

libcin

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# Chapter 1

## FastCCD Communication Library (libcin)

### Introduction

This library, based in C is designed to control the FastCCD detector from Lawrence Berkeley National Laboratory. It controls both camera control functions and data acquisition (frame acquisition). It is separated into two distinct parts, the control part ,`cin_ctl`, and the data (image) part named `cin_data`. It was written in part for use with `areaDetector`.

### Prerequisites

The library relies on the following:

- `libbsd` (Used for string manipulation)
- `libconfig` (Used for nice config files)
- `libpthread` (Used for threading)
- `librt` (Used for time functions)

### Installation

Installation of the library is like most unix based source packages:

```
./make
./make doc
./make test
./make install
```

### Versioning

For the versions available, see the [tags on this repository](#).

## Authors

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See also the list of [contributors](#) who participated in this project.

## License

This project is licensed under the BSD License - see the [LICENSE](#) file for details

## Acknowledgments

A huge thanks to Peter Dennes, John Joseph and the detector team at LBNL and the team at Sydor Instruments.

# Chapter 2

## Module Index

### 2.1 Modules

Here is a list of all modules:

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## Chapter 3

# Class Index

### 3.1 Class List

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## Chapter 4

# File Index

### 4.1 File List

Here is a list of all documented files with brief descriptions:

src/ <a href="#">cin.h</a> . . . . .	<a href="#">25</a>
src/ <b>cin_register_map.h</b> . . . . .	??
src/ <b>cinregisters.h</b> . . . . .	??
src/ <b>common.h</b> . . . . .	??
src/ <b>config.h</b> . . . . .	??
src/ <b>control.h</b> . . . . .	??
src/ <b>data.h</b> . . . . .	??
src/ <b>descramble.h</b> . . . . .	??
src/ <b>descramble_map.h</b> . . . . .	??
src/ <b>fclk_program.h</b> . . . . .	??
src/ <b>fifo.h</b> . . . . .	??
src/ <b>report.h</b> . . . . .	??
src/ <b>version.h</b> . . . . .	??



## Chapter 5

# Module Documentation

### 5.1 Cin Control Routines

#### Functions

- int [cin\\_ctl\\_init](#) ([cin\\_ctl\\_t](#) \*cin, const char \*ipaddr, uint16\_t oport, uint16\_t iport, uint16\_t soport, uint16\_t siport)
- int [cin\\_ctl\\_destroy](#) ([cin\\_ctl\\_t](#) \*cin)
- int [cin\\_ctl\\_read](#) ([cin\\_ctl\\_t](#) \*cin, uint16\_t reg, uint16\_t \*val)
- int [cin\\_ctl\\_write](#) ([cin\\_ctl\\_t](#) \*cin, uint16\_t reg, uint16\_t val, int wait)
- int [cin\\_ctl\\_stream\\_write](#) ([cin\\_ctl\\_t](#) \*cin, char \*val, int size)
- int [cin\\_ctl\\_write\\_with\\_readback](#) ([cin\\_ctl\\_t](#) \*cin, uint16\_t reg, uint16\_t val)
- int [cin\\_ctl\\_pwr](#) ([cin\\_ctl\\_t](#) \*cin, int pwr)
- int [cin\\_ctl\\_fp\\_pwr](#) ([cin\\_ctl\\_t](#) \*cin, int pwr)
- int [cin\\_ctl\\_fo\\_test\\_pattern](#) ([cin\\_ctl\\_t](#) \*cin, int on\_off)
- int [cin\\_ctl\\_load\\_config](#) ([cin\\_ctl\\_t](#) \*cin, char \*filename)
- int [cin\\_ctl\\_load\\_firmware](#) ([cin\\_ctl\\_t](#) \*cin, char \*filename)
- int [cin\\_ctl\\_set\\_fclk](#) ([cin\\_ctl\\_t](#) \*cin, int clkfreq)
- int [cin\\_ctl\\_get\\_fclk](#) ([cin\\_ctl\\_t](#) \*cin, int \*clkfreq)
- int [cin\\_ctl\\_freeze\\_dco](#) ([cin\\_ctl\\_t](#) \*cin, int freeze)
- int [cin\\_ctl\\_get\\_cfg\\_fpga\\_status](#) ([cin\\_ctl\\_t](#) \*cin, uint16\_t \*\_val)
- int [cin\\_ctl\\_get\\_id](#) ([cin\\_ctl\\_t](#) \*cin, [cin\\_ctl\\_id\\_t](#) \*\_val)
- void [cin\\_ctl\\_display\\_id](#) (FILE \*out, [cin\\_ctl\\_id\\_t](#) val)
- void [cin\\_ctl\\_display\\_fpga\\_status](#) (FILE \*out, uint16\_t val)
- int [cin\\_ctl\\_get\\_dcm\\_status](#) ([cin\\_ctl\\_t](#) \*cin, uint16\_t \*\_val)
- void [cin\\_ctl\\_display\\_dcm\\_status](#) (FILE \*out, uint16\_t \*\_val)
- double [cin\\_ctl\\_current\\_calc](#) (uint16\_t val)
- int [cin\\_ctl\\_get\\_power\\_status](#) ([cin\\_ctl\\_t](#) \*cin, int full, int \*pwr, [cin\\_ctl\\_pwr\\_mon\\_t](#) \*values)
- void [cin\\_ctl\\_display\\_pwr](#) (FILE \*out, [cin\\_ctl\\_pwr\\_mon\\_t](#) \*values)
- void [cin\\_ctl\\_display\\_pwr\\_line](#) (FILE \*out, const char \*msg, [cin\\_ctl\\_pwr\\_val\\_t](#) val)
- int [cin\\_ctl\\_calc\\_vi\\_status](#) ([cin\\_ctl\\_t](#) \*cin, uint16\_t vreg, uint16\_t ireg, double vfact, [cin\\_ctl\\_pwr\\_val\\_t](#) \*vi)
- int [cin\\_ctl\\_get\\_camera\\_pwr](#) ([cin\\_ctl\\_t](#) \*cin, int \*val)
- int [cin\\_ctl\\_set\\_camera\\_pwr](#) ([cin\\_ctl\\_t](#) \*cin, int val)
- int [cin\\_ctl\\_set\\_bias](#) ([cin\\_ctl\\_t](#) \*cin, int val)
- int [cin\\_ctl\\_get\\_bias](#) ([cin\\_ctl\\_t](#) \*cin, int \*val)
- int [cin\\_ctl\\_set\\_clocks](#) ([cin\\_ctl\\_t](#) \*cin, int val)
- int [cin\\_ctl\\_get\\_clocks](#) ([cin\\_ctl\\_t](#) \*cin, int \*val)
- int [cin\\_ctl\\_set\\_trigger](#) ([cin\\_ctl\\_t](#) \*cin, int val)

- int **cin\_ctl\_get\_trigger** ([cin\\_ctl\\_t](#) \*cin, int \*val)
- int **cin\_ctl\_set\_focus** ([cin\\_ctl\\_t](#) \*cin, int val)
- int **cin\_ctl\_get\_focus** ([cin\\_ctl\\_t](#) \*cin, int \*val)
- int **cin\_ctl\_get\_triggering** ([cin\\_ctl\\_t](#) \*cin, int \*trigger)
- int **cin\_ctl\_int\_trigger\_start** ([cin\\_ctl\\_t](#) \*cin, int nimages)
- int **cin\_ctl\_int\_trigger\_stop** ([cin\\_ctl\\_t](#) \*cin)
- int **cin\_ctl\_ext\_trigger\_start** ([cin\\_ctl\\_t](#) \*cin, int trigger\_mode)
- int **cin\_ctl\_ext\_trigger\_stop** ([cin\\_ctl\\_t](#) \*cin)
- int **cin\_ctl\_set\_exposure\_time** ([cin\\_ctl\\_t](#) \*cin, float e\_time)
- int **cin\_ctl\_set\_trigger\_delay** ([cin\\_ctl\\_t](#) \*cin, float t\_time)
- int **cin\_ctl\_set\_cycle\_time** ([cin\\_ctl\\_t](#) \*cin, float ftime)
- int **cin\_ctl\_frame\_count\_reset** ([cin\\_ctl\\_t](#) \*cin)
- int **cin\_ctl\_set\_mux** ([cin\\_ctl\\_t](#) \*cin, int setting)
- int **cin\_ctl\_get\_mux** ([cin\\_ctl\\_t](#) \*cin, int \*setting)
- int **cin\_ctl\_set\_fcric\_gain** ([cin\\_ctl\\_t](#) \*cin, int gain)
- int **cin\_ctl\_set\_fabric\_address** ([cin\\_ctl\\_t](#) \*cin, char \*ip)
- int **cin\_ctl\_reg\_dump** ([cin\\_ctl\\_t](#) \*cin, FILE \*fp)
- int **cin\_ctl\_get\_bias\_voltages** ([cin\\_ctl\\_t](#) \*cin, float \*voltage)
- int **cin\_ctl\_set\_bias\_voltages** ([cin\\_ctl\\_t](#) \*cin, float \*voltage)
- int **cin\_ctl\_set\_fcric\_clamp** ([cin\\_ctl\\_t](#) \*cin, int clamp)

### 5.1.1 Detailed Description

### 5.1.2 Function Documentation

#### 5.1.2.1 cin\_ctl\_destroy()

```
int cin_ctl_destroy (
    cin\_ctl\_t * cin )
```

Destroy (close) the cin control library

Close connections, free memory and exit library

#### Parameters

<i>cin</i>	handle to cin library
------------	-----------------------

#### Returns

Returns 0 on success non-zero if error

#### 5.1.2.2 cin\_ctl\_init()

```
int cin_ctl_init (
    cin\_ctl\_t * cin,
```

```

    const char * ipaddr,
    uint16_t oport,
    uint16_t iport,
    uint16_t soport,
    uint16_t siport )

```

Initialize the cin control library

Initialize the control structures and communications with the CIN via the control interface. This function opens the UDP ports and starts a listening thread to receive packets from the CIN.

#### Parameters

<i>cin</i>	handle to cin library
<i>ipaddr</i>	ip address of CIN base address
<i>oport</i>	output udp port of cin
<i>iport</i>	input udp port of cin
<i>soport</i>	stream output udp port of cin
<i>siport</i>	stream input udp port of cin

#### Returns

Returns 0 on success non-zero if error

#### 5.1.2.3 cin\_ctl\_read()

```

int cin_ctl_read (
    cin_ctl_t * cin,
    uint16_t reg,
    uint16_t * val )

```

Read register from CIN

#### Parameters

<i>cin</i>	handle to cin library
<i>reg</i>	register to read
<i>val</i>	variable to read value of register to

#### Returns

Returns 0 on success non-zero if error

#### 5.1.2.4 cin\_ctl\_stream\_write()

```

int cin_ctl_stream_write (
    cin_ctl_t * cin,

```

```
char * val,
int size )
```

Write stream data to CIN

#### Parameters

<i>cin</i>	handle to cin library
<i>val</i>	array of values to write
<i>size</i>	size of array pointed to by val

Write stream data to cin in form of 16 bit array.

#### Returns

Returns 0 on success non-zero if error

#### 5.1.2.5 cin\_ctl\_write()

```
int cin_ctl_write (
    cin_ctl_t * cin,
    uint16_t reg,
    uint16_t val,
    int wait )
```

Write register to CIN

#### Parameters

<i>cin</i>	handle to cin library
<i>reg</i>	register to write to
<i>val</i>	value to write to register
<i>wait</i>	if non-zero

Write register value to CIN. If wait is non-zero then wait a sleep time of i CIN\_CTL\_WRITE\_SLEEP before releasing the mutex to add flow control to the cin.

#### Returns

Returns 0 on success non-zero if error

#### 5.1.2.6 cin\_ctl\_write\_with\_readback()

```
int cin_ctl_write_with_readback (
    cin_ctl_t * cin,
    uint16_t reg,
    uint16_t val )
```

Write register to CIN with readback verification



**Parameters**

<i>cin</i>	handle to cin library
<i>reg</i>	register to write to
<i>val</i>	value to write to register

Write register value to CIN. Follow write with read of register and compare value. CIN\_CTL\_WRITE\_SLEEP before releasing the mutex to add flow control to the cin.

**Returns**

Returns 0 on success non-zero if error

## 5.2 CIN Data Initialization Routines

### Functions

- int [cin\\_data\\_init](#) ([cin\\_data\\_t](#) \*cin, int packet\_buffer\_len, int frame\_buffer\_len, char \*ipaddr, uint16\_t port, char \*cin\_ipaddr, uint16\_t [cin\\_port](#), int rcvbuf, cin\_data\_callback push\_callback, cin\_data\_callback pop\_callback, void \*usr\_ptr)
- void [cin\\_data\\_stop\\_threads](#) ([cin\\_data\\_t](#) \*cin)

### 5.2.1 Detailed Description

Initialization group

### 5.2.2 Function Documentation

#### 5.2.2.1 cin\_data\_init()

```
int cin_data_init (
    cin\_data\_t * cin,
    int packet_buffer_len,
    int frame_buffer_len,
    char * ipaddr,
    uint16_t port,
    char * cin_ipaddr,
    uint16_t cin_port,
    int rcvbuf,
    cin_data_callback push_callback,
    cin_data_callback pop_callback,
    void * usr_ptr )
```

Initialize the cin data library

Initialize the data handling routines and start the threads for listening.

#### Parameters

<i>cin</i>	Handle to cin data library
<i>packet_buffer_len</i>	Length of packet buffer fifo (in units number of packets)
<i>frame_buffer_len</i>	Length of frame (assembler) buffer fifo (in units of number of frames)
<i>ipaddr</i>	IP-Address to bind to (if NULL binds to 0.0.0.0)
<i>port</i>	UDP Port of host
<i>cin_ipaddr</i>	IP-Address of cin (if NULL defaults to standard)
<a href="#">cin_port</a>	UDP Port of CIN
<i>rcvbuf</i>	TCP/IP Kernel receive buffer size
<i>push_callback</i>	This function is called when a data structure is needed
<i>pop_callback</i>	This function is called when an image has been processed
<i>usr_ptr</i>	Pointer passed to callback functions

### 5.2.2.2 cin\_data\_stop\_threads()

```
void cin_data_stop_threads (
    cin_data_t * cin )
```

Stop all threads and wait

Stop all the processing threads and join them to the main thread. This function blocks until all threads have joined the main thread (program). This should be called to clean up the library before the program is exited

#### Parameters

<i>cin</i>	Handle to cin data library
------------	----------------------------

## 5.3 CIN Data Framestore Functions

### Functions

- void [cin\\_data\\_framestore\\_trigger](#) ([cin\\_data\\_t](#) \*cin, int count)
- void [cin\\_data\\_framestore\\_skip](#) ([cin\\_data\\_t](#) \*cin, int count)
- int [cin\\_data\\_get\\_framestore\\_counter](#) ([cin\\_data\\_t](#) \*cin)
- void [cin\\_data\\_framestore\\_disable](#) ([cin\\_data\\_t](#) \*cin)
- void [cin\\_data\\_framestore\\_trigger\\_enable](#) ([cin\\_data\\_t](#) \*cin)

### 5.3.1 Detailed Description

Framestore Group

### 5.3.2 Function Documentation

#### 5.3.2.1 [cin\\_data\\_framestore\\_disable\(\)](#)

```
void cin_data_framestore_disable (
    cin\_data\_t * cin )
```

Disable the framestore modes

This function disables the framestore modes (software trigger and skip). If the camera is hardware triggering then the images will start to be processed.

#### Parameters

<i>cin</i>	Handle to the cin library
------------	---------------------------

#### 5.3.2.2 [cin\\_data\\_framestore\\_skip\(\)](#)

```
void cin_data_framestore_skip (
    cin\_data\_t * cin,
    int count )
```

Enable framestore skip mode

Enable the framestore skip mode. This function should be called before hardware triggering the camera. This causes the data processing to skip

## Parameters

<i>count</i>	frames from the first images to be read. This is usually done to stop the first few frames from being over exposed.
<i>cin</i>	handle to the <a href="#">cin_data</a> library

5.3.2.3 `cin_data_framestore_trigger()`

```
void cin_data_framestore_trigger (
    cin_data_t * cin,
    int count )
```

Send a framestore (software) trigger

Send a software trigger to the CIN by timestamping the request time and allow images to be processed when recieved after this time. The count option sets the number of frames to trigger. A value of -1 indicated that the trigger should not count images but run indefinitely after the trigger has occurred.

## Parameters

<i>cin</i>	handle to the <a href="#">cin_data</a> library
<i>count</i>	number of frames to trigger

5.3.2.4 `cin_data_framestore_trigger_enable()`

```
void cin_data_framestore_trigger_enable (
    cin_data_t * cin )
```

Enable the framestore trigger mode

This function enables the framestore trigger mode. It cases the images to not be processed pending a call to the function to (software) trigger the camera.

## Parameters

<i>cin</i>	Handle to the cin library
------------	---------------------------

5.3.2.5 `cin_data_get_framestore_counter()`

```
int cin_data_get_framestore_counter (
    cin_data_t * cin )
```

Get the value of the framestore counter

Return the number of frames in the framestore counter. In trigger mode, this returns the number of frames to go. In skip mode, this returns the number of frames that have to be skipped.

#### Parameters

<i>cin</i>	handle to the <a href="#">cin_data</a> library
------------	--

#### Returns

Number of frames to go in trigger

## Chapter 6

# Class Documentation

### 6.1 cin\_ctl Struct Reference

#### Public Attributes

- [cin\\_port\\_t](#) **ctl\_port**
- [cin\\_port\\_t](#) **stream\_port**
- [cin\\_ctl\\_config\\_t](#) **config**
- [cin\\_ctl\\_listener\\_t](#) \* **listener**
- [pthread\\_mutex\\_t](#) **access**
- [pthread\\_mutexattr\\_t](#) **access\_attr**

The documentation for this struct was generated from the following file:

- [src/cin.h](#)

### 6.2 cin\_ctl\_config Struct Reference

#### Public Attributes

- char **name** [CIN\_CONFIG\_MAX\_STRING]
- char **firmware\_filename** [CIN\_CONFIG\_MAX\_STRING]
- int **overscan**
- int **columns**
- int **fclk**
- [uint16\\_t](#) **timing** [CIN\_CONFIG\_MAX\_DATA][2]
- int **timing\_len**
- [uint16\\_t](#) **fcric** [CIN\_CONFIG\_MAX\_DATA][2]
- int **fcric\_len**
- [uint16\\_t](#) **bias** [CIN\_CONFIG\_MAX\_DATA][2]
- int **bias\_len**

The documentation for this struct was generated from the following file:

- [src/cin.h](#)

## 6.3 cin\_ctl\_id Struct Reference

### Public Attributes

- uint16\_t **board\_id**
- uint16\_t **serial\_no**
- uint16\_t **fpga\_ver**

The documentation for this struct was generated from the following file:

- src/[cin.h](#)

## 6.4 cin\_ctl\_listener Struct Reference

### Public Attributes

- struct [cin\\_port](#) \* **cp**
- [fifo](#) **ctl\_fifo**
- pthread\_t **thread\_id**

The documentation for this struct was generated from the following file:

- src/[cin.h](#)

## 6.5 cin\_ctl\_pwr\_mon\_t Struct Reference

### Public Attributes

- [cin\\_ctl\\_pwr\\_val\\_t](#) **bus\_12v0**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **mgmt\_3v3**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **mgmt\_2v5**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **mgmt\_1v2**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **enet\_1v0**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **s3e\_3v3**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **gen\_3v3**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **gen\_2v5**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **v6\_0v9**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **v6\_1v0**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **v6\_2v5**
- [cin\\_ctl\\_pwr\\_val\\_t](#) **fp**

The documentation for this struct was generated from the following file:

- src/[cin.h](#)



## 6.6 cin\_ctl\_pwr\_val Struct Reference

### Public Attributes

- double **i**
- double **v**

The documentation for this struct was generated from the following file:

- [src/cin.h](#)

## 6.7 cin\_data Struct Reference

### Public Attributes

- [fifo](#) \* **packet\_fifo**
- [fifo](#) \* **frame\_fifo**
- [fifo](#) \* **image\_fifo**
- [cin\\_data\\_threads\\_t](#) **listen\_thread**
- [cin\\_data\\_threads\\_t](#) **assembler\_thread**
- [cin\\_data\\_threads\\_t](#) **descramble\_thread**
- [pthread\\_mutex\\_t](#) **listen\_mutex**
- [pthread\\_mutex\\_t](#) **assembler\_mutex**
- [pthread\\_mutex\\_t](#) **descramble\_mutex**
- [pthread\\_mutex\\_t](#) **stats\_mutex**
- [pthread\\_mutex\\_t](#) **framestore\_mutex**
- [cin\\_data\\_callbacks\\_t](#) **callbacks**
- [cin\\_port\\_t](#) **dp**
- struct timespec **framerate**
- unsigned long int **dropped\_packets**
- unsigned long int **malformed\_packets**
- [uint16\\_t](#) **last\_frame**
- [descramble\\_map\\_t](#) **map**
- int **framestore\_mode**
- struct timespec **framestore\_trigger**
- int **framestore\_counter**

The documentation for this struct was generated from the following file:

- [src/cin.h](#)

## 6.8 cin\_data\_callbacks Struct Reference

### Public Attributes

- void \*(\* **push**)([cin\\_data\\_frame\\_t](#) \*)
- void \*(\* **pop**)([cin\\_data\\_frame\\_t](#) \*)
- [cin\\_data\\_frame\\_t](#) \* **frame**

The documentation for this struct was generated from the following file:

- [src/cin.h](#)

## 6.9 cin\_data\_frame Struct Reference

### Public Attributes

- uint16\_t \* **data**
- uint16\_t **number**
- struct timespec **timestamp**
- int **size\_x**
- int **size\_y**
- void \* **usr\_ptr**

The documentation for this struct was generated from the following file:

- [src/cin.h](#)

## 6.10 cin\_data\_packet Struct Reference

### Public Attributes

- unsigned char \* **data**
- int **size**
- struct timespec **timestamp**

The documentation for this struct was generated from the following file:

- [src/data.h](#)

## 6.11 cin\_data\_proc Struct Reference

### Public Attributes

- void \*(\* **input\_get** )(void \*, int)
- void \*(\* **input\_put** )(void \*, int)
- void \* **input\_args**
- int **reader**
- void \*(\* **output\_put** )(void \*)
- void \*(\* **output\_get** )(void \*)
- void \* **output\_args**
- [cin\\_data\\_t](#) \* **parent**

The documentation for this struct was generated from the following file:

- [src/data.h](#)

## 6.12 cin\_data\_stats Struct Reference

### Public Attributes

- int **last\_frame**
- double **framerate**
- double **datarate**
- double **packet\_percent\_full**
- double **frame\_percent\_full**
- double **image\_percent\_full**
- long int **packet\_overruns**
- long int **frame\_overruns**
- long int **image\_overruns**
- long int **packet\_used**
- long int **frame\_used**
- long int **image\_used**
- long int **dropped\_packets**
- long int **malformed\_packets**

The documentation for this struct was generated from the following file:

- src/[cin.h](#)

## 6.13 cin\_data\_threads Struct Reference

### Public Attributes

- pthread\_t **thread\_id**
- int **started**

The documentation for this struct was generated from the following file:

- src/[cin.h](#)

## 6.14 cin\_map\_t Struct Reference

### Public Attributes

- char \* **name**
- uint16\_t **reg**

The documentation for this struct was generated from the following file:

- src/cinregisters.h

## 6.15 cin\_port Struct Reference

### Public Attributes

- char \* **srvaddr**
- char \* **cliaddr**
- uint16\_t **srvport**
- uint16\_t **cliport**
- int **sockfd**
- struct timeval **tv**
- struct sockaddr\_in **sin\_srv**
- struct sockaddr\_in **sin\_cli**
- socklen\_t **slen**
- int **rcvbuf**
- int **rcvbuf\_rb**

The documentation for this struct was generated from the following file:

- [src/cin.h](#)

## 6.16 descramble\_map\_t Struct Reference

### Public Attributes

- uint32\_t \* **map**
- int **size\_x**
- int **size\_y**
- int **overscan**
- int **rows**

The documentation for this struct was generated from the following file:

- [src/cin.h](#)

## 6.17 fifo Struct Reference

### Public Attributes

- void \* **data**
- void \* **head**
- void \* **tail** [FIFO\_MAX\_READERS]
- void \* **end**
- int **readers**
- long int **size**
- int **elem\_size**
- int **full**
- long int **overruns**
- pthread\_mutex\_t **mutex**
- pthread\_cond\_t **signal**

The documentation for this struct was generated from the following file:

- [src/cin.h](#)

# Chapter 7

## File Documentation

### 7.1 src/cin.h File Reference

```
#include <stdint.h>
#include <stdio.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <netinet/ip.h>
#include <sys/time.h>
#include <pthread.h>
```

#### Classes

- struct [cin\\_ctl\\_config](#)
- struct [fifo](#)
- struct [cin\\_ctl\\_listener](#)
- struct [cin\\_port](#)
- struct [cin\\_ctl](#)
- struct [cin\\_data\\_frame](#)
- struct [cin\\_data\\_stats](#)
- struct [cin\\_data\\_threads](#)
- struct [cin\\_data\\_callbacks](#)
- struct [descramble\\_map\\_t](#)
- struct [cin\\_data](#)
- struct [cin\\_ctl\\_id](#)
- struct [cin\\_ctl\\_pwr\\_val](#)
- struct [cin\\_ctl\\_pwr\\_mon\\_t](#)

#### Macros

- #define **CIN\_CTL\_IP** "192.168.1.207"
- #define **CIN\_CTL\_SVR\_PORT** 49200
- #define **CIN\_CTL\_CLI\_PORT** 50200
- #define **CIN\_CTL\_SVR\_FRMW\_PORT** 49202
- #define **CIN\_CTL\_CLI\_FRMW\_PORT** 50202

- #define CIN\_CTL\_MAX\_READ\_TRIES 10
- #define CIN\_CTL\_MAX\_WRITE\_TRIES 5
- #define CIN\_CTL\_WRITE\_SLEEP 2000
- #define CIN\_CTL\_POWER\_ENABLE 0x001F
- #define CIN\_CTL\_POWER\_DISABLE 0x0000
- #define CIN\_CTL\_FP\_POWER\_ENABLE 0x0020
- #define CIN\_CTL\_DCM\_LOCKED 0x0001
- #define CIN\_CTL\_DCM\_PSDONE 0x0002
- #define CIN\_CTL\_DCM\_STATUS0 0x0004
- #define CIN\_CTL\_DCM\_STATUS1 0x0008
- #define CIN\_CTL\_DCM\_STATUS2 0x0010
- #define CIN\_CTL\_DCM\_TX1\_READY 0x0020
- #define CIN\_CTL\_DCM\_TX2\_READY 0x0040
- #define CIN\_CTL\_DCM\_ATCA\_ALARM 0x0080
- #define CIN\_CTL\_TRIG\_INTERNAL 0x0000
- #define CIN\_CTL\_TRIG\_EXTERNAL\_1 0x0001
- #define CIN\_CTL\_TRIG\_EXTERNAL\_2 0x0002
- #define CIN\_CTL\_TRIG\_EXTERNAL\_BOTH 0x0003
- #define CIN\_CTL\_FOCUS\_BIT 0x0002
- #define CIN\_CTL\_FCLK\_125 0x0000
- #define CIN\_CTL\_FCLK\_200 0x0001
- #define CIN\_CTL\_FCLK\_250 0x0002
- #define CIN\_CTL\_FCLK\_125\_C 0x0003
- #define CIN\_CTL\_FCLK\_200\_C 0x0004
- #define CIN\_CTL\_FCLK\_250\_C 0x0005
- #define CIN\_CTL\_FCLK\_156\_C 0x0006
- #define CIN\_CTL\_FPGA\_STS\_CFG 0x8000
- #define CIN\_CTL\_FPGA\_STS\_FP\_PWR 0x0008
- #define CIN\_CTL\_DCM\_STS\_ATCA 0x0080
- #define CIN\_CTL\_DCM\_STS\_LOCKED 0x0001
- #define CIN\_CTL\_DCM\_STS\_OVERRIDE 0x0800
- #define CIN\_CTL\_MUX1\_VCLK1 0x0001
- #define CIN\_CTL\_MUX1\_VCLK2 0x0002
- #define CIN\_CTL\_MUX1\_VCLK3 0x0003
- #define CIN\_CTL\_MUX1\_ATG 0x0004
- #define CIN\_CTL\_MUX1\_VFCLK1 0x0005
- #define CIN\_CTL\_MUX1\_VFCLK2 0x0006
- #define CIN\_CTL\_MUX1\_VFCLK3 0x0007
- #define CIN\_CTL\_MUX1\_HCLK1 0x0008
- #define CIN\_CTL\_MUX1\_HCLK2 0x0009
- #define CIN\_CTL\_MUX1\_OSW 0x000A
- #define CIN\_CTL\_MUX1\_RST 0x000B
- #define CIN\_CTL\_MUX1\_CONVERT 0x000C
- #define CIN\_CTL\_MUX1\_SHUTTER 0x000D
- #define CIN\_CTL\_MUX1\_SWTRIGGER 0x000E
- #define CIN\_CTL\_MUX1\_TRIGMON 0x000F
- #define CIN\_CTL\_MUX1\_EXPOSE 0x0000
- #define CIN\_CTL\_MUX2\_VCLK1 0x0010
- #define CIN\_CTL\_MUX2\_VCLK2 0x0020
- #define CIN\_CTL\_MUX2\_VCLK3 0x0030
- #define CIN\_CTL\_MUX2\_ATG 0x0040
- #define CIN\_CTL\_MUX2\_VFCLK1 0x0050
- #define CIN\_CTL\_MUX2\_VFCLK2 0x0060
- #define CIN\_CTL\_MUX2\_VFCLK3 0x0070
- #define CIN\_CTL\_MUX2\_HCLK1 0x0080

- #define **CIN\_CTL\_MUX2\_HCLK2** 0x0090
- #define **CIN\_CTL\_MUX2\_HCLK3** 0x00A0
- #define **CIN\_CTL\_MUX2\_OSW** 0x00B0
- #define **CIN\_CTL\_MUX2\_RST** 0x00C0
- #define **CIN\_CTL\_MUX2\_CONVERT** 0x00D0
- #define **CIN\_CTL\_MUX2\_SAVE** 0x00E0
- #define **CIN\_CTL\_MUX2\_HWTRIG** 0x00F0
- #define **CIN\_CTL\_MUX2\_EXPOSE** 0x0000
- #define **CIN\_CTL\_FO\_REG1** 0x821D
- #define **CIN\_CTL\_FO\_REG2** 0x821E
- #define **CIN\_CTL\_FO\_REG3** 0x821F
- #define **CIN\_CTL\_FO\_REG4** 0x8001
- #define **CIN\_CTL\_FO\_REG5** 0x8211
- #define **CIN\_CTL\_FO\_REG6** 0x8212
- #define **CIN\_CTL\_FO\_REG7** 0x8213
- #define **CIN\_DATA\_IP** "10.0.5.207"
- #define **CIN\_DATA\_PORT** 49201
- #define **CIN\_DATA\_CTL\_PORT** 49203
- #define **CIN\_DATA\_MAX\_MTU** 9000
- #define **CIN\_DATA\_UDP\_HEADER** 8
- #define **CIN\_DATA\_MAGIC\_PACKET** UINT64\_C(0x0000F4F3F2F1F000)
- #define **CIN\_DATA\_MAGIC\_PACKET\_MASK** UINT64\_C(0x0000FFFFFFFFFFFF00)
- #define **CIN\_DATA\_TAIL\_MAGIC\_PACKET** UINT64\_C(0x010DF0ADDEF2F1F0)
- #define **CIN\_DATA\_TAIL\_MAGIC\_PACKET\_MASK** UINT64\_C(0xFFFFFFFFFFFFFFFF)
- #define **CIN\_DATA\_DROPPED\_PACKET\_VAL** 0x2000
- #define **CIN\_DATA\_DATA\_MASK** 0x1FFF
- #define **CIN\_DATA\_CTRL\_MASK** 0xE000
- #define **CIN\_DATA\_SIGN\_MASK** 0x1000
- #define **CIN\_DATA\_GAIN\_8** 0xC000
- #define **CIN\_DATA\_GAIN\_4** 0x4000
- #define **CIN\_DATA\_PACKET\_LEN** 8184
- #define **CIN\_DATA\_MAX\_PACKETS** 542
- #define **CIN\_DATA\_RCVBUF** 100
- #define **CIN\_DATA\_MAX\_FRAME\_X** 1152
- #define **CIN\_DATA\_MAX\_FRAME\_Y** 2050
- #define **CIN\_DATA\_MAX\_STREAM** 2400000
- #define **CIN\_DATA\_CCD\_COLS** 96
- #define **CIN\_DATA\_CCD\_COLS\_PER\_CHAN** 10
- #define **CIN\_DATA\_PIPELINE\_FLUSH** 1344
- #define **NUM\_BIAS\_VOLTAGE** 20
- #define **pt\_posH** 0
- #define **pt\_negH** 1
- #define **pt\_posRG** 2
- #define **pt\_negRG** 3
- #define **pt\_posSW** 4
- #define **pt\_negSW** 5
- #define **pt\_posV** 6
- #define **pt\_negV** 7
- #define **pt\_posTG** 8
- #define **pt\_negTG** 9
- #define **pt\_posVF** 10
- #define **pt\_negVF** 11
- #define **pt\_NEDGE** 12
- #define **pt\_OTG** 13
- #define **pt\_VDDR** 14

- `#define pt_VDD_OUT 15`
- `#define pt_BUF_Base 16`
- `#define pt_BUF_Delta 17`
- `#define pt_Spare1 18`
- `#define pt_Spare2 19`
- `#define DEBUG_PRINT(fmt, ...) if(_debug_print_flag) { fprintf(stderr, "%s:%d:%s(): " fmt, __FILE__, __LINE__, __func__, __VA_ARGS__); }`
- `#define DEBUG_COMMENT(fmt) if(_debug_print_flag) { fprintf(stderr, "%s:%d:%s(): " fmt, __FILE__, __LINE__, __func__); }`
- `#define ERROR_COMMENT(fmt) if(_error_print_flag) { fprintf(stderr, "%s:%d:%s(): " fmt, __FILE__, __LINE__, __func__); }`
- `#define ERROR_PRINT(fmt, ...) if(_error_print_flag) { fprintf(stderr, "%s:%d:%s(): " fmt, __FILE__, __LINE__, __func__, __VA_ARGS__); }`
- `#define CIN_CONFIG_MAX_STRING 256`
- `#define CIN_CONFIG_MAX_DATA 5000`
- `#define FIFO_MAX_READERS 10`

## Typedefs

- `typedef struct cin_ctl_config cin_ctl_config_t`
- `typedef struct cin_ctl_listener cin_ctl_listener_t`
- `typedef struct cin_port cin_port_t`
- `typedef struct cin_ctl cin_ctl_t`
- `typedef struct cin_data_frame cin_data_frame_t`
- `typedef struct cin_data_stats cin_data_stats_t`
- `typedef struct cin_data_threads cin_data_threads_t`
- `typedef struct cin_data_callbacks cin_data_callbacks_t`
- `typedef struct cin_data cin_data_t`
- `typedef void(* cin_data_callback)(cin_data_frame_t *)`
- `typedef struct cin_ctl_id cin_ctl_id_t`
- `typedef struct cin_ctl_pwr_val cin_ctl_pwr_val_t`

## Functions

- `void cin_set_debug_print(int debug)`
- `void cin_set_error_print(int error)`
- `void cin_report(FILE *fp, int details)`
- `int cin_ctl_init(cin_ctl_t *cin, const char *ipaddr, uint16_t oport, uint16_t iport, uint16_t soport, uint16_t siport)`
- `int cin_ctl_destroy(cin_ctl_t *cin)`
- `int cin_ctl_read(cin_ctl_t *cin, uint16_t reg, uint16_t *val)`
- `int cin_ctl_write(cin_ctl_t *cin, uint16_t reg, uint16_t val, int wait)`
- `int cin_ctl_stream_write(cin_ctl_t *cin, char *val, int size)`
- `int cin_ctl_write_with_readback(cin_ctl_t *cin, uint16_t reg, uint16_t val)`
- `int cin_ctl_pwr(cin_ctl_t *cin, int pwr)`
- `int cin_ctl_fp_pwr(cin_ctl_t *cin, int pwr)`
- `int cin_ctl_fo_test_pattern(cin_ctl_t *cin, int on_off)`
- `int cin_ctl_load_config(cin_ctl_t *cin, char *filename)`
- `int cin_ctl_load_firmware(cin_ctl_t *cin, char *filename)`
- `int cin_ctl_set_fclk(cin_ctl_t *cin, int clkfreq)`
- `int cin_ctl_get_fclk(cin_ctl_t *cin, int *clkfreq)`
- `int cin_ctl_freeze_dco(cin_ctl_t *cin, int freeze)`
- `int cin_ctl_get_cfg_fpga_status(cin_ctl_t *cin, uint16_t *_val)`



- int [cin\\_ctl\\_get\\_id](#) ([cin\\_ctl\\_t](#) \*cin, [cin\\_ctl\\_id\\_t](#) \* \_val)
- void [cin\\_ctl\\_display\\_id](#) (FILE \*out, [cin\\_ctl\\_id\\_t](#) val)
- void [cin\\_ctl\\_display\\_fpga\\_status](#) (FILE \*out, [uint16\\_t](#) val)
- int [cin\\_ctl\\_get\\_dcm\\_status](#) ([cin\\_ctl\\_t](#) \*cin, [uint16\\_t](#) \* \_val)
- void [cin\\_ctl\\_display\\_dcm\\_status](#) (FILE \*out, [uint16\\_t](#) \* \_val)
- double [cin\\_ctl\\_current\\_calc](#) ([uint16\\_t](#) val)
- int [cin\\_ctl\\_get\\_power\\_status](#) ([cin\\_ctl\\_t](#) \*cin, int full, int \*pwr, [cin\\_ctl\\_pwr\\_mon\\_t](#) \*values)
- void [cin\\_ctl\\_display\\_pwr](#) (FILE \*out, [cin\\_ctl\\_pwr\\_mon\\_t](#) \*values)
- void [cin\\_ctl\\_display\\_pwr\\_line](#) (FILE \*out, const char \*msg, [cin\\_ctl\\_pwr\\_val\\_t](#) val)
- int [cin\\_ctl\\_calc\\_vi\\_status](#) ([cin\\_ctl\\_t](#) \*cin, [uint16\\_t](#) vreg, [uint16\\_t](#) ireg, double vfact, [cin\\_ctl\\_pwr\\_val\\_t](#) \*vi)
- int [cin\\_ctl\\_get\\_camera\\_pwr](#) ([cin\\_ctl\\_t](#) \*cin, int \*val)
- int [cin\\_ctl\\_set\\_camera\\_pwr](#) ([cin\\_ctl\\_t](#) \*cin, int val)
- int [cin\\_ctl\\_set\\_bias](#) ([cin\\_ctl\\_t](#) \*cin, int val)
- int [cin\\_ctl\\_get\\_bias](#) ([cin\\_ctl\\_t](#) \*cin, int \*val)
- int [cin\\_ctl\\_set\\_clocks](#) ([cin\\_ctl\\_t](#) \*cin, int val)
- int [cin\\_ctl\\_get\\_clocks](#) ([cin\\_ctl\\_t](#) \*cin, int \*val)
- int [cin\\_ctl\\_set\\_trigger](#) ([cin\\_ctl\\_t](#) \*cin, int val)
- int [cin\\_ctl\\_get\\_trigger](#) ([cin\\_ctl\\_t](#) \*cin, int \*val)
- int [cin\\_ctl\\_set\\_focus](#) ([cin\\_ctl\\_t](#) \*cin, int val)
- int [cin\\_ctl\\_get\\_focus](#) ([cin\\_ctl\\_t](#) \*cin, int \*val)
- int [cin\\_ctl\\_get\\_triggering](#) ([cin\\_ctl\\_t](#) \*cin, int \*trigger)
- int [cin\\_ctl\\_int\\_trigger\\_start](#) ([cin\\_ctl\\_t](#) \*cin, int nimages)
- int [cin\\_ctl\\_int\\_trigger\\_stop](#) ([cin\\_ctl\\_t](#) \*cin)
- int [cin\\_ctl\\_ext\\_trigger\\_start](#) ([cin\\_ctl\\_t](#) \*cin, int trigger\_mode)
- int [cin\\_ctl\\_ext\\_trigger\\_stop](#) ([cin\\_ctl\\_t](#) \*cin)
- int [cin\\_ctl\\_set\\_exposure\\_time](#) ([cin\\_ctl\\_t](#) \*cin, float e\_time)
- int [cin\\_ctl\\_set\\_trigger\\_delay](#) ([cin\\_ctl\\_t](#) \*cin, float t\_time)
- int [cin\\_ctl\\_set\\_cycle\\_time](#) ([cin\\_ctl\\_t](#) \*cin, float ftime)
- int [cin\\_ctl\\_frame\\_count\\_reset](#) ([cin\\_ctl\\_t](#) \*cin)
- int [cin\\_ctl\\_set\\_mux](#) ([cin\\_ctl\\_t](#) \*cin, int setting)
- int [cin\\_ctl\\_get\\_mux](#) ([cin\\_ctl\\_t](#) \*cin, int \*setting)
- int [cin\\_ctl\\_set\\_fcric\\_gain](#) ([cin\\_ctl\\_t](#) \*cin, int gain)
- int [cin\\_ctl\\_set\\_fabric\\_address](#) ([cin\\_ctl\\_t](#) \*cin, char \*ip)
- int [cin\\_ctl\\_reg\\_dump](#) ([cin\\_ctl\\_t](#) \*cin, FILE \*fp)
- int [cin\\_ctl\\_get\\_bias\\_voltages](#) ([cin\\_ctl\\_t](#) \*cin, float \*voltage)
- int [cin\\_ctl\\_set\\_bias\\_voltages](#) ([cin\\_ctl\\_t](#) \*cin, float \*voltage)
- int [cin\\_ctl\\_set\\_fcric\\_clamp](#) ([cin\\_ctl\\_t](#) \*cin, int clamp)
- int [cin\\_config\\_read\\_file](#) ([cin\\_ctl\\_t](#) \*cin, const char \*file)
- int [cin\\_data\\_init](#) ([cin\\_data\\_t](#) \*cin, int packet\_buffer\_len, int frame\_buffer\_len, char \*ipaddr, [uint16\\_t](#) port, char \*cin\_ipaddr, [uint16\\_t](#) cin\_port, int rcvbuf, [cin\\_data\\_callback](#) push\_callback, [cin\\_data\\_callback](#) pop\_callback, void \*usr\_ptr)
- void [cin\\_data\\_stop\\_threads](#) ([cin\\_data\\_t](#) \*cin)
- void [cin\\_data\\_framestore\\_trigger](#) ([cin\\_data\\_t](#) \*cin, int count)
- void [cin\\_data\\_framestore\\_skip](#) ([cin\\_data\\_t](#) \*cin, int count)
- int [cin\\_data\\_get\\_framestore\\_counter](#) ([cin\\_data\\_t](#) \*cin)
- void [cin\\_data\\_framestore\\_disable](#) ([cin\\_data\\_t](#) \*cin)
- void [cin\\_data\\_framestore\\_trigger\\_enable](#) ([cin\\_data\\_t](#) \*cin)
- struct [cin\\_data\\_frame](#) \* [cin\\_data\\_get\\_next\\_frame](#) ([cin\\_data\\_t](#) \*cin)
- void [cin\\_data\\_release\\_frame](#) ([cin\\_data\\_t](#) \*cin, int free\_mem)
- struct [cin\\_data\\_frame](#) \* [cin\\_data\\_get\\_buffered\\_frame](#) (void)
- void [cin\\_data\\_release\\_buffered\\_frame](#) (void)
- void [cin\\_data\\_compute\\_stats](#) ([cin\\_data\\_t](#) \*cin, [cin\\_data\\_stats\\_t](#) \*stats)
- void [cin\\_data\\_show\\_stats](#) (FILE \*fp, [cin\\_data\\_stats\\_t](#) stats)
- void [cin\\_data\\_reset\\_stats](#) ([cin\\_data\\_t](#) \*cin)
- int [cin\\_data\\_set\\_descramble\\_params](#) ([cin\\_data\\_t](#) \*cin, int rows, int overscan)
- void [cin\\_data\\_get\\_descramble\\_params](#) ([cin\\_data\\_t](#) \*cin, int \*rows, int \*overscan, int \*xsize, int \*ysize)

## Variables

- const char \* **cin\_build\_git\_time**
- const char \* **cin\_build\_git\_sha**
- const char \* **cin\_build\_version**
- int **\_debug\_print\_flag**
- int **\_error\_print\_flag**

### 7.1.1 Detailed Description

#### Author

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### 7.1.2 LICENSE

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### 7.1.3 DESCRIPTION

header file for CIN communications

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