UW [output_analog_6](#)
- Analog output 6.*
- UW [output_analog_7](#)
- Analog output 7.*
- UW [input_analog_0](#)
- Analog input 0.*
- UW [input_analog_1](#)
- Analog input 1.*
- UW [input_analog_2](#)
- Analog input 2.*
- UW [input_analog_3](#)
- Analog input 3.*
- UW [input_analog_4](#)
- Analog input 4.*
- UW [input_analog_5](#)
- Analog input 5.*
- UW [input_analog_6](#)
- Analog input 6.*
- UW [input_analog_7](#)
- Analog input 7.*
- UW [output_bank_0](#)
- Digital outputs 0-15.*
- UW [output_bank_1](#)
- Digital outputs 16-23.*
- UW [input_bank_0](#)
- Digital inputs 0-15.*
- UW [input_bank_1](#)
- Digital inputs 16-23.*
- UL [pulse_count_0](#)
- Pulse counter (see PC)8.*

- SL [zc_variable](#)
ZC User-defined variable (see ZC).
- SL [zd_variable](#)
ZD User-defined variable (see ZD).
- UW [output_bank_2](#)
Digital outputs 24-39. Data only valid for parts with 24EXOUT.
- UW [output_bank_3](#)
Digital outputs 40-47. Data only valid for parts with 24EXOUT.
- UW [input_bank_2](#)
Digital inputs 24-39. Data only valid for parts with 24EXIN.
- UW [input_bank_3](#)
Digital inputs 40-47. Data only valid for parts with 24EXIN.

12.12.1 Detailed Description

Data record struct for RIO-47300 with 24EX I/O daughter board.

Definition at line 968 of file `gclib_record.h`.

The documentation for this struct was generated from the following file:

- [gclib_record.h](#)

12.13 GDataRecord47300_ENC Struct Reference

Data record struct for RIO-47300. Includes encoder fields.

```
#include <gclib_record.h>
```

Data Fields

- UB [header_0](#)
1st Byte of Header.
- UB [header_1](#)
2nd Byte of Header.
- UB [header_2](#)
3rd Byte of Header.
- UB [header_3](#)
4th Byte of Header.
- UW [sample_number](#)
Sample number.
- UB [error_code](#)
Error code.
- UB [general_status](#)
General status.
- UW [output_analog_0](#)
Analog output 0.
- UW [output_analog_1](#)
Analog output 1.
- UW [output_analog_2](#)
Analog output 2.
- UW [output_analog_3](#)
Analog output 3.
- UW [output_analog_4](#)
Analog output 4.

- UW [output_analog_5](#)
Analog output 5.
- UW [output_analog_6](#)
Analog output 6.
- UW [output_analog_7](#)
Analog output 7.
- UW [input_analog_0](#)
Analog input 0.
- UW [input_analog_1](#)
Analog input 1.
- UW [input_analog_2](#)
Analog input 2.
- UW [input_analog_3](#)
Analog input 3.
- UW [input_analog_4](#)
Analog input 4.
- UW [input_analog_5](#)
Analog input 5.
- UW [input_analog_6](#)
Analog input 6.
- UW [input_analog_7](#)
Analog input 7.
- UW [output_bank_0](#)
Digital outputs 0-15;.
- UW [output_bank_1](#)
Digital outputs 16-23;.
- UW [input_bank_0](#)
Digital inputs 0-15;.
- UW [input_bank_1](#)
Digital inputs 16-23;.
- UL [pulse_count_0](#)
Pulse counter (see PC).
- SL [zc_variable](#)
ZC User-defined variable (see ZC).
- SL [zd_variable](#)
ZD User-defined variable (see ZD).
- SL [encoder_0](#)
Encoder channel 0. Data only valid for parts with -BISS, -QUAD, or -SSI.
- SL [encoder_1](#)
Encoder channel 1. Data only valid for parts with -BISS, -QUAD, or -SSI.
- SL [encoder_2](#)
Encoder channel 2. Data only valid for parts with -BISS, -QUAD, or -SSI.
- SL [encoder_3](#)
Encoder channel 3. Data only valid for parts with -BISS, -QUAD, or -SSI.

12.13.1 Detailed Description

Data record struct for RIO-47300. Includes encoder fields.

Definition at line 918 of file `gclib_record.h`.

The documentation for this struct was generated from the following file:

- [gclib_record.h](#)

12.14 GDataRecord52000 Struct Reference

Data record struct for DMC-52000 controller. Same as DMC-4000, with bank indicator added at byte 40.

```
#include <gclib_record.h>
```

Data Fields

- UB [header_0](#)
1st Byte of Header.
- UB [header_1](#)
2nd Byte of Header.
- UB [header_2](#)
3rd Byte of Header.
- UB [header_3](#)
4th Byte of Header.
- UW [sample_number](#)
sample number.
- UB [input_bank_0](#)
general input bank 0 (inputs 1-8).
- UB [input_bank_1](#)
general input bank 1 (inputs 9-16).
- UB [input_bank_2](#)
general input bank 2 (inputs 17-24).
- UB [input_bank_3](#)
general input bank 3 (inputs 25-32).
- UB [input_bank_4](#)
general input bank 4 (inputs 33-40).
- UB [input_bank_5](#)
general input bank 5 (inputs 41-48).
- UB [input_bank_6](#)
general input bank 6 (inputs 49-56).
- UB [input_bank_7](#)
general input bank 7 (inputs 57-64).
- UB [input_bank_8](#)
general input bank 8 (inputs 65-72).
- UB [input_bank_9](#)
general input bank 9 (inputs 73-80).
- UB [output_bank_0](#)
general output bank 0 (outputs 1-8).
- UB [output_bank_1](#)
general output bank 1 (outputs 9-16).
- UB [output_bank_2](#)
general output bank 2 (outputs 17-24).
- UB [output_bank_3](#)
general output bank 3 (outputs 25-32).
- UB [output_bank_4](#)
general output bank 4 (outputs 33-40).
- UB [output_bank_5](#)
general output bank 5 (outputs 41-48).
- UB [output_bank_6](#)
general output bank 6 (outputs 49-56).
- UB [output_bank_7](#)

- general output bank 7 (outputs 57-64).*
- UB [output_bank_8](#)
 - general output bank 8 (outputs 65-72).*
- UB [output_bank_9](#)
 - general output bank 9 (outputs 73-80).*
- SW [reserved_0](#)
 - Reserved.*
- SW [reserved_2](#)
 - Reserved.*
- SW [reserved_4](#)
 - Reserved.*
- SW [reserved_6](#)
 - Reserved.*
- SW [reserved_8](#)
 - Reserved.*
- SW [reserved_10](#)
 - Reserved.*
- SW [reserved_12](#)
 - Reserved.*
- UB [ethercat_bank](#)
 - EtherCAT Bank Indicator.*
- UB [reserved_14](#)
 - Reserved.*
- UB [ethernet_status_a](#)
 - Ethernet Handle A Status.*
- UB [ethernet_status_b](#)
 - Ethernet Handle B Status.*
- UB [ethernet_status_c](#)
 - Ethernet Handle C Status.*
- UB [ethernet_status_d](#)
 - Ethernet Handle D Status.*
- UB [ethernet_status_e](#)
 - Ethernet Handle E Status.*
- UB [ethernet_status_f](#)
 - Ethernet Handle F Status.*
- UB [ethernet_status_g](#)
 - Ethernet Handle G Status.*
- UB [ethernet_status_h](#)
 - Ethernet Handle H Status.*
- UB [error_code](#)
 - error code.*
- UB [thread_status](#)
 - thread status*
- UL [amplifier_status](#)
 - Amplifier Status.*
- UL [contour_segment_count](#)
 - Segment Count for Contour Mode.*
- UW [contour_buffer_available](#)
 - Buffer space remaining, Contour Mode.*
- UW [s_plane_segment_count](#)
 - segment count of coordinated move for S plane.*

- UW [s_plane_move_status](#)
coordinated move status for S plane.
- SL [s_distance](#)
distance traveled in coordinated move for S plane.
- UW [s_plane_buffer_available](#)
Buffer space remaining, S Plane.
- UW [t_plane_segment_count](#)
segment count of coordinated move for T plane.
- UW [t_plane_move_status](#)
Coordinated move status for T plane.
- SL [t_distance](#)
distance traveled in coordinated move for T plane.
- UW [t_plane_buffer_available](#)
Buffer space remaining, T Plane.
- UW [axis_a_status](#)
A axis status.
- UB [axis_a_switches](#)
A axis switches.
- UB [axis_a_stop_code](#)
A axis stop code.
- SL [axis_a_reference_position](#)
A axis reference position.
- SL [axis_a_motor_position](#)
A axis motor position.
- SL [axis_a_position_error](#)
A axis position error.
- SL [axis_a_aux_position](#)
A axis auxiliary position.
- SL [axis_a_velocity](#)
A axis velocity.
- SL [axis_a_torque](#)
A axis torque.
- UW [axis_a_analog_in](#)
A axis analog input.
- UB [axis_a_halls](#)
A Hall Input Status.
- UB [axis_a_reserved](#)
Reserved.
- SL [axis_a_variable](#)
A User-defined variable (ZA).
- UW [axis_b_status](#)
B axis status.
- UB [axis_b_switches](#)
B axis switches.
- UB [axis_b_stop_code](#)
B axis stop code.
- SL [axis_b_reference_position](#)
B axis reference position.
- SL [axis_b_motor_position](#)
B axis motor position.
- SL [axis_b_position_error](#)

- B axis position error.*
- SL [axis_b_aux_position](#)
 - B axis auxiliary position.*
- SL [axis_b_velocity](#)
 - B axis velocity.*
- SL [axis_b_torque](#)
 - B axis torque.*
- UW [axis_b_analog_in](#)
 - B axis analog input.*
- UB [axis_b_halls](#)
 - B Hall Input Status.*
- UB [axis_b_reserved](#)
 - Reserved.*
- SL [axis_b_variable](#)
 - B User-defined variable (ZA).*
- UW [axis_c_status](#)
 - C axis status.*
- UB [axis_c_switches](#)
 - C axis switches.*
- UB [axis_c_stop_code](#)
 - C axis stop code.*
- SL [axis_c_reference_position](#)
 - C axis reference position.*
- SL [axis_c_motor_position](#)
 - C axis motor position.*
- SL [axis_c_position_error](#)
 - C axis position error.*
- SL [axis_c_aux_position](#)
 - C axis auxiliary position.*
- SL [axis_c_velocity](#)
 - C axis velocity.*
- SL [axis_c_torque](#)
 - C axis torque.*
- UW [axis_c_analog_in](#)
 - C axis analog input.*
- UB [axis_c_halls](#)
 - C Hall Input Status.*
- UB [axis_c_reserved](#)
 - Reserved.*
- SL [axis_c_variable](#)
 - C User-defined variable (ZA).*
- UW [axis_d_status](#)
 - D axis status.*
- UB [axis_d_switches](#)
 - D axis switches.*
- UB [axis_d_stop_code](#)
 - D axis stop code.*
- SL [axis_d_reference_position](#)
 - D axis reference position.*
- SL [axis_d_motor_position](#)
 - D axis motor position.*

- SL [axis_d_position_error](#)
D axis position error.
- SL [axis_d_aux_position](#)
D axis auxiliary position.
- SL [axis_d_velocity](#)
D axis velocity.
- SL [axis_d_torque](#)
D axis torque.
- UW [axis_d_analog_in](#)
D axis analog input.
- UB [axis_d_halls](#)
D Hall Input Status.
- UB [axis_d_reserved](#)
Reserved.
- SL [axis_d_variable](#)
D User-defined variable (ZA).
- UW [axis_e_status](#)
E axis status.
- UB [axis_e_switches](#)
E axis switches.
- UB [axis_e_stop_code](#)
E axis stop code.
- SL [axis_e_reference_position](#)
E axis reference position.
- SL [axis_e_motor_position](#)
E axis motor position.
- SL [axis_e_position_error](#)
E axis position error.
- SL [axis_e_aux_position](#)
E axis auxiliary position.
- SL [axis_e_velocity](#)
E axis velocity.
- SL [axis_e_torque](#)
E axis torque.
- UW [axis_e_analog_in](#)
E axis analog input.
- UB [axis_e_halls](#)
E Hall Input Status.
- UB [axis_e_reserved](#)
Reserved.
- SL [axis_e_variable](#)
E User-defined variable (ZA).
- UW [axis_f_status](#)
F axis status.
- UB [axis_f_switches](#)
F axis switches.
- UB [axis_f_stop_code](#)
F axis stop code.
- SL [axis_f_reference_position](#)
F axis reference position.
- SL [axis_f_motor_position](#)

- F axis motor position.*
- SL [axis_f_position_error](#)
 - F axis position error.*
- SL [axis_f_aux_position](#)
 - F axis auxiliary position.*
- SL [axis_f_velocity](#)
 - F axis velocity.*
- SL [axis_f_torque](#)
 - F axis torque.*
- UW [axis_f_analog_in](#)
 - F axis analog input.*
- UB [axis_f_halls](#)
 - F Hall Input Status.*
- UB [axis_f_reserved](#)
 - Reserved.*
- SL [axis_f_variable](#)
 - F User-defined variable (ZA).*
- UW [axis_g_status](#)
 - G axis status.*
- UB [axis_g_switches](#)
 - G axis switches.*
- UB [axis_g_stop_code](#)
 - G axis stop code.*
- SL [axis_g_reference_position](#)
 - G axis reference position.*
- SL [axis_g_motor_position](#)
 - G axis motor position.*
- SL [axis_g_position_error](#)
 - G axis position error.*
- SL [axis_g_aux_position](#)
 - G axis auxiliary position.*
- SL [axis_g_velocity](#)
 - G axis velocity.*
- SL [axis_g_torque](#)
 - G axis torque.*
- UW [axis_g_analog_in](#)
 - G axis analog input.*
- UB [axis_g_halls](#)
 - G Hall Input Status.*
- UB [axis_g_reserved](#)
 - Reserved.*
- SL [axis_g_variable](#)
 - G User-defined variable (ZA).*
- UW [axis_h_status](#)
 - H axis status.*
- UB [axis_h_switches](#)
 - H axis switches.*
- UB [axis_h_stop_code](#)
 - H axis stop code.*
- SL [axis_h_reference_position](#)
 - H axis reference position.*

- SL [axis_h_motor_position](#)
H axis motor position.
- SL [axis_h_position_error](#)
H axis position error.
- SL [axis_h_aux_position](#)
H axis auxiliary position.
- SL [axis_h_velocity](#)
H axis velocity.
- SL [axis_h_torque](#)
H axis torque.
- UW [axis_h_analog_in](#)
H axis analog input.
- UB [axis_h_halls](#)
H Hall Input Status.
- UB [axis_h_reserved](#)
Reserved.
- SL [axis_h_variable](#)
H User-defined variable (ZA).

12.14.1 Detailed Description

Data record struct for DMC-52000 controller. Same as DMC-4000, with bank indicator added at byte 40.

Definition at line 218 of file `gclib_record.h`.

The documentation for this struct was generated from the following file:

- [gclib_record.h](#)

12.15 H_ArrayData Struct Reference

Structure to create a linked list for array data.

Data Fields

- char **name** [16]
- char * **data**
- int **len**
- int **elements**
- int **index**
- struct [H_ArrayData](#) * **next**
- struct [H_ArrayData](#) * **tail**
- int **count**

12.15.1 Detailed Description

Structure to create a linked list for array data.

Definition at line 20 of file `arrays.c`.

The documentation for this struct was generated from the following file:

- [arrays.c](#)

12.16 IP_Assigner_Example Class Reference

Assigns controller an IP Address given a serial number and a 1 byte address.

Static Public Member Functions

- static int [Main](#) (string[] args)

Main function for the IP Assigner example.

12.16.1 Detailed Description

Assigns controller an IP Address given a serial number and a 1 byte address.

The first argument should be the Serial # of a Galil Controller.

The second argument should be a 1 Byte value that will be used as the final byte in the newly assigned IP Address.

For VB.NET, see definition in file [ip_assigner_example.vb](#)

Definition at line 25 of file ip_assigner_example.cs.

12.16.2 Member Function Documentation

12.16.2.1 Main()

```
static int Main (
    string[] args ) [inline], [static]
```

Main function for the IP Assigner example.

Parameters

<i>args</i>	An array of command line arguments.
-------------	-------------------------------------

Returns

The success status or error code of the function.

The first argument should be the Serial # of a Galil Controller.

The second argument should be a 1 Byte value that will be used as the final byte in the newly assigned IP Address.

Definition at line 35 of file ip_assigner_example.cs.

References [Examples.GALIL_EXAMPLE_ERROR](#), [Examples.GALIL_EXAMPLE_OK](#), [Examples.IP_Assigner\(\)](#), and [Examples.PrintError\(\)](#).

The documentation for this class was generated from the following file:

- [ip_assigner_example.cs](#)

12.17 Jog_Example Class Reference

Accepts user-input at the command line to control the speed of the controller in Jog mode.

Static Public Member Functions

- static int [Main](#) (string[] args)

Main function for the jog example.

12.17.1 Detailed Description

Accepts user-input at the command line to control the speed of the controller in Jog mode.

The first argument should be the IP Address of a Galil controller.

For VB.NET, see definition in file [jog_example.vb](#)

Definition at line 23 of file jog_example.cs.

12.17.2 Member Function Documentation

12.17.2.1 Main()

```
static int Main (
    string[] args ) [inline], [static]
```

Main function for the jog example.

Parameters

<i>args</i>	An array of command line arguments.
-------------	-------------------------------------

Returns

The success status or error code of the function.

The first argument should be the IP Address of a Galil controller.

Definition at line 31 of file `jog_example.cs`.

References `Examples.GALIL_EXAMPLE_ERROR`, `Examples.GALIL_EXAMPLE_OK`, `Examples.Jog()`, and `Examples.PrintError()`.

The documentation for this class was generated from the following file:

- [jog_example.cs](#)

12.18 Message_Example Class Reference

Demonstrates how to handle and interpret messages from the controller.

Static Public Member Functions

- static int [Main](#) (string[] args)
Main function for the message example.

12.18.1 Detailed Description

Demonstrates how to handle and interpret messages from the controller.

The first argument should be the IP Address of a Galil controller.

For VB.NET, see definition in file [message_example.vb](#)

Definition at line 23 of file `message_example.cs`.

12.18.2 Member Function Documentation

12.18.2.1 Main()

```
static int Main (
    string[] args ) [inline], [static]
```

Main function for the message example.

Parameters

<i>args</i>	An array of command line arguments.
-------------	-------------------------------------

Returns

The success status or error code of the function.

The first argument should be the IP Address of a Galil controller.

Definition at line 31 of file `message_example.cs`.

References `Examples.GALIL_EXAMPLE_ERROR`, `Examples.GALIL_EXAMPLE_OK`, `Examples.Message()`, and `Examples.PrintError()`.

The documentation for this class was generated from the following file:

- [message_example.cs](#)

12.19 Motion_Complete_Example Class Reference

Uses controller interrupts to detect when motion is complete.

Static Public Member Functions

- static int [Main](#) (string[] args)
Main function for the Motion Complete example.

12.19.1 Detailed Description

Uses controller interrupts to detect when motion is complete.
The first argument should be the IP Address of a Galil controller.
For VB.NET, see definition in file [motion_complete_example.vb](#)
Definition at line 23 of file `motion_complete_example.cs`.

12.19.2 Member Function Documentation

12.19.2.1 Main()

```
static int Main (
    string[] args ) [inline], [static]
```

Main function for the Motion Complete example.

Parameters

<i>args</i>	An array of command line arguments.
-------------	-------------------------------------

Returns

The success status or error code of the function.

The first argument should be the IP Address of a Galil controller.

Definition at line 31 of file `motion_complete_example.cs`.

References `Examples.GALIL_EXAMPLE_ERROR`, `Examples.GALIL_EXAMPLE_OK`, `Examples.Motion_↵
Complete()`, and `Examples.PrintError()`.

The documentation for this class was generated from the following file:

- [motion_complete_example.cs](#)

12.20 Position_Tracking_Example Class Reference

Places controller into position tracking mode. Accepts user-defined positional values at the command line.

Static Public Member Functions

- static int [Main](#) (string[] args)
Main function for the position tracking example.

12.20.1 Detailed Description

Places controller into position tracking mode. Accepts user-defined positional values at the command line. The first argument should be the IP Address of a Galil controller. The second argument is optional and defines the default speed of the controller in Position Tracking mode. For VB.NET, see definition in file [position_tracking_example.vb](#). Definition at line 26 of file position_tracking_example.cs.

12.20.2 Member Function Documentation

12.20.2.1 Main()

```
static int Main (
    string[] args ) [inline], [static]
```

Main function for the position tracking example.

Parameters

<i>args</i>	An array of command line arguments.
-------------	-------------------------------------

Returns

The success status or error code of the function.

The first argument should be the IP Address of a Galil controller. The second argument is optional and defines the default speed of the controller in Position Tracking mode.

Definition at line 36 of file position_tracking_example.cs.

References `Examples.GALIL_EXAMPLE_ERROR`, `Examples.GALIL_EXAMPLE_OK`, `Examples.Position_↔Tracking()`, and `Examples.PrintError()`.

The documentation for this class was generated from the following file:

- [position_tracking_example.cs](#)

12.21 Record_Position_Example Class Reference

Takes two file paths at the command line to hold positional data for Axis A and Axis B. Positional data is saved to the two files until an analog input value changes.

Static Public Member Functions

- static int [Main](#) (string[] args)
Main function for the Record Position example.

12.21.1 Detailed Description

Takes two file paths at the command line to hold positional data for Axis A and Axis B. Positional data is saved to the two files until an analog input value changes.

The first argument should be the IP Address of a Galil controller.

The second argument should be a path to a file to save Axis A positional data.

The third argument should be a path to a file to save Axis B positional data.

For VB.NET, see definition in file [record_position_example.vb](#)

Definition at line 27 of file record_position_example.cs.

12.21.2 Member Function Documentation

12.21.2.1 Main()

```
static int Main (
    string[] args ) [inline], [static]
```

Main function for the Record Position example.

Parameters

<i>args</i>	An array of command line arguments.
-------------	-------------------------------------

Returns

The success status or error code of the function.

The first argument should be the IP Address of a Galil controller.

The second argument should be a path to a file to save Axis A positional data.

The third argument should be a path to a file to save Axis B positional data.

Definition at line 38 of file `record_position_example.cs`.

References `Examples.GALIL_EXAMPLE_ERROR`, `Examples.GALIL_EXAMPLE_OK`, `Examples.PrintError()`, and `Examples.Record_Position()`.

The documentation for this class was generated from the following file:

- [record_position_example.cs](#)

12.22 Remote_Client_Example Class Reference

Demonstrates various uses of [GListServers\(\)](#) and [GSetServer\(\)](#)

Static Public Member Functions

- static int [Main](#) ()
Main function for the Remote Client example.

12.22.1 Detailed Description

Demonstrates various uses of [GListServers\(\)](#) and [GSetServer\(\)](#)

This example requires no command line arguments.

For VB.NET, see definition in file [remote_client_example.vb](#)

Definition at line 24 of file `remote_client_example.cs`.

12.22.2 Member Function Documentation

12.22.2.1 Main()

```
static int Main ( ) [inline], [static]
```

Main function for the Remote Client example.

Returns

The success status or error code of the function.

The first argument is an optional name to publish your client under.

Definition at line 31 of file `remote_client_example.cs`.

References `Examples.GALIL_EXAMPLE_ERROR`, `Examples.GALIL_EXAMPLE_OK`, and `Examples.Remote_Client()`.

The documentation for this class was generated from the following file:

- [remote_client_example.cs](#)

12.23 Remote_Server_Example Class Reference

Demonstrates various uses of [GPublishServer\(\)](#)

Static Public Member Functions

- static int [Main](#) (string[] args)

Main function for the Remote Server example.

12.23.1 Detailed Description

Demonstrates various uses of [GPublishServer\(\)](#)

The first argument is an optional name to publish your server under.

For VB.NET, see definition in file [remote_server_example.vb](#)

Definition at line 24 of file [remote_server_example.cs](#).

12.23.2 Member Function Documentation

12.23.2.1 Main()

```
static int Main (
    string[] args ) [inline], [static]
```

Main function for the Remote Server example.

Parameters

<i>args</i>	An array of command line arguments.
-------------	-------------------------------------

Returns

The success status or error code of the function.

The first argument is optional and defines the name to publish your server under.

Definition at line 32 of file [remote_server_example.cs](#).

References [Examples.GALIL_EXAMPLE_ERROR](#), [Examples.GALIL_EXAMPLE_OK](#), and [Examples.Remote_Server\(\)](#).

The documentation for this class was generated from the following file:

- [remote_server_example.cs](#)

12.24 Vector_Mode_Example Class Reference

Takes a path to a file at the command line holding vector commands for the controller. The controller is placed into vector mode and commands are read from the file and sent to the controller.

Static Public Member Functions

- static int [Main](#) (string[] args)

Main function for the vector mode example.

12.24.1 Detailed Description

Takes a path to a file at the command line holding vector commands for the controller. The controller is placed into vector mode and commands are read from the file and sent to the controller.

The first argument should be the IP Address of a Galil controller. The second argument should be a path to a file containing vector commands.

For VB.NET, see definition in file [vector_mode_example.vb](#)
Definition at line 26 of file vector_mode_example.cs.

12.24.2 Member Function Documentation

12.24.2.1 Main()

```
static int Main (  
    string[] args ) [inline], [static]
```

Main function for the vector mode example.

Parameters

<i>args</i>	An array of command line arguments.
-------------	-------------------------------------

Returns

The success status or error code of the function.

The first argument should be the IP Address of a Galil controller. The second argument should be a path to a file containing vector commands.

Definition at line 35 of file vector_mode_example.cs.

References Examples.GALIL_EXAMPLE_ERROR, Examples.GALIL_EXAMPLE_OK, Examples.PrintError(), and Examples.Vector_Mode().

The documentation for this class was generated from the following file:

- [vector_mode_example.cs](#)

Chapter 13

File Documentation

13.1 arrays.c File Reference

```
#include "gclibo.h"
#include <stdlib.h>
#include <string.h>
#include <stdio.h>
#include <math.h>
#include <zlib.h>
```

Data Structures

- struct [H_ArrayData](#)
Structure to create a linked list for array data.

Typedefs

- typedef struct [H_ArrayData](#) **ArrayNode**

Functions

- void [H_InitArrayNode](#) ([ArrayNode](#) *node)
Function to initialize the memory of a new node.
- [GReturn H_AddArray](#) ([ArrayNode](#) *head, char *name, char *data)
Add an ArrayData node to the linked list.
- void [H_FreeArrays](#) ([ArrayNode](#) *node)
Frees all memory downstream of node. After passing list head to this function, all memory is freed and the head node is invalid.
- [GReturn H_UploadArrayToList](#) ([GCon](#) g, [ArrayNode](#) *head, char *name)
Uploads a particular array and adds it to the linked list.
- [GReturn H_CreateArrayNode](#) ([ArrayNode](#) *head, char *name)
Creates a buffer on the heap to write data, and adds it to the linked list.
- [GReturn H_ArrayAddElement](#) ([ArrayNode](#) *node, [GCStringIn](#) element)
Adds an array element to an array node.
- [GReturn H_DownloadArraysFromList](#) ([GCon](#) g, [ArrayNode](#) *head, int fail)
Walks through the array linked list, downloading each.
- [GReturn H_WriteArrayCsv](#) ([ArrayNode](#) *head, [GCStringIn](#) file_path)
After filling the array list, this function is called to write out the CSV.
- [GReturn H_ArrayDownloadFromMemory](#) ([GCon](#) g, const char *array_data, int fail)
Helper function to download a block of arrays to the controller.

- [GReturn H_DownloadData](#) ([GCon](#) g, const char *data, int fail)
Helper function to send a string of commands to the controller, one at a time.
- char * [H_FindSector](#) (char *arr, int arr_size, int index)
Function that returns a pointer to the start of the specified sector in the GCB data.
- [GReturn GCALL GArrayDownloadFile](#) ([GCon](#) g, [GCStringIn](#) file_path)
Array download from file.
- [GReturn GCALL GArrayUploadFile](#) ([GCon](#) g, [GCStringIn](#) file_path, [GCStringIn](#) names)
Array upload to file.
- [GReturn GCALL GSetupDownloadFile](#) ([GCon](#) g, [GCStringIn](#) file_path, [GOption](#) options, [GCStringOut](#) info, [GSize](#) info_len)
Download a saved controller configuration from a file.

13.1.1 Detailed Description

Function calls for uploading and downloading arrays with CSV files. Also contains functions for support of [GSetupDownloadFile\(\)](#).

Warning

All helper functions (names beginning with H_) are subject to change without notice

13.1.2 Function Documentation

13.1.2.1 GArrayDownloadFile()

```
GReturn GCALL GArrayDownloadFile (
    GCon g,
    GCStringIn file_path )
```

Array download from file.

Downloads a csv file containing array data at `file_path`. If the arrays don't exist, they will be dimensioned.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the array file.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_arrays.cpp` for an example.

Definition at line 380 of file `arrays.c`.

References `G_BAD_FILE`, `G_NO_ERROR`, and `H_ArrayDownloadFromMemory()`.

13.1.2.2 GArrayUploadFile()

```
GReturn GCALL GArrayUploadFile (
    GCon g,
    GCStringIn file_path,
    GCStringIn names )
```

Array upload to file.

Uploads the entire controller array table or a subset and saves the data as a csv file specified by `file_path`.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the array file, file will be overwritten if it exists.
<i>names</i>	Null-terminated string containing the arrays to upload, delimited with space. "" or null uploads all arrays listed in LA.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_arrays.cpp` for an example.

Definition at line 408 of file `arrays.c`.

References `G_NO_ERROR`, `GCmdT()`, `H_FreeArrays()`, `H_InitArrayNode()`, `H_UploadArrayToList()`, and `H_WriteArrayCsv()`.

13.1.2.3 GSetupDownloadFile()

```
GReturn GCALL GSetupDownloadFile (
    GCon g,
    GCStringIn file_path,
    GOption options,
    GCStringOut info,
    GSize info_len )
```

Download a saved controller configuration from a file.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the gcb file.
<i>options</i>	Bit mask to determine what configuration data to download. See below for all options.
<i>info</i>	Optional pointer to a buffer to store the controller info. If no info is needed, specify as NULL.
<i>info_len</i>	Length of optional info buffer. If no info is needed, specify as NULL.

Returns

The success status or error code of the function. If the options parameter is set to 0, the return value will be a bit mask indicating which sectors in the specified GCB are not empty. Otherwise, see [gclib_errors.h](#) for possible error values.

Note

By default, `GSetupDownloadFile()` will stop immediately if an error is encountered downloading data. This can be overridden in the options parameter. For example, you may want to override the error if you have a backup from an 8-axis controller and want to restore the parameters for the first 4 axes to a 4-axis controller.

If both `info` and `info_len` are not NULL, the controller information will be provided regardless of the options parameter. The options parameter is a bit mask. If options is set to 0, `GSetupDownloadFile()` will return a bit mask indicating which sectors in the specified GCB are not empty. The following contains a list of all currently available options:

Bit	Value	Function	Description
1	0x0002	Restore parameters	KPA , KIA , KDA , etc...
3	0x0008	Restore variables	Variables are listed by the LV command
4	0x0010	Restore arrays	Arrays are listed by the LA command
5	0x0020	Restore program	The program is listed by the LS command

Bit	Value	Function	Description
31	0x8000	Ignore errors	Ignore invalid parameter errors and continue restoring data. GSetupDownloadFile() will still stop immediately if a connection issue or other fatal error is encountered

Usage example:

```
GCon g;
GOption opt = 0;
GCStringOut info;
GSize info_len = 4096;
GReturn rc = GOpen("192.168.0.50", &g);
if (rc) return rc;
// Call GSetupDownloadFile() with options set to 0 so we can get the non-empty sector bit mask
opt = GSetupDownloadFile(g, "C:\\path\\to\\gcb\\file.gcb", 0, NULL, NULL);
info = (GCStringOut)malloc(sizeof(GCStringOut) * info_len);
// Call GSetupDownloadFile() with the bit mask returned in the previous function call
rc = GSetupDownloadFile(g, "C:\\path\\to\\gcb\\file.gcb", opt, info, info_len);
printf("Info:\n\n%s", info);
GClose(g);
free(info);
return rc;
```

Definition at line 476 of file arrays.c.

References [G_BAD_FILE](#), [G_NO_ERROR](#), [GProgramDownload\(\)](#), [H_ArrayDownloadFromMemory\(\)](#), [H_↔DownloadData\(\)](#), and [H_FindSector\(\)](#).

13.1.2.4 H_DownloadArraysFromList()

```
GReturn H_DownloadArraysFromList (
    GCon g,
    ArrayNode * head,
    int fail )
```

Walks through the array linked list, downloading each.

Warning

This function will call DA and DM which modifies the controllers' array table. This should NOT be done while running record array (see RA/RC/RD) or while using the MODBUS array sharing feature (see ME). To prevent any possibility of array table issues, dimension all the arrays used in the applications with the appropriate lengths before use and comment out the *array table modification* section below.

Definition at line 136 of file arrays.c.

References [G_BAD_RESPONSE_QUESTION_MARK](#), [G_BOUNDS](#), [G_NO_ERROR](#), [GArrayDownload\(\)](#), and [GCmd\(\)](#).

Referenced by [H_ArrayDownloadFromMemory\(\)](#).

13.2 commands.cpp File Reference

```
#include "examples.h"
#include <iostream>
```

Functions

- [GReturn commands](#) (GCon g)
Demonstrates various uses of [GCommand\(\)](#) and [GUtility\(\)](#).

13.2.1 Detailed Description

Function calls for the Command Example Project.

13.2.2 Function Documentation

13.2.2.1 commands()

```
GReturn commands (
    GCon g )
```

Demonstrates various uses of [GCommand\(\)](#) and [GUtility\(\)](#).

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [commands_example.cpp](#) for an example.

Definition at line 16 of file [commands.cpp](#).

References [e\(\)](#), [G_SMALL_BUFFER](#), [G_UTIL_ERROR_CONTEXT](#), [GCmd\(\)](#), [GCmdD\(\)](#), [GCmdI\(\)](#), [GCmdT\(\)](#), [GCommand\(\)](#), and [GUtility\(\)](#).

13.3 commands.cs File Reference

Data Structures

- class [Examples](#)

Provides a class of shared constants and methods for gclib's example projects.

13.3.1 Detailed Description

Function calls for the Command Example Project.

For VB.NET, see definition in file [commands.vb](#)

13.4 commands_example.cpp File Reference

```
#include "examples.h"
```

Functions

- int [main](#) (int argc, char *argv[])

Main function for Commands Example.

13.4.1 Detailed Description

See [commands\(\)](#) for implementation of logic

13.4.2 Function Documentation

13.4.2.1 main()

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file [commands_example.cpp](#).

References `G_SMALL_BUFFER`, and `pause()`.

13.5 commands_example.cs File Reference

Data Structures

- class [Commands_Example](#)

Demonstrates various uses of [GCommand\(\)](#) and basic controller queries.

13.5.1 Detailed Description

See [Commands\(\)](#) for implementation of logic

For VB.NET, see definition in file [commands_example.vb](#)

13.6 contour.cpp File Reference

```
#include "examples.h"
#include <iostream>
#include <fstream>
#include <string>
#include <vector>
```

Functions

- bool [load_buf](#) ([GCon](#) g, const [std::vector](#)< int > &positions_A, const [std::vector](#)< int > &positions_B, int capacity, int &cmd)

Loads contour buffer with commands from the given text file.

- `std::vector< int > csv_to_vector` (ifstream &is)
Converts a file of comma separated values to a vector.
- `GReturn contour` (`GCon g`, `char *fileA`, `char *fileB`)
Record user's training and plays back training through contour mode.

13.6.1 Detailed Description

Function calls for the Contour Example project

13.6.2 Function Documentation

13.6.2.1 contour()

```
GReturn contour (
    GCon g,
    char * fileA,
    char * fileB )
```

Record user's training and plays back training through contour mode.

Parameters

<i>g</i>	Connection's handle.
<i>fileA</i>	A Path to a text file where training for Axis A will be recorded.
<i>fileB</i>	A Path to a text file where training for Axis B will be recorded.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [contour_example.cpp](#) for an example.

Definition at line 20 of file `contour.cpp`.

References `csv_to_vector()`, `e()`, `G_SMALL_BUFFER`, `GCmd()`, `GMotionComplete()`, and `record_position()`.

13.7 contour.cs File Reference

Data Structures

- class [Examples](#)
Provides a class of shared constants and methods for gclib's example projects.

13.7.1 Detailed Description

Function calls for the Contour Example Project.

For VB.NET, see definition in file [contour.vb](#)

13.8 contour_example.cpp File Reference

```
#include "examples.h"
#include <iostream>
```

Functions

- int [main](#) (int argc, char *argv[])

Main function for Commands Example.

13.8.1 Detailed Description

See [contour\(\)](#) for implementation of logic

13.8.2 Function Documentation

13.8.2.1 main()

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file [commands_example.cpp](#).

References [G_SMALL_BUFFER](#), and [pause\(\)](#).

13.9 contour_example.cs File Reference

Data Structures

- class [Contour_Example](#)

Record user's training and plays back training through contour mode.

13.9.1 Detailed Description

See [Contour\(\)](#) for implementation of logic

For VB.NET, see definition in file [contour_example.vb](#)

13.10 examples.cs File Reference

Data Structures

- class [Examples](#)

Provides a class of shared constants and methods for gclib's example projects.

13.10.1 Detailed Description

Shared methods and constants for gclib example projects.

For VB.NET, see definition in file [examples.vb](#)

13.11 examples.h File Reference

```
#include "gclib.h"
#include "gclibo.h"
#include <iostream>
#include <cstdio>
```

Macros

- `#define _CRT_SECURE_NO_WARNINGS`
- `#define GALIL_EXAMPLE_OK 0`
- `#define GALIL_EXAMPLE_ERROR -100`

Functions

- void [e](#) ([GReturn](#) rc)
A trivial, C++ style return code check used in Galil's examples and demos.
- void [error](#) ([GCon](#) g, [GReturn](#) rc)
An example of error handling and debugging information.
- int [pause](#) ()
Pauses console apps for a user key stroke.
- [GReturn](#) [position_tracking](#) ([GCon](#) g, int speed=5000)
Puts controller into Position Tracking Mode and accepts user-entered positions.
- [GReturn](#) [jog](#) ([GCon](#) g)
Puts controller into Jog Mode and accepts user input to adjust the speed.
- [GReturn](#) [vector](#) ([GCon](#) g, char *file)
Puts controller into Vector Mode and accepts a file defining vector points.
- [GReturn](#) [ip_assigner](#) (char *serial_num, int address)
Assigns controller an IP Address given a serial number and a 1 byte address.
- [GReturn](#) [commands](#) ([GCon](#) g)
Demonstrates various uses of [GCommand\(\)](#) and [GUtility\(\)](#).
- [GReturn](#) [motion_complete](#) ([GCon](#) g)
Uses interrupts to track when the motion of controller is completed.
- [GReturn](#) [message](#) ([GCon](#) g)

Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.

- [GReturn record_position](#) ([GCon](#) g, char *fileA, char *fileB)

Record user's training and saves to a text file.

- [GReturn contour](#) ([GCon](#) g, char *fileA, char *fileB)

Record user's training and plays back training through contour mode.

- [GReturn remote_server](#) (const char *server_name)

Publishes local gcaps server to the network.

- [GReturn remote_client](#) ()

Lists available remote servers and allows connection to remote server.

13.11.1 Detailed Description

Header file for Galil gclib example projects.

13.11.2 Function Documentation

13.11.2.1 commands()

```
GReturn commands (
    GCon g )
```

Demonstrates various uses of [GCommand\(\)](#) and [GUtility\(\)](#).

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [commands_example.cpp](#) for an example.

Definition at line 16 of file commands.cpp.

References [e\(\)](#), [G_SMALL_BUFFER](#), [G_UTIL_ERROR_CONTEXT](#), [GCmd\(\)](#), [GCmdD\(\)](#), [GCmdI\(\)](#), [GCmdT\(\)](#), [GCommand\(\)](#), and [GUtility\(\)](#).

13.11.2.2 contour()

```
GReturn contour (
    GCon g,
    char * fileA,
    char * fileB )
```

Record user's training and plays back training through contour mode.

Parameters

<i>g</i>	Connection's handle.
<i>fileA</i>	A Path to a text file where training for Axis A will be recorded.
<i>fileB</i>	A Path to a text file where training for Axis B will be recorded.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [contour_example.cpp](#) for an example.

Definition at line 20 of file `contour.cpp`.

References `csv_to_vector()`, `e()`, `G_SMALL_BUFFER`, `GCmd()`, `GMotionComplete()`, and `record_position()`.

13.11.2.3 e()

```
void e (
    GReturn rc ) [inline]
```

A trivial, C++ style return code check used in Galil's examples and demos.

Throws `GReturn` if return value is not `G_NO_ERROR`. See [Commands_Example.cpp](#) for example usage and `catch()` handler.

Definition at line 33 of file `examples.h`.

References `G_NO_ERROR`.

Referenced by `check_interrupts()`, `commands()`, `contour()`, `H_ArrayDownloadFromMemory()`, `ip_assigner()`, `jog()`, `load_buf()`, `load_buffer()`, `message()`, `motion_complete()`, `position_tracking()`, `record_position()`, `remote_server()`, `vector()`, and `write_array_to_file()`.

13.11.2.4 ip_assigner()

```
GReturn ip_assigner (
    char * serial_num,
    int address )
```

Assigns controller an IP Address given a serial number and a 1 byte address.

Parameters

<i>serial_num</i>	Serial Number of the controller.
<i>address</i>	A 1 byte address that defines the last byte of the IP Address.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [ip_assigner_example.cpp](#) for an example.

This function will listen on the network for controllers requesting an IP Address. If a detected controller matches the serial number provided by the user, a new IP Address will be assigned based on the first 3 bytes of the detected IP Address combined with the user defined 1 byte address.

Definition at line 26 of file `ip_assigner.cpp`.

References `e()`, `G_SMALL_BUFFER`, `GIpRequests()`, and `string_split()`.

13.11.2.5 jog()

```
GReturn jog (
    GCon g )
```

Puts controller into Jog Mode and accepts user input to adjust the speed.

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [jog_example.cpp](#) for an example.

Key	Usage
q	Quit Jogging
a	-2000 counts / second
s	-500 counts / second
d	+500 counts / second
f	+2000 counts / second
r	Direction Reversal

Definition at line 29 of file jog.cpp.

References `e()`, `G_CONNECTION_NOT_ESTABLISHED`, `G_SMALL_BUFFER`, `GCmd()`, and `GMotionComplete()`.

13.11.2.6 message()

```
GReturn message (
    GCon g )
```

Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [message_example.cpp](#) for an example.

Definition at line 14 of file message.cpp.

References `e()`, `G_NO_ERROR`, `G_SMALL_BUFFER`, `G_UTIL_GCAPS_KEEPALIVE`, `GCmd()`, `GMessage()`, `GProgramDownload()`, and `GUtility()`.

Referenced by `Examples::Message()`.

13.11.2.7 motion_complete()

```
GReturn motion_complete (
    GCon g )
```

Uses interrupts to track when the motion of controller is completed.

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [motion_complete_example.cpp](#) for an example.

Definition at line 18 of file motion_complete.cpp.

References `check_interrupts()`, `e()`, `G_NO_ERROR`, `G_SMALL_BUFFER`, `G_UNSUPPORTED_FUNCTION`, `GCmd()`, `GCmdT()`, `GCommand()`, `GInterrupt()`, and `GTimeout()`.

13.11.2.8 position_tracking()

```
GReturn position_tracking (
    GCon g,
    int speed = 5000 )
```

Puts controller into Position Tracking Mode and accepts user-entered positions.

Parameters

<i>g</i>	Connection's handle.
<i>speed</i>	Optional speed of the controller in Position Tracking Mode. Default value of 5000.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [position_tracking_example.cpp](#) for an example.

Definition at line 15 of file `position_tracking.cpp`.

References `e()`, `G_CONNECTION_NOT_ESTABLISHED`, `G_SMALL_BUFFER`, `GCmd()`, and `GMotionComplete()`.

13.11.2.9 record_position()

```
GReturn record_position (
    GCon g,
    char * fileA,
    char * fileB )
```

Record user's training and saves to a text file.

Parameters

<i>g</i>	Connection's handle.
<i>fileA</i>	A Path to a text file where training for Axis A will be recorded.
<i>fileB</i>	A Path to a text file where training for Axis B will be recorded.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [record_position_example.cpp](#) for an example.

Definition at line 20 of file `record_position.cpp`.

References `e()`, `GCmd()`, `GCmdI()`, `GProgramDownload()`, `GSleep()`, and `write_array_to_file()`.

Referenced by `contour()`.

13.11.2.10 remote_client()

```
GReturn remote_client ( )
```

Lists available remote servers and allows connection to remote server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [remote_client_example](#) for an example.

Key	Usage
q	Quit
s	List available servers on then network
h	List available hardware on the current server
0-9	Connect to server instance by number
l	Connect back to local server

Definition at line 89 of file `remote_client.cpp`.

References `G_SMALL_BUFFER`.

13.11.2.11 remote_server()

GReturn remote_server (
 const char * server_name)

Publishes local gcaps server to the network.

Parameters

<i>Name</i>	to publish server under.
-------------	--------------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See remote_server_example for an example.

Key	Usage
q	Quit
p	Publish this server to the network
r	Remove this server from the network

Definition at line 39 of file remote_server.cpp.

References [e\(\)](#), [G_SMALL_BUFFER](#), and [GPublishServer\(\)](#).

13.11.2.12 vector()

GReturn vector (
 GCon g,
 char * file)

Puts controller into Vector Mode and accepts a file defining vector points.

Parameters

<i>g</i>	Connection's handle.
<i>file</i>	A Path to a file that defines vector commands.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [vector_example.cpp](#) for an example.

Example text file:

```
VP -2219,-2667
VP -2523,-2832
VP 2844,-1425
VP 728,1971
VP 2127,183
VP -997,688
VP 725,-1893
VP 527,2899
VP -37,2523
VP 1277,1425
VP 857,2388
VP 1096,-1694
CR 1000,0,90
```

Definition at line 36 of file vector.cpp.

References [e\(\)](#), [G_BAD_FILE](#), [G_CONNECTION_NOT_ESTABLISHED](#), [GCmd\(\)](#), [GCmdI\(\)](#), [GMotionComplete\(\)](#), [GSleep\(\)](#), and [load_buffer\(\)](#).

13.12 gclib.h File Reference

```
#include "gclib_record.h"
#include "gclib_errors.h"
```

Macros

- #define **GCLIB_DLL_EXPORTED**
- #define **GCALL** __stdcall
Specify calling convention for Windows.
- #define **G_DR** 1
Value for [GRecord\(\)](#) method variable for acquiring a data record via DR mode.
- #define **G_QR** 0
Value for [GRecord\(\)](#) method variable for acquiring a data record via QR mode.
- #define **G_BOUNDS** -1
For functions that take range options, e.g. [GArrayUpload\(\)](#), use this value for full range.
- #define **G_CR** 0
For [GArrayUpload\(\)](#), use this value in the delim field to delimit with carriage returns.
- #define **G_COMMA** 1
For [GArrayUpload\(\)](#), use this value in the delim field to delimit with commas.
- #define **G_PUBLISH_SERVER** 1
For [GPublishServer\(\)](#), use this value to publish server to local network.
- #define **G_REMOVE_SERVER** 0
For [GPublishServer\(\)](#), use this value to remove server from local network.
- #define **G_UTIL_TIMEOUT** 1
[GUtility\(\)](#), Access to timeout.
- #define **G_UTIL_TIMEOUT_OVERRIDE** 2
[GUtility\(\)](#), read/write access to timeout override.
- #define **G_USE_INITIAL_TIMEOUT** -1
[GUtility\(\)](#), for timeout override. Set `G_UTIL_TIMEOUT_OVERRIDE` to this value to use initial [GOpen\(\)](#) timeout (`--timeout`).
- #define **G_UTIL_VERSION** 128
[GUtility\(\)](#), get a library version string.
- #define **G_UTIL_INFO** 129
[GUtility\(\)](#), get a connection info string.
- #define **G_UTIL_SLEEP** 130
[GUtility\(\)](#), specify an interval to sleep.
- #define **G_UTIL_ADDRESSES** 131
[GUtility\(\)](#), get a list of available connections.
- #define **G_UTIL_IPREQUEST** 132
[GUtility\(\)](#), get a list of hardware requesting IPs.
- #define **G_UTIL_ASSIGN** 133
[GUtility\(\)](#), assign IP addresses over the network.
- #define **G_UTIL_DEVICE_INITIALIZE** 134
[GUtility\(\)](#), sends CF, CW, EO etc. to initialize the connection. Useful after RS or other reset.
- #define **G_UTIL_PING** 135
[GUtility\(\)](#), uses ICMP ping to determine if an IP address is reachable and assigned.
- #define **G_UTIL_ERROR_CONTEXT** 136
[GUtility\(\)](#), provides additional error context, where available.
- #define **G_UTIL_GCAPS_HOST** 256
- #define **G_UTIL_GCAPS_VERSION** 257

- [GUtility\(\)](#), get the version of the [gcaps](#) server.
- #define [G_UTIL_GCAPS_KEEPA_LIVE](#) 258
[GUtility\(\)](#), Deprecated 20210119. No longer functional.
- #define [G_UTIL_GCAPS_ADDRESSES](#) 259
[GUtility\(\)](#), get a list of available connections from the [gcaps](#) server.
- #define [G_UTIL_GCAPS_IPREQUEST](#) 260
[GUtility\(\)](#), get a list of hardware requesting IPs from the [gcaps](#) server.
- #define [G_UTIL_GCAPS_ASSIGN](#) 261
[GUtility\(\)](#), assign IP addresses over the network from the [gcaps](#) server.
- #define [G_UTIL_GCAPS_PING](#) 262
[GUtility\(\)](#), uses ICMP ping to determine if an IP address is reachable and assigned. Ping sent from the [gcaps](#) server.
- #define [G_UTIL_GCAPS_LIST_SERVERS](#) 263
[GUtility\(\)](#), get a list of all available [gcaps](#) servers on the local network.
- #define [G_UTIL_GCAPS_PUBLISH_SERVER](#) 264
[GUtility\(\)](#), make local [gcaps](#) server discoverable by other [gcaps](#) servers on the local network.
- #define [G_UTIL_GCAPS_SET_SERVER](#) 265
[GUtility\(\)](#), set the new active [gcaps](#) server.
- #define [G_UTIL_GCAPS_SERVER_STATUS](#) 266
[GUtility\(\)](#), get information on the local server's name and if it is published to the local network.
- #define [G_UTIL_GCAPS_REMOTE_CONNECTIONS](#) 267
[GUtility\(\)](#), get a list of remote addresses connected to local server.
- #define [G_UTIL_GCAPS_SERVER_INFO](#) 268
- #define [G_SMALL_BUFFER](#) 1024
Most reads from Galil are small. This value will easily hold most, e.g. TH, TZ, etc.
- #define [G_HUGE_BUFFER](#) 524288
Most reads from Galil hardware are small. This value will hold the largest array or program upload/download possible.
- #define [G_LINE_BUFFER](#) 80
For writes, via command interpreter, to the Galil.

Typedefs

- typedef int [GReturn](#)
Every function returns a value of type [GReturn](#). See [gclib_errors.h](#) for possible values.
- typedef void * [GCon](#)
Connection handle. Unique for each connection in process. Assigned a non-zero value in [GOpen\(\)](#).
- typedef unsigned int [GSize](#)
Size of buffers, etc.
- typedef int [GOption](#)
Option integer for various formatting, etc.
- typedef char * [GCStringOut](#)
C-string output from the library. Implies null-termination.
- typedef const char * [GCStringIn](#)
C-string input to the library. Implies null-termination.
- typedef char * [GBufOut](#)
Data output from the library. No null-termination implied. Returned values may be null-terminated, see function documentation for details.
- typedef const char * [GBufln](#)
Data input to the library. No null-termination, function will have a [GSize](#) to indicate bytes to write .
- typedef unsigned char [GStatus](#)
Interrupt status byte.
- typedef void * [GMemory](#)
Pointer to untyped memory for use in [GUtility\(\)](#).

Functions

- GCLIB_DLL_EXPORTED `GReturn GCALL GOpen` (`GCStringIn` address, `GCon` *g)
Open a connection to a Galil Controller.
- GCLIB_DLL_EXPORTED `GReturn GCALL GClose` (`GCon` g)
Closes a connection to a Galil Controller.
- GCLIB_DLL_EXPORTED `GReturn GCALL GRead` (`GCon` g, `GBufOut` buffer, `GSize` buffer_len, `GSize` *bytes_read)
Performs a read on the connection.
- GCLIB_DLL_EXPORTED `GReturn GCALL GWrite` (`GCon` g, `GBufIn` buffer, `GSize` buffer_len)
Performs a write on the connection.
- GCLIB_DLL_EXPORTED `GReturn GCALL GCommand` (`GCon` g, `GCStringIn` command, `GBufOut` buffer, `GSize` buffer_len, `GSize` *bytes_returned)
Performs a command-and-response transaction on the connection.
- GCLIB_DLL_EXPORTED `GReturn GCALL GProgramDownload` (`GCon` g, `GCStringIn` program, `GCStringIn` preprocessor)
Downloads a program to the controller's program buffer.
- GCLIB_DLL_EXPORTED `GReturn GCALL GProgramUpload` (`GCon` g, `GBufOut` buffer, `GSize` buffer_len)
Uploads a program from the controller's program buffer.
- GCLIB_DLL_EXPORTED `GReturn GCALL GArrayDownload` (`GCon` g, const `GCStringIn` array_name, `GOption` first, `GOption` last, `GCStringIn` buffer)
Downloads array data to a pre-dimensioned array in the controller's array table.
- GCLIB_DLL_EXPORTED `GReturn GCALL GArrayUpload` (`GCon` g, const `GCStringIn` array_name, `GOption` first, `GOption` last, `GOption` delim, `GBufOut` buffer, `GSize` buffer_len)
Uploads array data from the controller's array table.
- GCLIB_DLL_EXPORTED `GReturn GCALL GRecord` (`GCon` g, union `GDataRecord` *record, `GOption` method)
Provides a fresh copy of the controller's data record. Data is cast into a union, `GDataRecord`.
- GCLIB_DLL_EXPORTED `GReturn GCALL GMessage` (`GCon` g, `GCStringOut` buffer, `GSize` buffer_len)
Provides access to unsolicited messages from the controller.
- GCLIB_DLL_EXPORTED `GReturn GCALL GInterrupt` (`GCon` g, `GStatus` *status_byte)
Provides access to PCI and UDP interrupts from the controller.
- GCLIB_DLL_EXPORTED `GReturn GCALL GFirmwareDownload` (`GCon` g, `GCStringIn` filepath)
Upgrade firmware.
- GCLIB_DLL_EXPORTED `GReturn GCALL GUtility` (`GCon` g, `GOption` request, `GMemory` memory1, `GMemory` memory2)
Provides read/write access to driver settings and convenience features based on the request variable.

13.12.1 Detailed Description

Defines the interface for the Galil C Library (GCLIB).

13.12.2 Function Documentation

13.12.2.1 GArrayDownload()

```
GCLIB_DLL_EXPORTED GReturn GCALL GArrayDownload (
    GCon g,
    const GCStringIn array_name,
    GOption first,
    GOption last,
    GCStringIn buffer )
```

Downloads array data to a pre-dimensioned array in the controller's array table.

Warning

The array must already exist on the controller and be sufficient dimension to hold the desired array data, e.g. via DM.

Parameters

<i>g</i>	Connection's handle.
<i>array_name</i>	Null-terminated string containing the name of the array to download. Must match the array name used in DM.
<i>first</i>	The first element of the array for sub-array downloads. <code>G_BOUNDS</code> to omit.
<i>last</i>	The last element of the array for sub-array downloads. <code>G_BOUNDS</code> to omit.
<i>buffer</i>	Buffer containing the null-terminated data to be sent to the controller. The array data may be separated with <i>carriage return</i> , <i>carriage return + line feed</i> , or a <i>comma</i> . No spaces.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_arrays.cpp` for an example.

Referenced by `H_DownloadArraysFromList()`.

13.12.2.2 GArrayUpload()

```
GCLIB_DLL_EXPORTED GReturn GCALL GArrayUpload (
    GCon g,
    const GCStringIn array_name,
    GOption first,
    GOption last,
    GOption delim,
    GBufOut buffer,
    GSize buffer_len )
```

Uploads array data from the controller's array table.

Parameters

<i>g</i>	Connection's handle.
<i>array_name</i>	Null-terminated string containing the name of the array to upload.
<i>first</i>	The first element of the array for sub-array uploads. <code>G_BOUNDS</code> to omit.
<i>last</i>	The last element of the array for sub-array uploads. <code>G_BOUNDS</code> to omit.
<i>delim</i>	Sets the delimiter between array elements in the returned data, <code>G_CR</code> specifies carriage return, <code>G_COMMA</code> specifies comma.
<i>buffer</i>	Buffer to receive the uploaded data. The data will be null terminated unless function returns <code>G_BAD_LOST_DATA</code> due to the buffer being too small to hold the data.
<i>buffer_len</i>	The length of the receive buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_arrays.cpp` for an example.

Referenced by `H_UploadArrayToList()`, and `write_array_to_file()`.

13.12.2.3 GCclose()

```
GCLIB_DLL_EXPORTED GReturn GCALL GCclose (
    GCon g )
```

Closes a connection to a Galil Controller.

Attention

gclib requires that `GCclose()` be called whenever a program is finished with a controller. This includes when a program closes. A rule of thumb is that for every `GOpen()` call on a given connection, a `GCclose()` call should be found on every code path. Failing to call `GCclose()` may cause controller resources to not be released or can hang the process if there are outstanding asynchronous operations. The latter can occur, for example, if a call to `GRead()` times out and the process exits without calling `GCclose()`. In this case, `GRead()` still has an outstanding asynchronous read pending. `GCclose()` will terminate this operation allowing the process to exit correctly.

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_examples.cpp` for an example.

13.12.2.4 GCommand()

```
GCLIB_DLL_EXPORTED GReturn GCALL GCommand (
    GCon g,
    GCStringIn command,
    GBufOut buffer,
    GSize buffer_len,
    GSize * bytes_returned )
```

Performs a *command-and-response* transaction on the connection.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller. The library will append a carriage return to the command string.
<i>buffer</i>	Buffer for the response. Will be filled with the response from the controller. The data will be null terminated unless the function returns <code>G_BAD_LOST_DATA</code> due to the buffer being too small to hold the data.
<i>buffer_len</i>	The size of the response buffer.
<i>bytes_returned</i>	The size of the data returned from the controller. This does not include null termination. This argument may be null if the value is not desired.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Referenced by `commands()`, `error()`, `GCmd()`, `GCmdD()`, `GCmdI()`, `GCmdT()`, `GWaitForBool()`, and `motion_↔complete()`.

13.12.2.5 GFirmwareDownload()

```
GCLIB_DLL_EXPORTED GReturn GCALL GFirmwareDownload (
    GCon g,
    GCStringIn filepath )
```

Upgrade firmware.

Parameters

<i>g</i>	Connection's handle.
<i>filepath</i>	The full file path to the Galil-supplied firmware hex file. See http://www.galil.com/downloads/firmware

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

```
ec(GInfo(g, buf, sizeof(buf))); //get controller info
cout << buf << '\n'; //print the info
ec(GFirmwareDownload(g, "F:/1806.dmc/dmc-1806-r11a.hex"));
ec(GInfo(g, buf, sizeof(buf))); //get the info again
cout << buf << '\n';
// example output:
// GALILPCI1, DMC1846 Rev 1.1a-CM, 4232
// GALILPCI1, DMC1846 Rev 1.1a, 4232
```

13.12.2.6 GInterrupt()

```
GCLIB_DLL_EXPORTED GReturn GCALL GInterrupt (
    GCon g,
    GStatus * status_byte )
```

Provides access to PCI and UDP interrupts from the controller.

Interrupts can be generated automatically by the firmware on important events via `EI` (Enable Interrupt) or by the user in embedded DMC code via `UI` (User Interrupt). To use this function, `-s EI` must be used in the [GOpen\(\)](#) address string to subscribe to interrupts.

Parameters

<i>g</i>	Connection's handle.
<i>status_byte</i>	A pointer to a <code>GStatus</code> to receive the status byte.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

[GInterrupt\(\)](#) will block until an interrupt is received, or the function times out.

Note

If this function is called with a timeout of zero, a non-blocking read is performed. If interrupt data is waiting in the interrupt queue, the oldest byte will be popped off the queue. If there is no interrupt data queued, but there is data waiting in the socket or PCI FIFO, one read will be performed to process the waiting data. If new data is still not found after these two attempts, `G_GCLIB_NON_BLOCKING_READ_EMPTY` will be returned.

See `x_ginterrupt.cpp` for an example. See `x_nonblocking.cpp` for an example of non-blocking usage. Referenced by `check_interrupts()`, and `motion_complete()`.

13.12.2.7 GMessage()

```
GCLIB_DLL_EXPORTED GReturn GCALL GMessage (
    GCon g,
    GCStringOut buffer,
    GSize buffer_len )
```

Provides access to unsolicited messages from the controller.

To use this function, `-s MG` must be used in the `GOpen()` `address` string to subscribe to messages. Unsolicited bytes must be flagged by the high-bit setting, `CW 1`. The driver will automatically set this when subscribing to messages. The user should not overwrite this setting.

Unsolicited messages are data generated by the controller that are not in response to a command, a data record, or an interrupt. Examples follow.

1. Data generated by the `MG` command from embedded code. `MG` sent from the host is solicited.
2. Any command in an embedded program that returns data, e.g. `TP, RP, var=?`
3. A run time error in an embedded program, e.g. `?55 i=var`

Note

Messages are unframed byte streams. There is no guarantee that the user will get complete messages or single messages in a call to `GMessage()`.

Parameters

<i>g</i>	Connection's handle.
<i>buffer</i>	The buffer to write the message data. The buffer will be null terminated.
<i>buffer_len</i>	The length of the user's buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

`GMessage()` will block until a message is received, or the function times out.

Note

If this function is called with a timeout of zero, a non-blocking read is performed. If message data has been processed since the last time the function was called, this data will be returned. If there is no processed message data, but there is data waiting in the socket or PCI FIFO, one read will be performed to process the waiting data. If new data is still not found after these two attempts, `G_GCLIB_NON_BLOCKING_READ_↔EMPTY` will be returned.

Warning

When sending message streams through `gcaps`, the following non-printable bytes are illegal, `$00-$07` and `$10-$17`. These bytes may be routed to a third party device such as an HMI or display panel. See `MG` and `CF`.

See `x_gmessage.cpp` for an example. See `x_nonblocking.cpp` for an example of non-blocking usage. Referenced by `message()`.

13.12.2.8 GOpen()

```
GCLIB_DLL_EXPORTED GReturn GCALL GOpen (
    GCStringIn address,
    GCon * g )
```

Open a connection to a Galil Controller.

Parameters

<i>address</i>	Null-terminated address string. See table below.
<i>g</i>	Pointer to user's <i>GCon</i> variable. On success, the library will fill the user's variable with the handle to use for the rest of the connection. A valid <i>g</i> value is nonzero.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

address switch	Meaning	Arguments (default), other options	Examples
--address	Simple address to hardware	<i>IP address, PCI, COM port</i>	--address COM1
-a	shorthand for --address	See <i>Address Ranges</i> below	-a GALILPCI1
{no switch}	--address is implicit for any lone token		192.168.0.42
--baud	Baud rate	(115200), <i>valid baud...</i>	COM2 --baud 19200
-b	shorthand for --baud		COM3 -b 38400
--command	Command-and-response socket protocol	(TCP), UDP	192.168.0.42 --command TCP
-c	shorthand for --command		192.168.0.42 -c UDP
--direct	Connect directly to hardware instead of via gcaps		-a GALILPCI2 --direct
-d	shorthand for --direct		GALILPCI2 -d
--subscribe	Subscribe to messages, data records, and/or interrupts	(NONE), MG, DR, EI, ALL	192.168.0.42 --subscribe MG
-s	shorthand for --subscribe		192.168.0.42 -s DR -s EI
--timeout	timeout in ms	(5000), <i>0-65535</i>	192.168.0.42 --timeout 5000
-t	shorthand for --timeout		GALILPCI2 -t 500
--unsolicited	Unsolicited socket protocol	(UDP), NONE	192.168.0.42 --unsolicited NONE
-u	shorthand for --unsolicited		192.168.1.42 -u UDP
The following address switches are deprecated and will be unavailable starting July 1st, 2020.			
--p1	Primary port for command-and-response traffic	(23), <i>valid port number</i>	192.168.0.42 --p1 5000
--p2	Secondary port for unsolicited traffic	(60007), <i>valid port number</i>	192.168.0.42 --p2 5000

Operating System	Address Range	Notes
Windows	COM1 - COM256	RS232 and USB-to-serial
Linux	/dev/ttyS0 - /dev/ttyS255	RS232
Linux	/dev/ttyUSB0 - /dev/ttyUSB255	USB-to-serial, e.g. DMC-4103
Windows	GALILPCI1 - GALILPCI8	PCI
Linux	/dev/galilpci0 - /dev/galilpci7	PCI

See `x_examples.cpp` for an example.

When connecting to a network device, if the command-and-response socket is opened successfully but the unsolicited socket fails, `GOpen()` will still complete successfully. This allows connection to a Galil controller when only one Ethernet handle is available. Unsolicited traffic will not be accessible in this case.

13.12.2.9 GProgramDownload()

```
GCLIB_DLL_EXPORTED GReturn GCALL GProgramDownload (
    GCon g,
    GCStringIn program,
    GCStringIn preprocessor )
```

Downloads a program to the controller's program buffer.

Parameters

<i>g</i>	Connection's handle.
<i>program</i>	Null-terminated program for download.
<i>preprocessor</i>	Options string for preprocessing the program before sending it to the controller. Null allows the library to use defaults for the download. See the Program Preprocessor documentation for options.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_programs.cpp` for an example.

Referenced by `GProgramDownloadFile()`, `GSetupDownloadFile()`, `message()`, and `record_position()`.

13.12.2.10 GProgramUpload()

```
GCLIB_DLL_EXPORTED GReturn GCALL GProgramUpload (
    GCon g,
    GBufOut buffer,
    GSize buffer_len )
```

Uploads a program from the controller's program buffer.

Parameters

<i>g</i>	Connection's handle.
<i>buffer</i>	Buffer to receive the controller's program. The data will be null terminated unless function returns <code>G_BAD_LOST_DATA</code> due to the buffer being too small to hold the data.
<i>buffer_len</i>	The length of the receive buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_programs.cpp` for an example.

Referenced by `GProgramUploadFile()`.

13.12.2.11 GRead()

```
GCLIB_DLL_EXPORTED GReturn GCALL GRead (
    GCon g,
    GBufOut buffer,
    GSize buffer_len,
    GSize * bytes_read )
```

Performs a read on the connection.

Parameters

<i>g</i>	Connection's handle.
<i>buffer</i>	The user's read buffer.
<i>buffer_len</i>	The length of the user's read buffer.
<i>bytes_read</i>	Pointer to a GSize which will be filled with the number of bytes read upon return.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Warning

This function is deprecated and will be removed in a future gclib version. Please contact Galil for needs not covered by the other gclib functions.

Unsolicited messages may be returned in the read data. The high bit of each message byte will be set unless the user changes the CW setting. Interrupts and Data Records are always filtered from a read.

See `x_gread_gwrite.cpp` for an example.

13.12.2.12 GRecord()

```
GCLIB_DLL_EXPORTED GReturn GCALL GRecord (
    GCon g,
    union GDataRecord * record,
    GOption method )
```

Provides a fresh copy of the controller's data record. Data is cast into a union, [GDataRecord](#).

Parameters

<i>g</i>	Connection's handle.
<i>record</i>	A pointer to the user's DataRecord union to hold the copy.
<i>method</i>	Determines the method for acquiring the data. <ul style="list-style-type: none"> • <code>G_QR</code>: QR is used via command-and-response. • <code>G_DR</code>: DR is used for asynchronous acquisition.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

When using `G_DR`, the asynchronous data record must already be set up.

- `-s DR` must be used in the [GOpen\(\)](#) `address` string to subscribe to records. The driver will automatically set the second argument of `DR`, where applicable.
- [GRecordRate\(\)](#) should be issued to set `DR` to an appropriate interval, `n`. The interval must be no faster than the rate at which [GRecord\(\)](#) is called.

[GRecord\(\)](#) will block until the data record is received, or the transaction times out.

Note

If this function is called with a timeout of zero and the `G_DR` method, a non-blocking read is performed. If a data record has been processed since the last time the function was called, this data will be returned. If there is not a processed data record, but there is data waiting in the socket or PCI FIFO, one read will be performed to process the waiting data. If new data is still not found after these two attempts, `G_GCLIB_↔NON_BLOCKING_READ_EMPTY` will be returned.

See `x_grecord.cpp` for an example. See `x_nonblocking.cpp` for an example of non-blocking usage.

13.12.2.13 GUtility()

```
GCLIB_DLL_EXPORTED GReturn GCALL GUtility (
    GCon g,
    GOption request,
    GMemory memory1,
    GMemory memory2 )
```

Provides read/write access to driver settings and convenience features based on the request variable.

Note

The open source library, [gclibo.h](#), has wrappers for most of these utilities.

Parameters

<i>g</i>	Connection's handle.
<i>request</i>	Defines the request. Input/Output and type of memory are implicit in the value of request. The following lists the supported request values.

- [G_UTIL_TIMEOUT](#) Read initial timeout value, as specified in [GOpen\(\)](#) via `--timeout` switch.
 - `memory1` is output and must be an `unsigned short*`.
 - `memory2` is ignored, use null.
- [G_UTIL_TIMEOUT_OVERRIDE](#) See [GTimeout\(\)](#). Write/Read override timeout value.
 - `memory1` is input. If nonnull, value must be a `short*` holding the override, in milliseconds, for the timeout. Write `G_USE_INITIAL_TIMEOUT` to use initial timeout. If null, no write occurs.
 - `memory2` is output. If nonnull, value must be a `short*` which will be filled with the current override. `G_USE_INITIAL_TIMEOUT` indicates initial timeout used. If null, no read occurs. `memory2` is processed before 'memory1'.
- [G_UTIL_VERSION](#) See [GVersion\(\)](#). Returns the library version. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is output, and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
 - `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_INFO](#) See [GInfo\(\)](#). Returns information about the connection.
 - `memory1` is output and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
 - `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_SLEEP](#) See [GSleep\(\)](#). Platform-independent, non-busy, sleep. A valid connection (`g`) is not necessary, i.e. `g` may be null.

- `memory1` is input and must be an `unsigned int*`, units are milliseconds.
 - `memory2` is ignored, use null.
- [G_UTIL_ADDRESSES](#) see [GAddresses\(\)](#). Provides a `\n` delimited listing of all available IP addresses, PCI addresses, and COM ports. A valid connection (`g`) is not necessary, i.e. `g` may be null. The suffix `-d` will be appended to each address to indicate these addresses are available via direct connection. See [G_UTIL_GCAPS_ADDRESSES](#) for addresses through [gcaps](#).
 - `memory1` is output and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
 - `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_IPREQUEST](#) see [GIpRequests\(\)](#). Listens and returns a `\n` delimited listing of Galil MAC addresses sending BOOT-P or DHCP requests. The function will listen, and block, for roughly 5 seconds. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is output and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
 - `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_ASSIGN](#) see [GAssign\(\)](#). Provides a method to assign an IP address given a Galil MAC address. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is input and must be a `char*` containing the null terminated address that is to be assigned. e.g. `"192.168.0.43"`.
 - `memory2` is input and must be a `char*` containing the null terminated controller MAC address. e.g. `"00:50:4C:20:01:23"`.
- [G_UTIL_DEVICE_INITIALIZE](#) Provides a method to reinitialize a connection after a reset, e.g. an RS command. Depending on the device type, the appropriate commands will be sent to configure the communication bus for optimal performance.
 - `memory1` is ignored, use null.
 - `memory2` is ignored, use null.
- [G_UTIL_PING](#) Uses ICMP ping to determine if an IP address is reachable and assigned. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is input and must be a `char*` containing the null terminated address that is to be pinged. e.g. `"192.168.0.43"`.
 - `memory2` is output and must be an `int*`. The value will be set to zero if the ping times out, and nonzero if a ping reply is returned.
- [G_UTIL_ERROR_CONTEXT](#) More error detail for the last error on [GCon](#), where available. The internal error message is cleared upon read.
 - `memory1` is output and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
 - `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.

The following request values are for use with a [@ref gcaps](#) server.

- [G_UTIL_GCAPS_VERSION](#) see [GVersion\(\)](#). Returns the [gcaps](#) server version. A valid connection (`g`) is not necessary, i.e. `g` may be null. This operation will connect to the server to determine the version.
 - `memory1` is output and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
 - `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_GCAPS_ADDRESSES](#) see [GAddresses\(\)](#). Provides a `\n` delimited listing of all available IP addresses, PCI addresses, and COM ports as available from the [gcaps](#) server. A valid connection (`g`) is not necessary, i.e. `g` may be null.

- `memory1` is output and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
- `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_GCAPS_IPREQUEST](#) see [GIpRequests\(\)](#). Connects to [gcaps](#) and returns a `\n` delimited listing of Galil MAC addresses sending BOOT-P or DHCP requests. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is output and must be a `char*`. Data will be null terminated, even if the data must be truncated to do so.
 - `memory2` is input and must be an `unsigned int*` holding the length of the buffer in `memory1`.
- [G_UTIL_GCAPS_ASSIGN](#) see [GAssign\(\)](#). Provides a method to assign an IP address through [gcaps](#) given a Galil MAC address. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is input and must be a `char*` containing the null terminated address that is to be assigned. e.g. "192.168.0.43".
 - `memory2` is input and must be a `char*` containing the null terminated controller MAC address. e.g. "00:50:4C:20:01:23".
- [G_UTIL_GCAPS_PING](#) Uses ICMP ping to determine if an IP address is reachable and assigned. Ping sent from the [gcaps](#) server. A valid connection (`g`) is not necessary, i.e. `g` may be null.
 - `memory1` is input and must be a `char*` containing the null terminated address that is to be pinged. e.g. "192.168.0.43".
 - `memory2` is output and must be an `int*`. The value will be set to zero if the ping times out, and nonzero if a ping reply is returned.

Parameters

<i>memory1</i>	An untyped pointer to data required for request. The data type is defined by the request variable.
<i>memory2</i>	An untyped pointer to data required for request. The data type is defined by the request variable.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See the following functions from `gclibo`, the open source portion, for implementation of several [GUtility\(\)](#) requests.:

- [GAddresses\(\)](#)
- [GAssign\(\)](#)
- [GInfo\(\)](#)
- [GIpRequests\(\)](#)
- [GSleep\(\)](#)
- [GTimeout\(\)](#)
- [GVersion\(\)](#)

Referenced by `commands()`, `error()`, `GAddresses()`, `GAssign()`, `GInfo()`, `GIpRequests()`, `GListServers()`, `GPublishServer()`, `GRemoteConnections()`, `GServerStatus()`, `GSetServer()`, `GSleep()`, `GTimeout()`, `GVersion()`, and `message()`.

13.12.2.14 GWrite()

```
GCLIB_DLL_EXPORTED GReturn GCALL GWrite (
    GCon g,
    GBufIn buffer,
    GSize buffer_len )
```

Performs a write on the connection.

Parameters

<i>g</i>	Connection's handle.
<i>buffer</i>	The user's write buffer. To send a Galil command, a terminating carriage return is usually required.
<i>buffer_len</i>	The length of the data in the buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values. If `G_NO_ERROR` is returned, all bytes were written.

Warning

This function is deprecated and will be removed in a future gclib version. Please contact Galil for needs not covered by the other gclib functions.

See `x_gread_gwrite.cpp` for an example.

13.13 gclib_errors.h File Reference

Macros

- #define `G_NO_ERROR` 0
Return value if function succeeded.
- #define `G_NO_ERROR_S` "no error"
- #define `G_GCLIB_ERROR` -1
General library error. Indicates internal API caught an unexpected error. Contact Galil support if this error is returned, softwaresupport@galil.com.
- #define `G_GCLIB_ERROR_S` "gclib unexpected error"
- #define `G_GCLIB_UTILITY_ERROR` -2
An invalid request value was specified to GUtility.
- #define `G_GCLIB_UTILITY_ERROR_S` "invalid request value or bad arguments were specified to [GUtility\(\)](#)"
- #define `G_GCLIB_UTILITY_IP_TAKEN` -3
The IP cannot be assigned because ping returned a reply.
- #define `G_GCLIB_UTILITY_IP_TAKEN_S` "ip address is already taken by a device on the network"
- #define `G_GCLIB_NON_BLOCKING_READ_EMPTY` -4
GMessage, GInterrupt, and GRecord can be called with a zero timeout. If there wasn't data waiting in memory, this error is returned.
- #define `G_GCLIB_NON_BLOCKING_READ_EMPTY_S` "data was not waiting for a zero-timeout read"
- #define `G_GCLIB_POLLING_FAILED` -5
GWaitForBool out of polling trials.
- #define `G_GCLIB_POLLING_FAILED_S` "exit condition not met in specified polling period"
- #define `G_TIMEOUT` -1100
Operation timed out. Timeout is set by the `-timeout` option in [GOpen\(\)](#) and can be overridden by [GSetting\(\)](#).
- #define `G_TIMEOUT_S` "device timed out"
- #define `G_OPEN_ERROR` -1101
Device could not be opened. E.G. Serial port or PCI device already open.

- **#define G_OPEN_ERROR_S** "device failed to open"
- **#define G_READ_ERROR** -1103
Device read failed. E.G. Socket was closed by remote host. See G_UTIL_GCAPS_KEEPALIVE.
- **#define G_READ_ERROR_S** "device read error"
- **#define G_WRITE_ERROR** -1104
Device write failed. E.G. Socket was closed by remote host. See G_UTIL_GCAPS_KEEPALIVE.
- **#define G_WRITE_ERROR_S** "device write error"
- **#define G_INVALID_PREPROCESSOR_OPTIONS** -1204
GProgramDownload was called with a bad preprocessor directive.
- **#define G_INVALID_PREPROCESSOR_OPTIONS_S** "preprocessor did not recognize options"
- **#define G_COMMAND_CALLED_WITH_ILLEGAL_COMMAND** -1106
GCommand() was called with an illegal command, e.g. ED, DL or QD.
- **#define G_COMMAND_CALLED_WITH_ILLEGAL_COMMAND_S** "illegal command passed to command call"
- **#define G_DATA_RECORD_ERROR** -1107
Data record error, e.g. DR attempted on serial connection.
- **#define G_DATA_RECORD_ERROR_S** "data record error"
- **#define G_UNSUPPORTED_FUNCTION** -1109
Function cannot be called on this bus. E.G. GInterrupt() on serial.
- **#define G_UNSUPPORTED_FUNCTION_S** "function not supported on this communication bus"
- **#define G_FIRMWARE_LOAD_NOT_SUPPORTED** -1110
Firmware is not supported on this bus, e.g. Ethernet for the DMC-21x3 series.
- **#define G_FIRMWARE_LOAD_NOT_SUPPORTED_S** "firmware cannot be loaded on this communication bus to this hardware"
- **#define G_ARRAY_NOT_DIMENSIONED** -1200
Array operation was called on an array that was not in the controller's array table, see LA command.
- **#define G_ARRAY_NOT_DIMENSIONED_S** "array not dimensioned on controller or wrong size"
- **#define G_CONNECTION_NOT_ESTABLISHED** -1201
Function was called with no connection.
- **#define G_CONNECTION_NOT_ESTABLISHED_S** "connection to hardware not established"
- **#define G_ILLEGAL_DATA_IN_PROGRAM** -1202
Data to download not valid, e.g. \ in data.
- **#define G_ILLEGAL_DATA_IN_PROGRAM_S** "illegal ASCII character in program"
- **#define G_UNABLE_TO_COMPRESS_PROGRAM_TO_FIT** -1203
Program preprocessor could not compress the program within the user's constraints.
- **#define G_UNABLE_TO_COMPRESS_PROGRAM_TO_FIT_S** "program cannot be compressed to fit on the controller"
- **#define G_BAD_RESPONSE_QUESTION_MARK** -10000
Operation received a ?, indicating controller has a TC error.
- **#define G_BAD_RESPONSE_QUESTION_MARK_S** "question mark returned by controller"
- **#define G_BAD_VALUE_RANGE** -10002
Bad value or range, e.g. GCon g variable passed to function was bad.
- **#define G_BAD_VALUE_RANGE_S** "value passed to function was bad or out of range"
- **#define G_BAD_FULL_MEMORY** -10003
Not enough memory for an operation, e.g. all connections allowed for a process already taken.
- **#define G_BAD_FULL_MEMORY_S** "operation could not complete because of a memory error"
- **#define G_BAD_LOST_DATA** -10004
Lost data, e.g. GCommand() response buffer was too small for the controller's response.
- **#define G_BAD_LOST_DATA_S** "data was lost due to buffer or fifo limitations"
- **#define G_BAD_FILE** -10005
Bad file path, bad file contents, or bad write.
- **#define G_BAD_FILE_S** "file was not found, contents are invalid, or write failed"

- #define [G_BAD_ADDRESS](#) -10006
Bad address.
- #define [G_BAD_ADDRESS_S](#) "a bad address was specified in open"
- #define [G_BAD_FIRMWARE_LOAD](#) -10008
Bad firmware upgrade.
- #define [G_BAD_FIRMWARE_LOAD_S](#) "Firmware upgrade failed"
- #define [G_GCAPS_OPEN_ERROR](#) -20000
gcaps connection couldn't open. Server is not running or is not reachable.
- #define [G_GCAPS_OPEN_ERROR_S](#) "gcaps connection could not be opened"
- #define [G_GCAPS_SUBSCRIPTION_ERROR](#) -20002
GMessage(), GRecord(), GInterrupt() called on a connection without –subscribe switch.
- #define [G_GCAPS_SUBSCRIPTION_ERROR_S](#) "function requires subscription not specified in [GOpen\(\)](#)"

13.13.1 Detailed Description

Defines values for the Galil C Library return codes and error strings.

13.14 gclib_record.h File Reference

```
#include <stdint.h>
```

Data Structures

- struct [GDataRecord4000](#)
Data record struct for DMC-4000 controllers, including 4000, 4200, 4103, and 500x0.
- struct [GDataRecord52000](#)
Data record struct for DMC-52000 controller. Same as DMC-4000, with bank indicator added at byte 40.
- struct [GDataRecord1806](#)
Data record struct for DMC-1806 controller.
- struct [GDataRecord2103](#)
Data record struct for DMC-2103 controllers.
- struct [GDataRecord1802](#)
- struct [GDataRecord30000](#)
Data record struct for DMC-30010 controllers.
- struct [GDataRecord47000_ENC](#)
Data record struct for RIO-471xx and RIO-472xx PLCs. Includes encoder fields.
- struct [GDataRecord47300_ENC](#)
Data record struct for RIO-47300. Includes encoder fields.
- struct [GDataRecord47300_24EX](#)
Data record struct for RIO-47300 with 24EX I/O daughter board.
- struct [GDataRecord47162](#)
Data record struct for RIO-47162.
- union [GDataRecord](#)
Data record union, containing all structs and a generic byte array accessor.

Macros

- #define [GALILDATARECORDMAXLENGTH](#) 512
Max size for any Galil data record, equal to dual port ram size of PCI.

Typedefs

- typedef uint8_t **UB**
- typedef uint16_t **UW**
- typedef int16_t **SW**
- typedef int32_t **SL**
- typedef uint32_t **UL**

13.14.1 Detailed Description

Defines a union for data records. Each supported controller has a struct member in the union with named record types. Offsets into the data record can also be used by referencing the member `byte_array`.

13.15 gclibo.c File Reference

```
#include "gclibo.h"
#include <stdlib.h>
#include <string.h>
#include <stdio.h>
#include <math.h>
#include <time.h>
```

Functions

- GCLIB_DLL_EXPORTED void **GCALL GSleep** (unsigned int timeout_ms)
Uses [GUtility\(\)](#) and [G_UTIL_SLEEP](#) to provide a blocking sleep call which can be useful for timing-based chores.
- GCLIB_DLL_EXPORTED **GReturn GCALL GVersion** (GCStringOut ver, GSize ver_len)
Uses [GUtility\(\)](#), [G_UTIL_VERSION](#) and [G_UTIL_GCAPS_VERSION](#) to provide the library and [gcaps](#) version numbers.
- GCLIB_DLL_EXPORTED **GReturn GCALL GInfo** (GCon g, GCStringOut info, GSize info_len)
Uses [GUtility\(\)](#) and [G_UTIL_INFO](#) to provide a useful connection string.
- GCLIB_DLL_EXPORTED **GReturn GCALL GAddresses** (GCStringOut addresses, GSize addresses_len)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ADDRESSES](#) or [G_UTIL_ADDRESSES](#) to provide a listing of all available connection addresses.
- GCLIB_DLL_EXPORTED **GReturn GCALL GTimeout** (GCon g, short timeout_ms)
Uses [GUtility\(\)](#) and [G_UTIL_TIMEOUT_OVERRIDE](#) to set the library timeout.
- GCLIB_DLL_EXPORTED **GReturn GCALL GAssign** (GCStringIn ip, GCStringIn mac)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ASSIGN](#) or [G_UTIL_ASSIGN](#) to assign an IP address over the Ethernet to a controller at a given MAC address.
- GCLIB_DLL_EXPORTED **GReturn GCALL GIpRequests** (GCStringOut requests, GSize requests_len)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_IPREQUEST](#) or [G_UTIL_IPREQUEST](#) to provide a list of all Galil controllers requesting IP addresses via BOOT-P or DHCP.
- GCLIB_DLL_EXPORTED **GReturn GCALL GSetServer** (GCStringIn server_name)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SET_SERVER](#) to set the new active server.
- GCLIB_DLL_EXPORTED **GReturn GCALL GServerStatus** (GCStringOut status, GSize status_len)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SERVER_STATUS](#) to get information on the local server name and if it is published to the local network.
- GCLIB_DLL_EXPORTED **GReturn GCALL GListServers** (GCStringOut servers, GSize servers_len)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_LIST_SERVERS](#) to provide a list of all available gcaps services on the local network.
- GCLIB_DLL_EXPORTED **GReturn GCALL GPublishServer** (GCStringIn name, GOption publish, GOption save)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_PUBLISH_SERVER](#) to publish local gcaps server to the local network.

- GCLIB_DLL_EXPORTED [GReturn](#) [GCALL](#) [GRemoteConnections](#) ([GCStringOut](#) connections, [GSize](#) connections_length)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_REMOTE_CONNECTIONS](#) to get a list of remote addresses connected to the local server.
- GCLIB_DLL_EXPORTED [GReturn](#) [GCALL](#) [GCmd](#) ([GCon](#) g, [GCStringIn](#) command)
Wrapper around [GCommand](#) for use when the return value is not desired.
- GCLIB_DLL_EXPORTED [GReturn](#) [GCALL](#) [GCmdT](#) ([GCon](#) g, [GCStringIn](#) command, [GCStringOut](#) trimmed_response, [GSize](#) response_len, [GCStringOut](#) *front)
Wrapper around [GCommand](#) that trims the response.
- GCLIB_DLL_EXPORTED [GReturn](#) [GCALL](#) [GCmdI](#) ([GCon](#) g, [GCStringIn](#) command, int *value)
Wrapper around [GCommand](#) that provides the return value of a command parsed into an int.
- GCLIB_DLL_EXPORTED [GReturn](#) [GCALL](#) [GCmdD](#) ([GCon](#) g, [GCStringIn](#) command, double *value)
Wrapper around [GCommand](#) that provides the return value of a command parsed into a double.
- GCLIB_DLL_EXPORTED [GReturn](#) [GCALL](#) [GMotionComplete](#) ([GCon](#) g, [GCStringIn](#) axes)
Blocking call that returns once all axes specified have completed their motion.
- GCLIB_DLL_EXPORTED [GReturn](#) [GCALL](#) [GWaitForBool](#) ([GCon](#) g, [GCStringIn](#) predicate, int trials)
Blocking call that returns when the controller evaluates the predicate as true.
- GCLIB_DLL_EXPORTED [GReturn](#) [GCALL](#) [GRecordRate](#) ([GCon](#) g, double period_ms)
*Sets the asynchronous data record to a user-specified period via *DR*.*
- GCLIB_DLL_EXPORTED [GReturn](#) [GCALL](#) [GProgramDownloadFile](#) ([GCon](#) g, [GCStringIn](#) file_path, [GCStringIn](#) preprocessor)
Program download from file.
- GCLIB_DLL_EXPORTED [GReturn](#) [GCALL](#) [GProgramUploadFile](#) ([GCon](#) g, [GCStringIn](#) file_path)
Program upload to file.
- GCLIB_DLL_EXPORTED void [GCALL](#) [GError](#) ([GReturn](#) rc, [GCStringOut](#) error, [GSize](#) error_len)
Provides a human-readable description string for return codes.

13.15.1 Detailed Description

Partial implementation of [gclibo.h](#)

13.15.2 Function Documentation

13.15.2.1 GAddresses()

```
GReturn GCALL GAddresses (
    GCStringOut addresses,
    GSize addresses_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ADDRESSES](#) or [G_UTIL_ADDRESSES](#) to provide a listing of all available connection addresses.

Note

Serial ports are listed, e.g. COM1. Upon open, it may be necessary to specify a baud rate for the controller, e.g. `--baud 19200`. Default baud is 115200. See [GOpen\(\)](#).

Parameters

<i>addresses</i>	Buffer to hold the output string. Buffer will be null terminated, even if the data must be truncated to do so. See below for more information.
<i>addresses_len</i>	Length of buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

If [gcaps](#) is available, the listing will come from the server via [G_UTIL_GCAPS_ADDRESSES](#). In the absence of the server, gclib will use [G_UTIL_ADDRESSES](#) to generate the list.

- Ethernet controllers will be listed as *ip_address, revision_report, network_adapter_name, network_adapter↵_ip_address*. If an IP address is unreachable via ping, the address will be in parentheses.
- PCI controllers will be listed by their identifier, e.g. GALILPCI1.
- Serial ports will be listed by their identifier, e.g. COM1.

```
10.1.3.91, DMC4020 Rev 1.2e, LAN, 10.1.3.10
192.168.0.63, DMC4040 Rev 1.2f, Static, 192.168.0.41
(192.0.0.42), RIO47102 Rev 1.1j, Static, 192.168.0.41
GALILPCI1
COM1
COM2
```

Note

[GAddresses\(\)](#) will take up to 1 second to look for [gcaps](#).

See `x_examples.cpp` for an example.

Definition at line 54 of file `gclibo.c`.

References [G_NO_ERROR](#), [G_UTIL_ADDRESSES](#), [G_UTIL_GCAPS_ADDRESSES](#), and [GUtility\(\)](#).

13.15.2.2 GAssign()

```
GReturn GCALL GAssign (
    GCStringIn ip,
    GCStringIn mac )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ASSIGN](#) or [G_UTIL_ASSIGN](#) to assign an IP address over the Ethernet to a controller at a given MAC address.

Parameters

<i>ip</i>	The null-terminated ip address to assign. The hardware should not yet have an IP address.
<i>mac</i>	The null-terminated MAC address of the hardware.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

On Linux and Mac, the desired IP address will be pinged prior to the assignment. If the ping is returned, [GAssign\(\)](#) will return [G_GCLIB_UTILITY_IP_TAKEN](#).

If [gcaps](#) is available, the assign will be performed from the server via [G_UTIL_GCAPS_ASSIGN](#). [gcaps](#) will remember the assignment and will automatically assign the desired IP address should the controller ever request one again, e.g. after a controller master reset. To clear the remembered IP address from [gcaps](#), call [GAssign\(\)](#) with a blank string in place of the ip address. To remove all remembered ip addresses, specify a blank string for the mac address.

In the absence of the server, gclib will use [G_UTIL_ASSIGN](#) to assign. [GAssign\(\)](#) will take up to 1 second to look for [gcaps](#). When not using [gcaps](#), Linux/OS X users must be root to use [GAssign\(\)](#) and have UDP access to send on port 68.

See `x_examples.cpp` for an example.

Definition at line 70 of file `gclibo.c`.

References [G_GCLIB_UTILITY_IP_TAKEN](#), [G_NO_ERROR](#), [G_UTIL_ASSIGN](#), [G_UTIL_GCAPS_ASSIGN](#), [G↵UTIL_GCAPS_PING](#), [G_UTIL_PING](#), and [GUtility\(\)](#).

13.15.2.3 GCmd()

```
GReturn GCALL GCmd (
    GCon g,
    GCStringIn command )
```

Wrapper around GCommand for use when the return value is not desired.

The returned data is still checked for error, e.g. ? or timeout, but is not brought out through the prototype.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 237 of file `gclibo.c`.

References `G_SMALL_BUFFER`, and `GCommand()`.

Referenced by `check_interrupts()`, `commands()`, `contour()`, `GRecordRate()`, `H_DownloadArraysFromList()`, `H_DownloadData()`, `jog()`, `load_buf()`, `load_buffer()`, `message()`, `motion_complete()`, `position_tracking()`, `record_position()`, and `vector()`.

13.15.2.4 GCmdD()

```
GReturn GCALL GCmdD (
    GCon g,
    GCStringIn command,
    double * value )
```

Wrapper around GCommand that provides the return value of a command parsed into a double.

Use this function to retrieve the full Galil 4.2 range, e.g. for a variable value with fractional data, or the value of an Analog input or Output.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.
<i>value</i>	Pointer to a double that will be filled with the return value.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 289 of file `gclibo.c`.

References `G_NO_ERROR`, `G_SMALL_BUFFER`, and `GCommand()`.

Referenced by `commands()`, and `GRecordRate()`.

13.15.2.5 GCmdI()

```
GReturn GCALL GCmdI (
    GCon g,
    GCStringIn command,
    int * value )
```

Wrapper around GCommand that provides the return value of a command parsed into an int.

Use this function to get most values including TP, RP, TE, Digital I/O states, etc.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.
<i>value</i>	Pointer to an int that will be filled with the return value.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 278 of file `gclibo.c`.

References `G_NO_ERROR`, `G_SMALL_BUFFER`, and `GCommand()`.

Referenced by `commands()`, `record_position()`, and `vector()`.

13.15.2.6 GCmdT()

```
GReturn GCALL GCmdT (
    GCon g,
    GCStringIn command,
    GCStringOut trimmed_response,
    GSize response_len,
    GCStringOut * front )
```

Wrapper around `GCommand` that trims the response.

For use when the return value is desired, is ASCII (not binary), and the response should be trimmed of trailing colon, whitespace, and optionally leading space.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.
<i>trimmed_response</i>	The trimmed response from the controller. Trailing space is trimmed by null terminating any trailing spaces, carriage returns, or line feeds.
<i>response_len</i>	The length of the <code>trimmed_response</code> buffer.
<i>front</i>	If non-null, upon return <code>*front</code> will point to the first non-space character in <code>trimmed_response</code> . This allows trimming the front of the string without modifying the user's buffer pointer, which may be allocated on the heap.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 243 of file `gclibo.c`.

References `G_NO_ERROR`, and `GCommand()`.

Referenced by `commands()`, `GArrayUploadFile()`, `GRecordRate()`, and `motion_complete()`.

13.15.2.7 GError()

```
void GCALL GError (
    GReturn rc,
    GCStringOut error,
    GSize error_len )
```

Provides a human-readable description string for return codes.

Parameters

<i>rc</i>	The return code to lookup.
<i>error</i>	The buffer to fill with the error text. Buffer will be null terminated, even if the data must be truncated to do so.
<i>error_len</i>	The length of the error buffer.

See `x_examples.cpp` for an example.

Definition at line 459 of file `gclibo.c`.

References `G_NO_ERROR`.

Referenced by `error()`.

13.15.2.8 GInfo()

```
GReturn GCALL GInfo (
    GCon g,
    GCStringOut info,
    GSize info_len )
```

Uses `GUtility()` and `G_UTIL_INFO` to provide a useful connection string.

Parameters

<i>g</i>	Connection's handle.
<i>info</i>	Buffer to hold the output string. Buffer will be null terminated, even if the data must be truncated to do so.
<i>info_len</i>	Length of buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

The response is *address*, *revision_report*, *serial_number*. For example:

```
COM2, RIO47102 Rev 1.1j, 37290
```

See `x_examples.cpp` for an example.

Definition at line 49 of file `gclibo.c`.

References `G_UTIL_INFO`, and `GUtility()`.

13.15.2.9 GIpRequests()

```
GReturn GCALL GIpRequests (
    GCStringOut requests,
    GSize requests_len )
```

Uses `GUtility()`, `G_UTIL_GCAPS_IPREQUEST` or `G_UTIL_IPREQUEST` to provide a list of all Galil controllers requesting IP addresses via BOOT-P or DHCP.

Parameters

<i>requests</i>	The buffer to hold the list of requesting controllers. Data will be null terminated, even if the data must be truncated to do so. See below for more information.
<i>requests_len</i>	The length of the requests buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

[GlpRequests\(\)](#) will block up to 5 seconds while listening for requests.

If [gcaps](#) is available, the listing will come from the server via [G_UTIL_GCAPS_IPREQUEST](#). In the absence of the server, gclib will use [G_UTIL_IPREQUEST](#) to generate the list. [GlpRequests\(\)](#) will take up to 1 second to look for [gcaps](#). When not using [gcaps](#), Linux/OS X users must be root to use [GlpRequests\(\)](#) and have UDP access to bind and listen on port 67.

Each line of the returned data will be of the form *model, serial_number, MAC_address, network_adapter_name, network_adapter_ip_address, remembered_ip_assignment*. See [GAssign\(\)](#) for more information about remembered IP assignments. The following is an example output.

```
DMC2000, 34023, 00:50:4C:00:84:E7, enp5s0, 192.168.42.92, 192.168.42.200
DMC2105, 7, 00:50:4C:58:00:07, enp5s0, 192.168.42.92, 0.0.0.0
DMC2105, 13, 00:50:4C:58:00:0D, enp5s0, 192.168.42.92, 0.0.0.0
```

See [x_examples.cpp](#) for an example.

Definition at line 106 of file [gclibo.c](#).

References [G_NO_ERROR](#), [G_UTIL_GCAPS_IPREQUEST](#), [G_UTIL_IPREQUEST](#), [GSleep\(\)](#), and [GUtility\(\)](#).

Referenced by [ip_assigner\(\)](#).

13.15.2.10 GListServers()

```
GReturn GCALL GListServers (
    GCStringOut servers,
    GSize servers_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_LIST_SERVERS](#) to provide a list of all available gcaps services on the local network.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>servers</i>	The buffer to hold the list of available gcaps servers
<i>servers_len</i>	The length of the servers buffer

This function is used to find a list of available gcaps servers that have made themselves "Discoverable".

The list of available servers are separated by a newline '\n' character.

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 169 of file [gclibo.c](#).

References [G_GCAPS_OPEN_ERROR](#), [G_NO_ERROR](#), [G_UTIL_GCAPS_LIST_SERVERS](#), and [GUtility\(\)](#).

13.15.2.11 GMotionComplete()

```
GReturn GCALL GMotionComplete (
    GCon g,
    GCStringIn axes )
```

Blocking call that returns once all axes specified have completed their motion.

Note

This function uses a profiled motion indicator, not the position of the encoder. E.G. see the difference between AM (profiled) and MC (encoder-based).

Although using the `_BGm` operand is the most generally compatible method, there are higher-performance ways to check for motion complete by using the data record, or interrupts. See examples `x_dr_motioncomplete()` and `x_ei_motioncomplete()`.

Parameters

<i>g</i>	Connection's handle.
<i>axes</i>	A null-terminated string containing a multiple-axes mask. Every character in the string should be a valid argument to <code>MG_BGm</code> , i.e. XYZWABCEFGHST.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gmotioncomplete.cpp` for an example.

Definition at line 300 of file `gclibo.c`.

References `G_NO_ERROR`, and `GWaitForBool()`.

Referenced by `contour()`, `jog()`, `position_tracking()`, and `vector()`.

13.15.2.12 GProgramDownloadFile()

```
GReturn GCALL GProgramDownloadFile (
    GCon g,
    GCStringIn file_path,
    GCStringIn preprocessor )
```

Program download from file.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the program file.
<i>preprocessor</i>	Options string for preprocessing the program before sending it to the controller. See GProgramDownload() .

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_programs.cpp` for an example.

Definition at line 387 of file `gclibo.c`.

References `G_BAD_FILE`, `G_BAD_FULL_MEMORY`, `G_NO_ERROR`, and `GProgramDownload()`.

13.15.2.13 GProgramUploadFile()

```
GReturn GCALL GProgramUploadFile (
    GCon g,
    GCStringIn file_path )
```

Program upload to file.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the program file, file will be overwritten if it exists.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_programs.cpp` for an example.

Definition at line 430 of file `gclibo.c`.

References `G_BAD_FILE`, `G_BAD_FULL_MEMORY`, `G_NO_ERROR`, `GProgramUpload()`, and `MAXPROG`.

13.15.2.14 GPublishServer()

```
GReturn GCALL GPublishServer (
    GCStringIn name,
    GOption publish,
    GOption save )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_PUBLISH_SERVER](#) to publish local gcaps server to the local network.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>name</i>	The name of the server to publish or remove
<i>publish</i>	Option to publish or remove server from network
<i>save</i>	Option to save this configuration for future reboots

This function is used to make your local gcaps server "Discoverable" or "Invisible"

publish Option:

Set to 1 to publish server to the network and make "Discoverable"

Set to 0 to remove server from the network and make "Invisible"

save Option:

Set to 1 to save the configuration for future reboots of the server

Set to 0 to use this configuration once, and not overwrite previous server settings

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 189 of file `gclibo.c`.

References `G_GCAPS_OPEN_ERROR`, `G_NO_ERROR`, `G_UTIL_GCAPS_PUBLISH_SERVER`, and `GUtility()`.

Referenced by `remote_server()`.

13.15.2.15 GRecordRate()

```
GReturn GCALL GRecordRate (
    GCon g,
    double period_ms )
```

Sets the asynchronous data record to a user-specified period via DR.

Takes TM and product type into account and sets the DR period to the period requested by the user, if possible.

Parameters

<i>g</i>	Connection's handle.
<i>period_ms</i>	Period, in milliseconds, to set up for the asynchronous data record.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_grecord.cpp` for an example.

Definition at line 342 of file `gclibo.c`.

References `G_NO_ERROR`, `G_SMALL_BUFFER`, `GCmd()`, `GCmdD()`, and `GCmdT()`.

13.15.2.16 GRemoteConnections()

```
GReturn GCALL GRemoteConnections (
    GCStringOut connections,
    GSize connections_length )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_REMOTE_CONNECTIONS](#) to get a list of remote addresses connected to the local server.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>connections</i>	The buffer to hold the list of remote IP addresses currently connected to your hardware
<i>connections_len</i>	The length of the connections buffer

This function is used to find a list of IP Addresses of machines that currently have open connections to your local hardware. If another user sets your local server as their active server, and then opens a connection to your hardware, their IP Address will appear in this list.

The list of IP addresses are separated by a newline '\n' character.

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 217 of file `gclibo.c`.

References `G_GCAPS_OPEN_ERROR`, `G_NO_ERROR`, `G_UTIL_GCAPS_REMOTE_CONNECTIONS`, and `GUtility()`.

13.15.2.17 GServerStatus()

```
GReturn GCALL GServerStatus (
    GCStringOut status,
    GSize status_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SERVER_STATUS](#) to get information on the local server name and if it is published to the local network.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>status</i>	The buffer to hold the status of the local gcaps server
<i>status_len</i>	The length of the status buffer

This function is used to find the status of your local gcaps server. Use this function to determine the name your server is currently using, and whether or not your gcaps server is currently set to "Discoverable" or "Invisible". The status buffer will be filled in the form of "[Server Name], [Discoverable]". For example, for a server with the name "Example Server" that is set to "Discoverable", the status buffer would contain "Example Server, true".

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 149 of file `gclibo.c`.

References `G_GCAPS_OPEN_ERROR`, `G_NO_ERROR`, `G_UTIL_GCAPS_SERVER_STATUS`, and `GUtility()`.

13.15.2.18 GSetServer()

```
GReturn GCALL GSetServer (
    GCStringIn server_name )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SET_SERVER](#) to set the new active server.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>server_name</i>	The name of the server to set as your new active server.
--------------------	--

Use this function in conjunction with [GListServers\(\)](#). Choose a name received from [GListServers\(\)](#) to set as your new active server.

After setting a new active server, all gclib calls will route through that new active server, unless explicitly noted otherwise.

To set your active server back to your local server, simply pass "Local" to [GSetServer\(\)](#):

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 128 of file `gclibo.c`.

References `G_GCAPS_OPEN_ERROR`, `G_NO_ERROR`, `G_UTIL_GCAPS_SET_SERVER`, and `GUtility()`.

13.15.2.19 GSleep()

```
void GCALL GSleep (
    unsigned int timeout_ms )
```

Uses [GUtility\(\)](#) and [G_UTIL_SLEEP](#) to provide a blocking sleep call which can be useful for timing-based chores.

Parameters

<i>timeout_ms</i>	The timeout, in milliseconds, to block before returning.
-------------------	--

See [GWaitForBool\(\)](#) for an example.

Definition at line 24 of file `gclibo.c`.

References `G_UTIL_SLEEP`, and `GUtility()`.

Referenced by `GlpRequests()`, `GWaitForBool()`, `record_position()`, and `vector()`.

13.15.2.20 GTimeout()

```
GReturn GCALL GTimeout (
    GCon g,
    short timeout_ms )
```

Uses [GUtility\(\)](#) and `G_UTIL_TIMEOUT_OVERRIDE` to set the library timeout.

Parameters

<i>g</i>	Connection's handle.
<i>timeout_ms</i>	The value to be used for the timeout. Use <code>G_USE_INITIAL_TIMEOUT</code> to set the timeout back to the initial GOpen() value, <code>--timeout</code> .

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` and `x_gread_gwrite.cpp` for examples.

Definition at line 65 of file `gclibo.c`.

References `G_UTIL_TIMEOUT_OVERRIDE`, and [GUtility\(\)](#).

Referenced by `motion_complete()`.

13.15.2.21 GVersion()

```
GReturn GCALL GVersion (
    GCStringOut ver,
    GSize ver_len )
```

Uses [GUtility\(\)](#), `G_UTIL_VERSION` and `G_UTIL_GCAPS_VERSION` to provide the library and [gcaps](#) version numbers.

Parameters

<i>ver</i>	Buffer to hold the output string. Buffer will be null terminated, even if the data must be truncated to do so.
<i>ver_len</i>	Length of buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

The version number of `gclib` is provided first. If the [gcaps](#) server can be found, its version will be provided after a space.

Example with `gcaps` version.

```
154.190.329 1.0.0.82
```

Example with `gclib` version only.

```
154.190.329
```

Note

[GVersion\(\)](#) will take up to 1 second to look for [gcaps](#).

See `x_examples.cpp` for an example.

Definition at line 29 of file `gclibo.c`.

References `G_NO_ERROR`, `G_UTIL_GCAPS_VERSION`, `G_UTIL_VERSION`, and [GUtility\(\)](#).

13.15.2.22 GWaitForBool()

```
GReturn GCALL GWaitForBool (
    GCon g,
    GCStringIn predicate,
    int trials )
```

Blocking call that returns when the controller evaluates the predicate as true.

Polls the message command (MG) to check the value of predicate. Polling will continue until the controller responds with a nonzero value or the number of polling trials is reached.

The amount of time until the function fails with `G_GCLIB_POLLING_FAILED` is roughly (trials * `POLLINGINTERVAL`) milliseconds.

Parameters

<i>g</i>	Connection's handle.
<i>predicate</i>	A null-terminated string containing the predicate to be polled. The predicate will be enclosed in parentheses and used in the command <code>MG (predicate)</code> to return the value.
<i>trials</i>	The number of polling cycles to perform looking for a nonzero value. Use -1 to poll indefinitely.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [GMotionComplete\(\)](#) for an example.

Definition at line 318 of file `gclibo.c`.

References `G_GCLIB_POLLING_FAILED`, `G_LINE_BUFFER`, `G_NO_ERROR`, `G_SMALL_BUFFER`, `GCommand()`, `GSleep()`, and `POLLINGINTERVAL`.

Referenced by `GMotionComplete()`.

13.16 gclibo.h File Reference

```
#include "gclib.h"
```

Macros

- `#define GCLIB_DLL_EXPORTED`
- `#define GCALL __stdcall`
- `#define MALLOCBUF G_HUGE_BUFFER`
Malloc used for large program and array uploads.
- `#define MAXPROG MALLOCBUF`
Maximum size for a program.
- `#define MAXARRAY MALLOCBUF`
Maximum size for an array table upload.
- `#define POLLINGINTERVAL 100`
Interval, in milliseconds, for polling commands, e.g. [GWaitForBool\(\)](#).
- `#define G_USE_GCAPS`
Use the GCAPS server in [GAddresses\(\)](#), [GAssign\(\)](#), [GlpRequests\(\)](#), and [GVersion\(\)](#). To avoid GCAPS, comment out this line and recompile, <http://galil.com/sw/pub/all/doc/gclib/html/gclibo.html>.

Functions

- `GCLIB_DLL_EXPORTED void GCALL GSleep` (unsigned int timeout_ms)
Uses [GUtility\(\)](#) and [G_UTIL_SLEEP](#) to provide a blocking sleep call which can be useful for timing-based chores.
- `GCLIB_DLL_EXPORTED GReturn GCALL GVersion` (GCStringOut ver, GSize ver_len)

- Uses [GUtility\(\)](#), [G_UTIL_VERSION](#) and [G_UTIL_GCAPS_VERSION](#) to provide the library and [gcaps](#) version numbers.
- [GCLIB_DLL_EXPORTED GReturn GCALL GAddresses](#) ([GCStringOut](#) addresses, [GSize](#) addresses_len)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ADDRESSES](#) or [G_UTIL_ADDRESSES](#) to provide a listing of all available connection addresses.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GInfo](#) ([GCon](#) g, [GCStringOut](#) info, [GSize](#) info_len)
Uses [GUtility\(\)](#) and [G_UTIL_INFO](#) to provide a useful connection string.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GTimeout](#) ([GCon](#) g, short timeout_ms)
Uses [GUtility\(\)](#) and [G_UTIL_TIMEOUT_OVERRIDE](#) to set the library timeout.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GCmd](#) ([GCon](#) g, [GCStringIn](#) command)
Wrapper around [GCommand](#) for use when the return value is not desired.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GCmdT](#) ([GCon](#) g, [GCStringIn](#) command, [GCStringOut](#) trimmed_response, [GSize](#) response_len, [GCStringOut](#) *front)
Wrapper around [GCommand](#) that trims the response.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GCmdI](#) ([GCon](#) g, [GCStringIn](#) command, int *value)
Wrapper around [GCommand](#) that provides the return value of a command parsed into an int.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GCmdD](#) ([GCon](#) g, [GCStringIn](#) command, double *value)
Wrapper around [GCommand](#) that provides the return value of a command parsed into a double.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GWaitForBool](#) ([GCon](#) g, [GCStringIn](#) predicate, int trials)
Blocking call that returns when the controller evaluates the predicate as true.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GMotionComplete](#) ([GCon](#) g, [GCStringIn](#) axes)
Blocking call that returns once all axes specified have completed their motion.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GRecordRate](#) ([GCon](#) g, double period_ms)
Sets the asynchronous data record to a user-specified period via [DR](#).
 - [GCLIB_DLL_EXPORTED GReturn GCALL GProgramDownloadFile](#) ([GCon](#) g, [GCStringIn](#) file_path, [GCStringIn](#) preprocessor)
Program download from file.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GProgramUploadFile](#) ([GCon](#) g, [GCStringIn](#) file_path)
Program upload to file.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GArrayDownloadFile](#) ([GCon](#) g, [GCStringIn](#) file_path)
Array download from file.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GArrayUploadFile](#) ([GCon](#) g, [GCStringIn](#) file_path, [GCStringIn](#) names)
Array upload to file.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GIpRequests](#) ([GCStringOut](#) requests, [GSize](#) requests_len)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_IPREQUEST](#) or [G_UTIL_IPREQUEST](#) to provide a list of all [Galil](#) controllers requesting IP addresses via [BOOT-P](#) or [DHCP](#).
 - [GCLIB_DLL_EXPORTED GReturn GCALL GSetServer](#) ([GCStringIn](#) server_name)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SET_SERVER](#) to set the new active server.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GListServers](#) ([GCStringOut](#) servers, [GSize](#) servers_len)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_LIST_SERVERS](#) to provide a list of all available [gcaps](#) services on the local network.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GPublishServer](#) ([GCStringIn](#) name, [GOption](#) publish, [GOption](#) save)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_PUBLISH_SERVER](#) to publish local [gcaps](#) server to the local network.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GServerStatus](#) ([GCStringOut](#) status, [GSize](#) status_len)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SERVER_STATUS](#) to get information on the local server name and if it is published to the local network.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GRemoteConnections](#) ([GCStringOut](#) connections, [GSize](#) connections_length)
Uses [GUtility\(\)](#), [G_UTIL_GCAPS_REMOTE_CONNECTIONS](#) to get a list of remote addresses connected to the local server.
 - [GCLIB_DLL_EXPORTED GReturn GCALL GAssign](#) ([GCStringIn](#) ip, [GCStringIn](#) mac)

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ASSIGN](#) or [G_UTIL_ASSIGN](#) to assign an IP address over the Ethernet to a controller at a given MAC address.

- GCLIB_DLL_EXPORTED void [GCALL GError](#) ([GReturn](#) rc, [GCStringOut](#) error, [GSize](#) error_len)

Provides a human-readable description string for return codes.

- GCLIB_DLL_EXPORTED [GReturn GCALL GSetupDownloadFile](#) ([GCon](#) g, [GCStringIn](#) file_path, [GOption](#) options, [GCStringOut](#) info, [GSize](#) info_len)

Download a saved controller configuration from a file.

13.16.1 Detailed Description

Open-source convenience functions for Galil C Lib. Please email softwarefeedback@galil.com with suggestions for useful/missing functions.

13.16.2 Function Documentation

13.16.2.1 GAddresses()

```
GReturn GCALL GAddresses (
    GCStringOut addresses,
    GSize addresses_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ADDRESSES](#) or [G_UTIL_ADDRESSES](#) to provide a listing of all available connection addresses.

Note

Serial ports are listed, e.g. COM1. Upon open, it may be necessary to specify a baud rate for the controller, e.g. `--baud 19200`. Default baud is 115200. See [GOpen\(\)](#).

Parameters

<i>addresses</i>	Buffer to hold the output string. Buffer will be null terminated, even if the data must be truncated to do so. See below for more information.
<i>addresses_len</i>	Length of buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

If [gcaps](#) is available, the listing will come from the server via [G_UTIL_GCAPS_ADDRESSES](#). In the absence of the server, gclib will use [G_UTIL_ADDRESSES](#) to generate the list.

- Ethernet controllers will be listed as *ip_address, revision_report, network_adapter_name, network_adapter↵_ip_address*. If an IP address is unreachable via ping, the address will be in parentheses.
- PCI controllers will be listed by their identifier, e.g. GALILPCI1.
- Serial ports will be listed by their identifier, e.g. COM1.

```
10.1.3.91, DMC4020 Rev 1.2e, LAN, 10.1.3.10
192.168.0.63, DMC4040 Rev 1.2f, Static, 192.168.0.41
(192.0.0.42), RIO47102 Rev 1.1j, Static, 192.168.0.41
GALILPCI1
COM1
COM2
```

Note

[GAddresses\(\)](#) will take up to 1 second to look for [gcaps](#).

See `x_examples.cpp` for an example.

Definition at line 54 of file `gclibo.c`.

References `G_NO_ERROR`, `G_UTIL_ADDRESSES`, `G_UTIL_GCAPS_ADDRESSES`, and `GUtility()`.

13.16.2.2 GArrayDownloadFile()

```
GCLIB_DLL_EXPORTED GReturn GCALL GArrayDownloadFile (
    GCon g,
    GCStringIn file_path )
```

Array download from file.

Downloads a csv file containing array data at `file_path`. If the arrays don't exist, they will be dimensioned.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the array file.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_arrays.cpp` for an example.

Definition at line 380 of file `arrays.c`.

References `G_BAD_FILE`, `G_NO_ERROR`, and `H_ArrayDownloadFromMemory()`.

13.16.2.3 GArrayUploadFile()

```
GCLIB_DLL_EXPORTED GReturn GCALL GArrayUploadFile (
    GCon g,
    GCStringIn file_path,
    GCStringIn names )
```

Array upload to file.

Uploads the entire controller array table or a subset and saves the data as a csv file specified by `file_path`.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the array file, file will be overwritten if it exists.
<i>names</i>	Null-terminated string containing the arrays to upload, delimited with space. "" or null uploads all arrays listed in LA.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_arrays.cpp` for an example.

Definition at line 408 of file `arrays.c`.

References `G_NO_ERROR`, `GCmdT()`, `H_FreeArrays()`, `H_InitArrayNode()`, `H_UploadArrayToList()`, and `H_WriteArrayCsv()`.

13.16.2.4 GAssign()

```
GReturn GCALL GAssign (
```

```
GCStringIn ip,
GCStringIn mac )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_ASSIGN](#) or [G_UTIL_ASSIGN](#) to assign an IP address over the Ethernet to a controller at a given MAC address.

Parameters

<i>ip</i>	The null-terminated ip address to assign. The hardware should not yet have an IP address.
<i>mac</i>	The null-terminated MAC address of the hardware.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

On Linux and Mac, the desired IP address will be pinged prior to the assignment. If the ping is returned, [GAssign\(\)](#) will return [G_GCLIB_UTILITY_IP_TAKEN](#).

If [gcaps](#) is available, the assign will be performed from the server via [G_UTIL_GCAPS_ASSIGN](#). [gcaps](#) will remember the assignment and will automatically assign the desired IP address should the controller ever request one again, e.g. after a controller master reset. To clear the remembered IP address from [gcaps](#), call [GAssign\(\)](#) with a blank string in place of the ip address. To remove all remembered ip addresses, specify a blank string for the mac address.

In the absence of the server, [gclib](#) will use [G_UTIL_ASSIGN](#) to assign. [GAssign\(\)](#) will take up to 1 second to look for [gcaps](#). When not using [gcaps](#), Linux/OS X users must be root to use [GAssign\(\)](#) and have UDP access to send on port 68.

See [x_examples.cpp](#) for an example.

Definition at line 70 of file [gclibo.c](#).

References [G_GCLIB_UTILITY_IP_TAKEN](#), [G_NO_ERROR](#), [G_UTIL_ASSIGN](#), [G_UTIL_GCAPS_ASSIGN](#), [G_UTIL_GCAPS_PING](#), [G_UTIL_PING](#), and [GUtility\(\)](#).

13.16.2.5 GCmd()

```
GReturn GCALL GCmd (
    GCon g,
    GCStringIn command )
```

Wrapper around [GCommand](#) for use when the return value is not desired.

The returned data is still checked for error, e.g. ? or timeout, but is not brought out through the prototype.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [x_gcommand.cpp](#) for an example.

Definition at line 237 of file [gclibo.c](#).

References [G_SMALL_BUFFER](#), and [GCommand\(\)](#).

Referenced by [check_interrupts\(\)](#), [commands\(\)](#), [contour\(\)](#), [GRecordRate\(\)](#), [H_DownloadArraysFromList\(\)](#), [H_DownloadData\(\)](#), [jog\(\)](#), [load_buf\(\)](#), [load_buffer\(\)](#), [message\(\)](#), [motion_complete\(\)](#), [position_tracking\(\)](#), [record_position\(\)](#), and [vector\(\)](#).

13.16.2.6 GCmdD()

```
GReturn GCALL GCmdD (
    GCon g,
```

```
GCStringIn command,
double * value )
```

Wrapper around GCommand that provides the return value of a command parsed into a double.

Use this function to retrieve the full Galil 4.2 range, e.g. for a variable value with fractional data, or the value of an Analog input or Output.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.
<i>value</i>	Pointer to a double that will be filled with the return value.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 289 of file `gclibo.c`.

References `G_NO_ERROR`, `G_SMALL_BUFFER`, and `GCommand()`.

Referenced by `commands()`, and `GRecordRate()`.

13.16.2.7 GCmdI()

```
GReturn GCALL GCmdI (
    GCon g,
    GCStringIn command,
    int * value )
```

Wrapper around GCommand that provides the return value of a command parsed into an int.

Use this function to get most values including TP, RP, TE, Digital I/O states, etc.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.
<i>value</i>	Pointer to an int that will be filled with the return value.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 278 of file `gclibo.c`.

References `G_NO_ERROR`, `G_SMALL_BUFFER`, and `GCommand()`.

Referenced by `commands()`, `record_position()`, and `vector()`.

13.16.2.8 GCmdT()

```
GReturn GCALL GCmdT (
    GCon g,
    GCStringIn command,
    GCStringOut trimmed_response,
    GSize response_len,
    GCStringOut * front )
```

Wrapper around GCommand that trims the response.

For use when the return value is desired, is ASCII (not binary), and the response should be trimmed of trailing colon, whitespace, and optionally leading space.

Parameters

<i>g</i>	Connection's handle.
<i>command</i>	Null-terminated command string to send to the controller.
<i>trimmed_response</i>	The trimmed response from the controller. Trailing space is trimmed by null terminating any trailing spaces, carriage returns, or line feeds.
<i>response_len</i>	The length of the <i>trimmed_response</i> buffer.
<i>front</i>	If non-null, upon return <i>*front</i> will point to the first non-space character in <i>trimmed_response</i> . This allows trimming the front of the string without modifying the user's buffer pointer, which may be allocated on the heap.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` for an example.

Definition at line 243 of file `gclibo.c`.

References `G_NO_ERROR`, and `GCommand()`.

Referenced by `commands()`, `GArrayUploadFile()`, `GRecordRate()`, and `motion_complete()`.

13.16.2.9 GError()

```
void GCALL GError (
    GReturn rc,
    GCStringOut error,
    GSize error_len )
```

Provides a human-readable description string for return codes.

Parameters

<i>rc</i>	The return code to lookup.
<i>error</i>	The buffer to fill with the error text. Buffer will be null terminated, even if the data must be truncated to do so.
<i>error_len</i>	The length of the error buffer.

See `x_examples.cpp` for an example.

Definition at line 459 of file `gclibo.c`.

References `G_NO_ERROR`.

Referenced by `error()`.

13.16.2.10 GInfo()

```
GReturn GCALL GInfo (
    GCon g,
    GCStringOut info,
    GSize info_len )
```

Uses [GUtility\(\)](#) and [G_UTIL_INFO](#) to provide a useful connection string.

Parameters

<i>g</i>	Connection's handle.
<i>info</i>	Buffer to hold the output string. Buffer will be null terminated, even if the data must be truncated to do so.
<i>info_len</i>	Length of buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

The response is *address*, *revision_report*, *serial_number*. For example:

```
COM2, RIO47102 Rev 1.1j, 37290
```

See `x_examples.cpp` for an example.

Definition at line 49 of file `gclibo.c`.

References `G_UTIL_INFO`, and `GUtility()`.

13.16.2.11 GIpRequests()

```
GReturn GCALL GIpRequests (
    GCStringOut requests,
    GSize requests_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_IPREQUEST](#) or [G_UTIL_IPREQUEST](#) to provide a list of all Galil controllers requesting IP addresses via BOOT-P or DHCP.

Parameters

<i>requests</i>	The buffer to hold the list of requesting controllers. Data will be null terminated, even if the data must be truncated to do so. See below for more information.
<i>requests_len</i>	The length of the requests buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

[GIpRequests\(\)](#) will block up to 5 seconds while listening for requests.

If `gcaps` is available, the listing will come from the server via [G_UTIL_GCAPS_IPREQUEST](#). In the absence of the server, `gclib` will use [G_UTIL_IPREQUEST](#) to generate the list. [GIpRequests\(\)](#) will take up to 1 second to look for `gcaps`. When not using `gcaps`, Linux/OS X users must be root to use [GIpRequests\(\)](#) and have UDP access to bind and listen on port 67.

Each line of the returned data will be of the form *model*, *serial_number*, *MAC_address*, *network_adapter_name*, *network_adapter_ip_address*, *remembered_ip_assignment*. See [GAssign\(\)](#) for more information about remembered IP assignments. The following is an example output.

```
DMC2000, 34023, 00:50:4C:00:84:E7, enp5s0, 192.168.42.92, 192.168.42.200
DMC2105, 7, 00:50:4C:58:00:07, enp5s0, 192.168.42.92, 0.0.0.0
DMC2105, 13, 00:50:4C:58:00:0D, enp5s0, 192.168.42.92, 0.0.0.0
```

See `x_examples.cpp` for an example.

Definition at line 106 of file `gclibo.c`.

References `G_NO_ERROR`, `G_UTIL_GCAPS_IPREQUEST`, `G_UTIL_IPREQUEST`, `GSleep()`, and `GUtility()`.

Referenced by `ip_assigner()`.

13.16.2.12 GListServers()

```
GReturn GCALL GListServers (
    GCStringOut servers,
    GSize servers_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_LIST_SERVERS](#) to provide a list of all available `gcaps` services on the local network.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>servers</i>	The buffer to hold the list of available gcaps servers
<i>servers_len</i>	The length of the servers buffer

This function is used to find a list of available gcaps servers that have made themselves "Discoverable". The list of available servers are separated by a newline '\n' character.

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 169 of file gclibo.c.

References `G_GCAPS_OPEN_ERROR`, `G_NO_ERROR`, `G_UTIL_GCAPS_LIST_SERVERS`, and `GUtility()`.

13.16.2.13 GMotionComplete()

```
GReturn GCALL GMotionComplete (
    GCon g,
    GCStringIn axes )
```

Blocking call that returns once all axes specified have completed their motion.

Note

This function uses a profiled motion indicator, not the position of the encoder. E.G. see the difference between AM (profiled) and MC (encoder-based).

Although using the `_BGm` operand is the most generally compatible method, there are higher-performance ways to check for motion complete by using the data record, or interrupts. See examples `x_dr_motioncomplete()` and `x_ei_motioncomplete()`.

Parameters

<i>g</i>	Connection's handle.
<i>axes</i>	A null-terminated string containing a multiple-axes mask. Every character in the string should be a valid argument to <code>MG_BGm</code> , i.e. XYZWABCEFGHST.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gmotioncomplete.cpp` for an example.

Definition at line 300 of file gclibo.c.

References `G_NO_ERROR`, and `GWaitForBool()`.

Referenced by `contour()`, `jog()`, `position_tracking()`, and `vector()`.

13.16.2.14 GProgramDownloadFile()

```
GReturn GCALL GProgramDownloadFile (
    GCon g,
    GCStringIn file_path,
    GCStringIn preprocessor )
```

Program download from file.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the program file.
<i>preprocessor</i>	Options string for preprocessing the program before sending it to the controller. See GProgramDownload() .

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_programs.cpp` for an example.

Definition at line 387 of file `gclibo.c`.

References `G_BAD_FILE`, `G_BAD_FULL_MEMORY`, `G_NO_ERROR`, and `GProgramDownload()`.

13.16.2.15 GProgramUploadFile()

```
GReturn GCALL GProgramUploadFile (
    GCon g,
    GCStringIn file_path )
```

Program upload to file.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the program file, file will be overwritten if it exists.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_programs.cpp` for an example.

Definition at line 430 of file `gclibo.c`.

References `G_BAD_FILE`, `G_BAD_FULL_MEMORY`, `G_NO_ERROR`, `GProgramUpload()`, and `MAXPROG`.

13.16.2.16 GPublishServer()

```
GReturn GCALL GPublishServer (
    GCStringIn name,
    GOption publish,
    GOption save )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_PUBLISH_SERVER](#) to publish local gcaps server to the local network.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>name</i>	The name of the server to publish or remove
<i>publish</i>	Option to publish or remove server from network
<i>save</i>	Option to save this configuration for future reboots

This function is used to make your local gcaps server "Discoverable" or "Invisible"
publish Option:

Set to 1 to publish server to the network and make "Discoverable"
 Set to 0 to remove server from the network and make "Invisible"

save Option:

Set to 1 to save the configuration for future reboots of the server
 Set to 0 to use this configuration once, and not overwrite previous server settings

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 189 of file gclibo.c.

References `G_GCAPS_OPEN_ERROR`, `G_NO_ERROR`, `G_UTIL_GCAPS_PUBLISH_SERVER`, and `GUtility()`.

Referenced by `remote_server()`.

13.16.2.17 GRecordRate()

```
GReturn GCALL GRecordRate (
    GCon g,
    double period_ms )
```

Sets the asynchronous data record to a user-specified period via `DR`.

Takes `TM` and product type into account and sets the `DR` period to the period requested by the user, if possible.

Parameters

<i>g</i>	Connection's handle.
<i>period_ms</i>	Period, in milliseconds, to set up for the asynchronous data record.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_grecord.cpp` for an example.

Definition at line 342 of file gclibo.c.

References `G_NO_ERROR`, `G_SMALL_BUFFER`, `GCmd()`, `GCmdD()`, and `GCmdT()`.

13.16.2.18 GRemoteConnections()

```
GReturn GCALL GRemoteConnections (
    GCStringOut connections,
    GSize connections_length )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_REMOTE_CONNECTIONS](#) to get a list of remote addresses connected to the local server.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>connections</i>	The buffer to hold the list of remote IP addresses currently connected to your hardware
<i>connections_len</i>	The length of the connections buffer

This function is used to find a list of IP Addresses of machines that currently have open connections to your local hardware. If another user sets your local server as their active server, and then opens a connection to your hardware, their IP Address will appear in this list.

The list of IP addresses are separated by a newline '\n' character.

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 217 of file gclibo.c.

References [G_GCAPS_OPEN_ERROR](#), [G_NO_ERROR](#), [G_UTIL_GCAPS_REMOTE_CONNECTIONS](#), and [GUtility\(\)](#).

13.16.2.19 GServerStatus()

```
GReturn GCALL GServerStatus (
    GCStringOut status,
    GSize status_len )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SERVER_STATUS](#) to get information on the local server name and if it is published to the local network.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>status</i>	The buffer to hold the status of the local gcaps server
<i>status_len</i>	The length of the status buffer

This function is used to find the status of your local gcaps server. Use this function to determine the name your server is currently using, and whether or not your gcaps server is currently set to "Discoverable" or "Invisible"

The status buffer will be filled in the form of "[Server Name], [Discoverable]"

For example, for a server with the name "Example Server" that is set to "Discoverable", the status buffer would contain "Example Server, true".

Attention

This function will always use your local gcaps server, regardless of which server you have set as your active server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 149 of file gclibo.c.

References [G_GCAPS_OPEN_ERROR](#), [G_NO_ERROR](#), [G_UTIL_GCAPS_SERVER_STATUS](#), and [GUtility\(\)](#).

13.16.2.20 GSetServer()

```
GReturn GCALL GSetServer (
    GCStringIn server_name )
```

Uses [GUtility\(\)](#), [G_UTIL_GCAPS_SET_SERVER](#) to set the new active server.

Note

This function is only available on Windows 10 and Linux.

Parameters

<i>server_name</i>	The name of the server to set as your new active server.
--------------------	--

Use this function in conjunction with [GListServers\(\)](#). Choose a name received from [GListServers\(\)](#) to set as your new active server.

After setting a new active server, all gclib calls will route through that new active server, unless explicitly noted otherwise.

To set your active server back to your local server, simply pass "Local" to [GSetServer\(\)](#):

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

Definition at line 128 of file gclibo.c.

References [G_GCAPS_OPEN_ERROR](#), [G_NO_ERROR](#), [G_UTIL_GCAPS_SET_SERVER](#), and [GUtility\(\)](#).

13.16.2.21 GSetupDownloadFile()

```
GCLIB_DLL_EXPORTED GReturn GCALL GSetupDownloadFile (
    GCon g,
    GCStringIn file_path,
    GOption options,
    GCStringOut info,
    GSize info_len )
```

Download a saved controller configuration from a file.

Parameters

<i>g</i>	Connection's handle.
<i>file_path</i>	Null-terminated string containing the path to the gcb file.
<i>options</i>	Bit mask to determine what configuration data to download. See below for all options.
<i>info</i>	Optional pointer to a buffer to store the controller info. If no info is needed, specify as NULL.
<i>info_len</i>	Length of optional info buffer. If no info is needed, specify as NULL.

Returns

The success status or error code of the function. If the options parameter is set to 0, the return value will be a bit mask indicating which sectors in the specified GCB are not empty. Otherwise, see [gclib_errors.h](#) for possible error values.

Note

By default, [GSetupDownloadFile\(\)](#) will stop immediately if an error is encountered downloading data. This can be overridden in the options parameter. For example, you may want to override the error if you have a backup from an 8-axis controller and want to restore the parameters for the first 4 axes to a 4-axis controller.

If both *info* and *info_len* are not NULL, the controller information will be provided regardless of the options parameter. The options parameter is a bit mask. If options is set to 0, [GSetupDownloadFile\(\)](#) will return a bit mask indicating which sectors in the specified GCB are not empty. The following contains a list of all currently available options:

Bit	Value	Function	Description
1	0x0002	Restore parameters	KPA, KIA, KDA, etc...

Bit	Value	Function	Description
3	0x0008	Restore variables	Variables are listed by the LV command
4	0x0010	Restore arrays	Arrays are listed by the LA command
5	0x0020	Restore program	The program is listed by the LS command
31	0x8000	Ignore errors	Ignore invalid parameter errors and continue restoring data. GSetupDownloadFile() will still stop immediately if a connection issue or other fatal error is encountered

Usage example:

```
GCon g;
GOption opt = 0;
GCStringOut info;
GSize info_len = 4096;
GReturn rc = GOpen("192.168.0.50", &g);
if (rc) return rc;
// Call GSetupDownloadFile() with options set to 0 so we can get the non-empty sector bit mask
opt = GSetupDownloadFile(g, "C:\\path\\to\\gcb\\file.gcb", 0, NULL, NULL);
info = (GCStringOut)malloc(sizeof(GCStringOut) * info_len);
// Call GSetupDownloadFile() with the bit mask returned in the previous function call
rc = GSetupDownloadFile(g, "C:\\path\\to\\gcb\\file.gcb", opt, info, info_len);
printf("Info:\n\n%s", info);
GClose(g);
free(info);
return rc;
```

Definition at line 476 of file arrays.c.

References [G_BAD_FILE](#), [G_NO_ERROR](#), [GProgramDownload\(\)](#), [H_ArrayDownloadFromMemory\(\)](#), [H_DownloadData\(\)](#), and [H_FindSector\(\)](#).

13.16.2.22 GSleep()

```
void GCALL GSleep (
    unsigned int timeout_ms )
```

Uses [GUtility\(\)](#) and [G_UTIL_SLEEP](#) to provide a blocking sleep call which can be useful for timing-based chores.

Parameters

<i>timeout_ms</i>	The timeout, in milliseconds, to block before returning.
-------------------	--

See [GWaitForBool\(\)](#) for an example.

Definition at line 24 of file gclibo.c.

References [G_UTIL_SLEEP](#), and [GUtility\(\)](#).

Referenced by [GlpRequests\(\)](#), [GWaitForBool\(\)](#), [record_position\(\)](#), and [vector\(\)](#).

13.16.2.23 GTimeout()

```
GReturn GCALL GTimeout (
    GCon g,
    short timeout_ms )
```

Uses [GUtility\(\)](#) and [G_UTIL_TIMEOUT_OVERRIDE](#) to set the library timeout.

Parameters

<i>g</i>	Connection's handle.
<i>timeout_ms</i>	The value to be used for the timeout. Use G_USE_INITIAL_TIMEOUT to set the timeout back to the initial GOpen() value, <code>--timeout</code> .

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `x_gcommand.cpp` and `x_gread_gwrite.cpp` for examples.

Definition at line 65 of file `gclibo.c`.

References `G_UTIL_TIMEOUT_OVERRIDE`, and `GUtility()`.

Referenced by `motion_complete()`.

13.16.2.24 GVersion()

```
GReturn GCALL GVersion (
    GCStringOut ver,
    GSize ver_len )
```

Uses [GUtility\(\)](#), [G_UTIL_VERSION](#) and [G_UTIL_GCAPS_VERSION](#) to provide the library and [gcaps](#) version numbers.

Parameters

<i>ver</i>	Buffer to hold the output string. Buffer will be null terminated, even if the data must be truncated to do so.
<i>ver_len</i>	Length of buffer.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

The version number of `gclib` is provided first. If the [gcaps](#) server can be found, its version will be provided after a space.

Example with `gcaps` version.

```
154.190.329 1.0.0.82
```

Example with `gclib` version only.

```
154.190.329
```

Note

[GVersion\(\)](#) will take up to 1 second to look for [gcaps](#).

See `x_examples.cpp` for an example.

Definition at line 29 of file `gclibo.c`.

References `G_NO_ERROR`, `G_UTIL_GCAPS_VERSION`, `G_UTIL_VERSION`, and `GUtility()`.

13.16.2.25 GWaitForBool()

```
GReturn GCALL GWaitForBool (
    GCon g,
    GCStringIn predicate,
    int trials )
```

Blocking call that returns when the controller evaluates the predicate as true.

Polls the message command (MG) to check the value of predicate. Polling will continue until the controller responds with a nonzero value or the number of polling trials is reached.

The amount of time until the function fails with [G_GCLIB_POLLING_FAILED](#) is roughly (trials * [POLLINGINTERVAL](#)) milliseconds.

Parameters

<i>g</i>	Connection's handle.
<i>predicate</i>	A null-terminated string containing the predicate to be polled. The predicate will be enclosed in parentheses and used in the command <code>MG (predicate) to return the value.</code>
<i>trials</i>	The number of polling cycles to perform looking for a nonzero value. Use -1 to poll indefinitely. ^{gclib 566}

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [GMotionComplete\(\)](#) for an example.

Definition at line 318 of file `gclibo.c`.

References `G_GCLIB_POLLING_FAILED`, `G_LINE_BUFFER`, `G_NO_ERROR`, `G_SMALL_BUFFER`, `GCommand()`, `GSleep()`, and `POLLINGINTERVAL`.

Referenced by `GMotionComplete()`.

13.17 ip_assigner.cpp File Reference

```
#include "examples.h"
#include <iostream>
#include <vector>
#include <string.h>
```

Typedefs

- typedef [std::vector](#)< string > **tokens**

Functions

- tokens [string_split](#) (const string &str, const string &token)
Splits a string into a vector based on a token.
- [GReturn ip_assigner](#) (char *serial_num, int address)
Assigns controller an IP Address given a serial number and a 1 byte address.

13.17.1 Detailed Description

Function calls for the IP Assigner Example Project.

13.17.2 Function Documentation

13.17.2.1 ip_assigner()

```
GReturn ip_assigner (
    char * serial_num,
    int address )
```

Assigns controller an IP Address given a serial number and a 1 byte address.

Parameters

<i>serial_num</i>	Serial Number of the controller.
<i>address</i>	A 1 byte address that defines the last byte of the IP Address.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [ip_assigner_example.cpp](#) for an example.

This function will listen on the network for controllers requesting an IP Address. If a detected controller matches the serial number provided by the user, a new IP Address will be assigned based on the first 3 bytes of the detected IP Address combined with the user defined 1 byte address.

Definition at line 26 of file `ip_assigner.cpp`.

References `e()`, `G_SMALL_BUFFER`, `GIpRequests()`, and `string_split()`.

13.18 ip_assigner.cs File Reference

Data Structures

- class [Examples](#)

Provides a class of shared constants and methods for gclib's example projects.

13.18.1 Detailed Description

Function calls for the IP Assigner Example Project.

For VB.NET, see definition in file [ip_assigner.vb](#)

13.19 ip_assigner_example.cpp File Reference

```
#include "examples.h"
#include <iostream>
```

Functions

- int [main](#) (int argc, char *argv[])

Main function for Commands Example.

13.19.1 Detailed Description

See [ip_assigner\(\)](#) for implementation of logic

13.19.2 Function Documentation

13.19.2.1 main()

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file `commands_example.cpp`.

References `G_SMALL_BUFFER`, and `pause()`.

13.20 ip_assigner_example.cs File Reference

Data Structures

- class [IP_Assigner_Example](#)

Assigns controller an IP Address given a serial number and a 1 byte address.

13.20.1 Detailed Description

See [IP_Assigner\(\)](#) for implementation of logic

For VB.NET, see definition in file [ip_assigner_example.vb](#)

13.21 jog.cpp File Reference

```
#include "examples.h"
#include <conio.h>
#include <iostream>
```

Functions

- [GReturn jog](#) ([GCon](#) g)

Puts controller into Jog Mode and accepts user input to adjust the speed.

13.21.1 Detailed Description

Function calls for the Jog Example Project.

13.21.2 Function Documentation

13.21.2.1 jog()

```
GReturn jog (
    GCon g )
```

Puts controller into Jog Mode and accepts user input to adjust the speed.

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [jog_example.cpp](#) for an example.

Key	Usage
q	Quit Jogging
a	-2000 counts / second
s	-500 counts / second
d	+500 counts / second
f	+2000 counts / second
r	Direction Reversal

Definition at line 29 of file `jog.cpp`.

References `e()`, `G_CONNECTION_NOT_ESTABLISHED`, `G_SMALL_BUFFER`, `GCmd()`, and `GMotionComplete()`.

13.22 jog.cs File Reference

Data Structures

- class [Examples](#)

Provides a class of shared constants and methods for gclib's example projects.

13.22.1 Detailed Description

Function calls for the Jog Example Project.

For VB.NET, see definition in file [jog.vb](#)

13.23 jog_example.cpp File Reference

```
#include "examples.h"
#include <iostream>
```

Functions

- int [main](#) (int argc, char *argv[])

Main function for Commands Example.

13.23.1 Detailed Description

See [jog\(\)](#) for implementation of logic

13.23.2 Function Documentation

13.23.2.1 main()

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file [commands_example.cpp](#).

References [G_SMALL_BUFFER](#), and [pause\(\)](#).

13.24 jog_example.cs File Reference

Data Structures

- class [Jog_Example](#)

Accepts user-input at the command line to control the speed of the controller in Jog mode.

13.24.1 Detailed Description

See [Jog\(\)](#) for implementation of logic

For VB.NET, see definition in file [jog_example.vb](#)

13.25 message.cpp File Reference

```
#include "examples.h"
#include <iostream>
#include <string.h>
```

Functions

- [GReturn message \(GCon g\)](#)

Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.

13.25.1 Detailed Description

Function calls for the Message Example project

13.25.2 Function Documentation

13.25.2.1 message()

```
GReturn message (
    GCon g )
```

Demonstrates how to receive messages from the controller and detect differences in Trace and crashed code.

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [message_example.cpp](#) for an example.

Definition at line 14 of file message.cpp.

References [e\(\)](#), [G_NO_ERROR](#), [G_SMALL_BUFFER](#), [G_UTIL_GCAPS_KEEPALIVE](#), [GCmd\(\)](#), [GMessage\(\)](#), [GProgramDownload\(\)](#), and [GUtility\(\)](#).

Referenced by Examples::Message().

13.26 message.cs File Reference

Data Structures

- class [Examples](#)

Provides a class of shared constants and methods for gclib's example projects.

13.26.1 Detailed Description

Function calls for the Message Example Project.

For VB.NET, see definition in file [message.vb](#)

13.27 message_example.cpp File Reference

```
#include "examples.h"
#include <iostream>
```

Functions

- int [main](#) (int argc, char *argv[])

Main function for Commands Example.

13.27.1 Detailed Description

See [message\(\)](#) for implementation of logic

13.27.2 Function Documentation

13.27.2.1 main()

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file [commands_example.cpp](#).

References [G_SMALL_BUFFER](#), and [pause\(\)](#).

13.28 message_example.cs File Reference

Data Structures

- class [Message_Example](#)

Demonstrates how to handle and interpret messages from the controller.

13.28.1 Detailed Description

See [Message\(\)](#) for implementation of logic

For VB.NET, see definition in file [message_example.vb](#)

13.29 motion_complete.cpp File Reference

```
#include "examples.h"
#include <iostream>
```

```
#include <string.h>
```

Functions

- int [check_interrupts](#) ([GCon](#) g, [GCStringIn](#) axes)
Monitors interrupt status on the given axes and returns when interrupts are fired.
- [GReturn motion_complete](#) ([GCon](#) g)
Uses interrupts to track when the motion of controller is completed.

13.29.1 Detailed Description

Function calls for the Motion Complete Example Project.

13.29.2 Function Documentation

13.29.2.1 motion_complete()

```
GReturn motion_complete (
    GCon g )
```

Uses interrupts to track when the motion of controller is completed.

Parameters

<i>g</i>	Connection's handle.
----------	----------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [motion_complete_example.cpp](#) for an example.

Definition at line 18 of file [motion_complete.cpp](#).

References [check_interrupts\(\)](#), [e\(\)](#), [G_NO_ERROR](#), [G_SMALL_BUFFER](#), [G_UNSUPPORTED_FUNCTION](#), [GCmd\(\)](#), [GCmdT\(\)](#), [GCommand\(\)](#), [GInterrupt\(\)](#), and [GTimeout\(\)](#).

13.30 motion_complete.cs File Reference

Data Structures

- class [Examples](#)
Provides a class of shared constants and methods for gclib's example projects.

13.30.1 Detailed Description

Function calls for the Motion Complete Example Project.

For VB.NET, see definition in file [motion_complete.vb](#)

13.31 motion_complete_example.cpp File Reference

```
#include "examples.h"
#include <iostream>
```


Functions

- int [main](#) (int argc, char *argv[])

Main function for Commands Example.

13.31.1 Detailed Description

See [motion_complete\(\)](#) for implementation of logic

13.31.2 Function Documentation

13.31.2.1 main()

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file [commands_example.cpp](#).

References [G_SMALL_BUFFER](#), and [pause\(\)](#).

13.32 motion_complete_example.cs File Reference

Data Structures

- class [Motion_Complete_Example](#)

Uses controller interrupts to detect when motion is complete.

13.32.1 Detailed Description

See [Motion_Complete\(\)](#) for implementation of logic

For VB.NET, see definition in file [motion_complete_example.vb](#)

13.33 position_tracking.cpp File Reference

```
#include "examples.h"
#include <iostream>
```

Functions

- [GReturn position_tracking](#) ([GCon](#) g, int speed=5000)
Puts controller into Position Tracking Mode and accepts user-entered positions.

13.33.1 Detailed Description

Function calls for the Position Tracking Example Project.

13.33.2 Function Documentation

13.33.2.1 position_tracking()

```
GReturn position_tracking (
    GCon g,
    int speed = 5000 )
```

Puts controller into Position Tracking Mode and accepts user-entered positions.

Parameters

<i>g</i>	Connection's handle.
<i>speed</i>	Optional speed of the controller in Position Tracking Mode. Default value of 5000.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [position_tracking_example.cpp](#) for an example.

Definition at line 15 of file [position_tracking.cpp](#).

References [e\(\)](#), [G_CONNECTION_NOT_ESTABLISHED](#), [G_SMALL_BUFFER](#), [GCmd\(\)](#), and [GMotionComplete\(\)](#).

13.34 position_tracking.cs File Reference

Data Structures

- class [Examples](#)
Provides a class of shared constants and methods for gclib's example projects.

13.34.1 Detailed Description

Function calls for the Position Tracking Example Project.

For VB.NET, see definition in file [position_tracking.vb](#)

13.35 position_tracking_example.cpp File Reference

```
#include "examples.h"
#include <iostream>
```

Functions

- `int main (int argc, char *argv[])`

Main function for Commands Example.

13.35.1 Detailed Description

See `position_tracking()` for implementation of logic

13.35.2 Function Documentation

13.35.2.1 main()

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file `commands_example.cpp`.

References `G_SMALL_BUFFER`, and `pause()`.

13.36 position_tracking_example.cs File Reference

Data Structures

- class [Position_Tracking_Example](#)
Places controller into position tracking mode. Accepts user-defined positional values at the command line.

13.36.1 Detailed Description

See [Position_Tracking\(\)](#) for implementation of logic

For VB.NET, see definition in file [position_tracking_example.vb](#)

13.37 record_position.cpp File Reference

```
#include "examples.h"
#include <iostream>
#include <fstream>
```

Macros

- `#define G_LASTINDEX 999`

Functions

- void [write_array_to_file](#) ([GCon](#) g, ofstream &os, const char *array_name, int previous_rd, int rd)
Grabs data from array on controller and writes it to the given text file.
- [GReturn record_position](#) ([GCon](#) g, char *fileA, char *fileB)
Record user's training and saves to a text file.

13.37.1 Detailed Description

Function calls for the Record Position Example project

13.37.2 Function Documentation

13.37.2.1 record_position()

```
GReturn record_position (
    GCon g,
    char * fileA,
    char * fileB )
```

Record user's training and saves to a text file.

Parameters

<i>g</i>	Connection's handle.
<i>fileA</i>	A Path to a text file where training for Axis A will be recorded.
<i>fileB</i>	A Path to a text file where training for Axis B will be recorded.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [record_position_example.cpp](#) for an example.

Definition at line 20 of file `record_position.cpp`.

References `e()`, `GCmd()`, `GCmdl()`, `GProgramDownload()`, `GSleep()`, and `write_array_to_file()`.

Referenced by `contour()`.

13.38 record_position.cs File Reference

Data Structures

- class [Examples](#)

Provides a class of shared constants and methods for gclib's example projects.

13.38.1 Detailed Description

Function calls for the Record Position Example Project.

For VB.NET, see definition in file [record_position.vb](#)

13.39 record_position_example.cpp File Reference

```
#include "examples.h"
#include <iostream>
```

Functions

- int [main](#) (int argc, char *argv[])

Main function for Commands Example.

13.39.1 Detailed Description

See [record_position\(\)](#) for implementation of logic

13.39.2 Function Documentation

13.39.2.1 main()

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file `commands_example.cpp`.

References `G_SMALL_BUFFER`, and `pause()`.

13.40 record_position_example.cs File Reference

Data Structures

- class [Record_Position_Example](#)

Takes two file paths at the command line to hold positional data for Axis A and Axis B. Positional data is saved to the two files until an analog input value changes.

13.40.1 Detailed Description

See [Record_Position\(\)](#) for implementation of logic

For VB.NET, see definition in file [record_position_example.vb](#)

13.41 remote_client.cpp File Reference

```
#include "examples.h"
#include <iostream>
#include <vector>
#include <string>
#include <conio.h>
```

Functions

- void **print_client_message** (const char *[message](#))
- void **print_servers_list** (const [std::vector](#)< std::string > &server_list)
- void **servers_to_list** ([std::vector](#)< std::string > &server_list, std::string servers)
- [GReturn remote_client](#) ()

Lists available remote servers and allows connection to remote server.

13.41.1 Detailed Description

Function calls for the Remote Client Example Project.

13.41.2 Function Documentation

13.41.2.1 remote_client()

GReturn remote_client ()

Lists available remote servers and allows connection to remote server.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See remote_client_example for an example.

Key	Usage
q	Quit
s	List available servers on then network
h	List available hardware on the current server
0-9	Connect to server instance by number
l	Connect back to local server

Definition at line 89 of file remote_client.cpp.

References G_SMALL_BUFFER.

13.42 Remote_Client.cs File Reference

Data Structures

- class [Examples](#)

Provides a class of shared constants and methods for gclib's example projects.

13.42.1 Detailed Description

Function calls for the Remote Client Example Project.

For VB.NET, see definition in file [remote_client.vb](#)

13.43 remote_client_example.cs File Reference

Data Structures

- class [Remote_Client_Example](#)

Demonstrates various uses of [GListServers\(\)](#) and [GSetServer\(\)](#)

13.43.1 Detailed Description

See [Remote_Client\(\)](#) for implementation of logic

For VB.NET, see definition in file [remote_client_example.vb](#)

13.44 remote_server.cpp File Reference

```
#include "examples.h"
#include <iostream>
#include <conio.h>
```

Functions

- void **print_server_message** (const char *[message](#))
- [GReturn remote_server](#) (const char *server_name)

Publishes local gcaps server to the network.

13.44.1 Detailed Description

Function calls for the Remote Server Example Project.

13.44.2 Function Documentation

13.44.2.1 remote_server()

```
GReturn remote_server (
    const char * server_name )
```

Publishes local gcaps server to the network.

Parameters

<i>Name</i>	to publish server under.
-------------	--------------------------

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See `remote_server_example` for an example.

Key	Usage
q	Quit
p	Publish this server to the network
r	Remove this server from the network

Definition at line 39 of file `remote_server.cpp`.

References `e()`, `G_SMALL_BUFFER`, and `GPublishServer()`.

13.45 Remote_Server.cs File Reference

Data Structures

- class [Examples](#)

Provides a class of shared constants and methods for gclib's example projects.

13.45.1 Detailed Description

Function calls for the Remote Server Example Project.

For VB.NET, see definition in file [remote_server.vb](#)

13.46 remote_server_example.cpp File Reference

```
#include "examples.h"
#include <iostream>
```



```
#include <string>
```

Functions

- int [main](#) (int argc, char *argv[])
Main function for Commands Example.

13.46.1 Detailed Description

See [remote_server\(\)](#) for implementation of logic

13.46.2 Function Documentation

13.46.2.1 main()

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file [commands_example.cpp](#).

References [G_SMALL_BUFFER](#), and [pause\(\)](#).

13.47 remote_server_example.cs File Reference

Data Structures

- class [Remote_Server_Example](#)

Demonstrates various uses of [GPublishServer\(\)](#)

13.47.1 Detailed Description

See [Remote_Server\(\)](#) for implementation of logic

For VB.NET, see definition in file [remote_server_example.vb](#)

13.48 vector.cpp File Reference

```
#include "examples.h"
#include <iostream>
#include <string>
#include <fstream>
```

Functions

- bool [load_buffer](#) ([GCon](#) g, ifstream &fs, int capacity)
- [GReturn vector](#) ([GCon](#) g, char *file)

Puts controller into Vector Mode and accepts a file defining vector points.

13.48.1 Detailed Description

Function calls the Vector Mode Example Project.

13.48.2 Function Documentation

13.48.2.1 load_buffer()

```
bool load_buffer (
    GCon g,
    ifstream & fs,
    int capacity )
```

Loads vector buffer with commands from the given text file.

Returns false when there are no more lines in the text file

Definition at line 88 of file vector.cpp.

References [e\(\)](#), and [GCmd\(\)](#).

Referenced by [vector\(\)](#).

13.48.2.2 vector()

```
GReturn vector (
    GCon g,
    char * file )
```

Puts controller into Vector Mode and accepts a file defining vector points.

Parameters

<i>g</i>	Connection's handle.
<i>file</i>	A Path to a file that defines vector commands.

Returns

The success status or error code of the function. See [gclib_errors.h](#) for possible values.

See [vector_example.cpp](#) for an example.

Example text file:

```
VP -2219,-2667
VP -2523,-2832
VP 2844,-1425
VP 728,1971
VP 2127,183
VP -997,688
VP 725,-1893
VP 527,2899
VP -37,2523
VP 1277,1425
VP 857,2388
VP 1096,-1694
CR 1000,0,90
```

Definition at line 36 of file vector.cpp.

References [e\(\)](#), [G_BAD_FILE](#), [G_CONNECTION_NOT_ESTABLISHED](#), [GCmd\(\)](#), [GCmdI\(\)](#), [GMotionComplete\(\)](#), [GSleep\(\)](#), and [load_buffer\(\)](#).

13.49 vector_example.cpp File Reference

```
#include "examples.h"
#include <iostream>
```

Functions

- [int main](#) (int argc, char *argv[])
Main function for Commands Example.

13.49.1 Detailed Description

See [vector\(\)](#) for implementation of logic

13.49.2 Function Documentation

13.49.2.1 main()

```
int main (
    int argc,
    char * argv[] )
```

Main function for Commands Example.

Main function for Vector Mode Example.

Main function for Remote Server Example.

Main function for Record Position Example.

Main function for Position Tracking Example.

Main Function for Motion Complete Example.

Main function for Message Example.

Main function for Jog Example.

Main function for IP Assigner Example.

Main function for Contour Example.

[commands_example.cpp](#) takes one arguments at the command line: an IP Address to a Galil controllers.

[contour_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[ip_assigner_example.cpp](#) takes two arguments at the command line: a Serial Number of a Galil controller and 1 byte address.

[jog_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller. When the program is run the controller will be at rest. Press a key at the console to adjust the speed of the controller.

[message_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[motion_complete_example.cpp](#) takes one argument at the command line: an IP Address to a Galil controller.

[position_tracking_example.cpp](#) takes up to two arguments at the command line: an IP Address to a Galil controller and an optional speed value. If only one argument is provided the program will default to a speed value of 5000.

[record_position_example.cpp](#) takes three arguments at the command line: an IP Address to a Galil controller and a two text files to hold the positional data for two axes.

[remote_client_example.cpp](#) takes no arguments at the command line.

[remote_server_example.cpp](#) takes one argument at the command line: the name you wish to publish your server under.

[vector_example.cpp](#) takes two arguments at the command line: an IP Address to a Galil controller and a path to a text file defining vector points. When the program is run the controller will be put into vector mode and loaded with the points defined in the text file. The controller will run until it reaches all points defined in the text file.

Definition at line 18 of file `commands_example.cpp`.

References `G_SMALL_BUFFER`, and `pause()`.

13.50 vector_mode.cs File Reference

Data Structures

- class [Examples](#)

Provides a class of shared constants and methods for gclib's example projects.

13.50.1 Detailed Description

Function calls for the Vector Mode Example Project.

For VB.NET, see definition in file [vector_mode.vb](#)

13.51 vector_mode_example.cs File Reference

Data Structures

- class [Vector_Mode_Example](#)

Takes a path to a file at the command line holding vector commands for the controller. The controller is placed into vector mode and commands are read from the file and sent to the controller.

13.51.1 Detailed Description

See [Vector_Mode\(\)](#) for implementation of logic

For VB.NET, see definition in file [vector_mode_example.vb](#)

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