

streamout

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# Chapter 1

## Hierarchical Index

### 1.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

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## Chapter 2

# Class Index

### 2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

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<a href="#">BufferLooperCounter</a>	14
<a href="#">DIF</a>	17
<a href="#">DIFPtr</a>	19
<a href="#">DIFSlowControl</a>	
Handler of <a href="#">DIF</a> Slow Control info	26
<a href="#">DIFUnpacker</a>	29
<a href="#">Event</a>	35
<a href="#">Hit</a>	36
<a href="#">Interface</a>	
Template class should implement void SOURCE::start(); bool SOURCE::next(); void SOURCE↔ ::end(); const <a href="#">Buffer</a> & SOURCE::getSDHCALBuffer();	41
<a href="#">RawBufferNavigator</a>	44
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## Chapter 3

# File Index

### 3.1 File List

Here is a list of all files with brief descriptions:

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## Chapter 4

# Class Documentation

### 4.1 Buffer Class Reference

```
#include <libs/core/include/Buffer.h>
```

#### Public Member Functions

- [Buffer](#) ()
- virtual [~Buffer](#) ()
- [Buffer](#) (const [bit8\\_t](#) b[], const std::size\_t &i)
- [Buffer](#) (const char b[], const std::size\_t &i)
- template<typename T >  
  [Buffer](#) (const std::vector< T > &rawdata)
- template<typename T, std::size\_t N>  
  [Buffer](#) (const std::array< T, N > &rawdata)
- std::size\_t [size](#) () const
- std::size\_t [capacity](#) () const
- void [set](#) (unsigned char \*b)
- [bit8\\_t](#) \* [begin](#) () const
- [bit8\\_t](#) \* [end](#) () const
- [bit8\\_t](#) & [operator\[\]](#) (const std::size\_t &pos)
- [bit8\\_t](#) & [operator\[\]](#) (const std::size\_t &pos) const
- void [setSize](#) (const std::size\_t &[size](#))

#### 4.1.1 Detailed Description

Definition at line [13](#) of file [Buffer.h](#).

#### 4.1.2 Constructor & Destructor Documentation

**4.1.2.1 Buffer()** [1/5]

```
Buffer::Buffer ( ) [inline]
```

Definition at line 16 of file [Buffer.h](#).

```
00016 : m_Buffer(nullptr), m_Size(0), m_Capacity(0) {}
```

**4.1.2.2 ~Buffer()**

```
virtual Buffer::~~Buffer ( ) [inline], [virtual]
```

Definition at line 17 of file [Buffer.h](#).

```
00017 {}
```

**4.1.2.3 Buffer()** [2/5]

```
Buffer::Buffer (
    const bit8_t b[],
    const std::size_t & i ) [inline]
```

Definition at line 18 of file [Buffer.h](#).

```
00018 : m_Buffer(const_cast<bit8_t*>(&b[0])), m_Size(i), m_Capacity(i) {}
```

**4.1.2.4 Buffer()** [3/5]

```
Buffer::Buffer (
    const char b[],
    const std::size_t & i ) [inline]
```

Definition at line 19 of file [Buffer.h](#).

```
00019 : m_Buffer(const_cast<bit8_t*>(reinterpret_cast<const bit8_t*>(&b[0]))), m_Size(i * sizeof(char)),
    m_Capacity(i * sizeof(char)) {}
```

**4.1.2.5 Buffer()** [4/5]

```
template<typename T >
Buffer::Buffer (
    const std::vector< T > & rawdata ) [inline]
```

Definition at line 20 of file [Buffer.h](#).

```
00020 : m_Buffer(const_cast<bit8_t*>(reinterpret_cast<const bit8_t*>(rawdata.data()))),
    m_Size(rawdata.size() * sizeof(T)), m_Capacity(rawdata.capacity() * sizeof(T)) {}
```

#### 4.1.2.6 Buffer() [5/5]

```
template<typename T , std::size_t N>
Buffer::Buffer (
    const std::array< T, N > & rawdata ) [inline]
```

Definition at line 21 of file [Buffer.h](#).

```
00021 : m_Buffer(const_cast<bit8_t*>(reinterpret_cast<const bit8_t*>(rawdata.data()))),
      m_Size(rawdata.size() * sizeof(T)), m_Capacity(rawdata.size() * sizeof(T)) {}
```

### 4.1.3 Member Function Documentation

#### 4.1.3.1 begin()

```
bit8_t * Buffer::begin ( ) const [inline]
```

Definition at line 27 of file [Buffer.h](#).

```
00027 { return m_Buffer; }
```

#### 4.1.3.2 capacity()

```
std::size_t Buffer::capacity ( ) const [inline]
```

Definition at line 24 of file [Buffer.h](#).

```
00024 { return m_Capacity; }
```

#### 4.1.3.3 end()

```
bit8_t * Buffer::end ( ) const [inline]
```

Definition at line 28 of file [Buffer.h](#).

```
00028 { return m_Buffer + m_Size; }
```

#### 4.1.3.4 operator[]() [1/2]

```
bit8_t & Buffer::operator[] (
    const std::size_t & pos ) [inline]
```

Definition at line 29 of file [Buffer.h](#).

```
00029 { return m_Buffer[pos]; }
```

#### 4.1.3.5 operator[]() [2/2]

```
bit8_t & Buffer::operator[] (
    const std::size_t & pos ) const [inline]
```

Definition at line 30 of file [Buffer.h](#).

```
00030 { return m_Buffer[pos]; }
```

#### 4.1.3.6 set()

```
void Buffer::set (
    unsigned char * b ) [inline]
```

Definition at line 26 of file [Buffer.h](#).

```
00026 { m_Buffer = b; }
```

#### 4.1.3.7 setSize()

```
void Buffer::setSize (
    const std::size_t & size ) [inline]
```

Definition at line 32 of file [Buffer.h](#).

```
00032 { m_Size = size; }
```

#### 4.1.3.8 size()

```
std::size_t Buffer::size ( ) const [inline]
```

Definition at line 23 of file [Buffer.h](#).

```
00023 { return m_Size; }
```

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

- [libs/core/include/Buffer.h](#)

## 4.2 BufferLooper< SOURCE, DESTINATION > Class Template Reference

```
#include <libs/core/include/BufferLooper.h>
```

## Public Member Functions

- [BufferLooper](#) (SOURCE &source, DESTINATION &dest, bool debug=false)
- void [addSink](#) (const spdlog::sink\_ptr &sink, const spdlog::level::level\_enum &level=spdlog::get\_level())
- void [loop](#) (const std::uint32\_t &m\_NbrEventsToProcess=0)
- void [printAllCounters](#) ()
- std::shared\_ptr< spdlog::logger > [log](#) ()
- void [setDetectorIDs](#) (const std::vector< [DetectorID](#) > &detectorIDs)

### 4.2.1 Detailed Description

```
template<typename SOURCE, typename DESTINATION>
class BufferLooper< SOURCE, DESTINATION >
```

Definition at line 23 of file [BufferLooper.h](#).

### 4.2.2 Constructor & Destructor Documentation

#### 4.2.2.1 BufferLooper()

```
template<typename SOURCE , typename DESTINATION >
BufferLooper< SOURCE, DESTINATION >::BufferLooper (
    SOURCE & source,
    DESTINATION & dest,
    bool debug = false ) [inline]
```

Definition at line 26 of file [BufferLooper.h](#).

```
00026                                     : m_Source(source),
    m_Destination(dest), m_Debug(debug)
00027 {
00028     m_Logger = spdlog::create<spdlog::sinks::null_sink_mt>("streamout");
00029     if(!spdlog::get("streamout")) { spdlog::register_logger(m_Logger); }
00030     m_Source.setLogger(m_Logger);
00031     m_Destination.setLogger(m_Logger);
00032 }
```

### 4.2.3 Member Function Documentation

#### 4.2.3.1 addSink()

```
template<typename SOURCE , typename DESTINATION >
void BufferLooper< SOURCE, DESTINATION >::addSink (
    const spdlog::sink_ptr & sink,
    const spdlog::level::level_enum & level = spdlog::get_level() ) [inline]
```

Definition at line 34 of file [BufferLooper.h](#).

```
00035 {
00036     sink->set_level(level);
00037     m_Sinks.push_back(sink);
00038     m_Logger = std::make_shared<spdlog::logger>("streamout", begin(m_Sinks), end(m_Sinks));
00039     m_Source.setLogger(m_Logger);
00040     m_Destination.setLogger(m_Logger);
00041 }
```

#### 4.2.3.2 log()

```
template<typename SOURCE , typename DESTINATION >
std::shared_ptr< spdlog::logger > BufferLooper< SOURCE, DESTINATION >::log ( ) [inline]
```

Definition at line 155 of file [BufferLooper.h](#).

```
00155 { return m_Logger; }
```

#### 4.2.3.3 loop()

```
template<typename SOURCE , typename DESTINATION >
void BufferLooper< SOURCE, DESTINATION >::loop (
    const std::uint32_t & m_NbrEventsToProcess = 0 ) [inline]
```

START EVENT ///

START DIF ///

START FRAME ///

START FRAME ///

START DIF ///

START EVENT ///

Definition at line 43 of file [BufferLooper.h](#).

```
00044 {
00045     Timer timer;
00046     timer.start();
00047     m_Source.start();
00048     m_Destination.start();
00049     RawBufferNavigator bufferNavigator;
00050     while(m_Source.nextEvent() && m_NbrEventsToProcess >= m_NbrEvents)
00051     {
00053         m_Source.startEvent();
00054         m_Destination.startEvent();
00056
00057         m_Logger->warn("====* Event number {} *====", m_NbrEvents);
00058         while(m_Source.nextDIFbuffer())
00059         {
00060             const Buffer& buffer = m_Source.getSDHCALBuffer();
00061             bufferNavigator.setBuffer(buffer);
00062
00063             bit8_t* debug_variable_1 = buffer.end();
00064             bit8_t* debug_variable_2 = bufferNavigator.getDIFBuffer().end();
00065             if(debug_variable_1 != debug_variable_2) m_Logger->info("DIF BUFFER END {} {}",
fmt::ptr(debug_variable_1), fmt::ptr(debug_variable_2));
00066             if(m_Debug) assert(debug_variable_1 == debug_variable_2);
00067
00068             if(std::find(m_DetectorIDs.begin(), m_DetectorIDs.end(),
static_cast<DetectorID>(bufferNavigator.getDetectorID())) == m_DetectorIDs.end())
00069             {
00070                 m_Logger->trace("{} ", bufferNavigator.getDetectorID());
00071                 continue;
00072             }
00073
00075             m_Source.startDIF();
00076             m_Destination.startDIF();
00078
00079             uint32_t idstart = bufferNavigator.getStartOfDIF();
00080             if(m_Debug && idstart == 0) m_Logger->info(to_hex(buffer));
00081             c.DIFStarter[idstart]++;
00082             if(!bufferNavigator.validBuffer())
00083             {
00084                 m_Logger->error("!bufferNavigator.validBuffer()");
00085                 continue;
00086             }
00087             DIFPtr& d = bufferNavigator.getDIFPtr();
```



```

00088         c.DIFPtrValueAtReturnedPos[bufferNavigator.getDIFBufferStart() [d.getGetFramePtrReturn()]]++;
00089         if(m_Debug) assert(bufferNavigator.getDIFBufferStart() [d.getGetFramePtrReturn()] == 0xa0);
00090         c.SizeAfterDIFPtr[bufferNavigator.getSizeAfterDIFPtr() ]++;
00091         m_Destination.processDIF(d);
00092         for(std::size_t i = 0; i < d.getNumberOfFrames(); ++i)
00093         {
00094             m_Source.startFrame();
00095             m_Destination.startFrame();
00096             m_Destination.processFrame(d, i);
00097             for(std::size_t j = 0; j < DU::NUMBER_PAD; ++j)
00098             {
00099                 m_Source.startPad();
00100                 m_Destination.startPad();
00101                 m_Destination.processPadInFrame(d, i, j);
00102                 m_Source.endPad();
00103                 m_Destination.endPad();
00104             }
00105             m_Source.endFrame();
00106             m_Destination.endFrame();
00107         }
00108
00109         bool processSC = false;
00110         if(bufferNavigator.hasSlowControlData())
00111         {
00112             c.hasSlowControl++;
00113             processSC = true;
00114         }
00115         if(bufferNavigator.badSCData())
00116         {
00117             c.hasBadSlowControl++;
00118             processSC = false;
00119         }
00120         if(processSC) { m_Destination.processSlowControl(bufferNavigator.getSCBuffer()); }
00121
00122         Buffer eod = bufferNavigator.getEndOfAllData();
00123         c.SizeAfterAllData[eod.size() ]++;
00124         bit8_t* debug_variable_3 = eod.end();
00125         if(debug_variable_1 != debug_variable_3) m_Logger->info("END DATA BUFFER END {} {}",
00126             fmt::ptr(debug_variable_1), fmt::ptr(debug_variable_3));
00127         if(m_Debug) assert(debug_variable_1 == debug_variable_3);
00128         if(eod.size() != 0) m_Logger->info("End of Data remaining stuff : {}", to_hex(eod));
00129
00130         int nonzeroCount = 0;
00131         for(bit8_t* it = eod.begin(); it != eod.end(); it++)
00132             if(static_cast<int>(*it) != 0) nonzeroCount++;
00133         c.NonZeroValueAtEndOfData[nonzeroCount]++;
00134         m_Source.endDIF();
00135         m_Destination.endDIF();
00136     } // end of DIF while loop
00137     m_Logger->warn("***** Event number {} *****", m_NbrEvents);
00138     m_NbrEvents++;
00139     m_Source.endEvent();
00140     m_Destination.endEvent();
00141 } // end of event while loop
00142 m_Destination.end();
00143 m_Source.end();
00144 timer.stop();
00145 fmt::print("=== elapsed time {}ms ({}ms/event) ===\n", timer.getElapsedTime() / 1000,
00146     timer.getElapsedTime() / (1000 * m_NbrEvents));
00147 }

```

#### 4.2.3.4 printAllCounters()

```

template<typename SOURCE , typename DESTINATION >
void BufferLooper< SOURCE, DESTINATION >::printAllCounters ( ) [inline]

```

Definition at line 154 of file [BufferLooper.h](#).

```
00154 { c.printAllCounters(); }
```

#### 4.2.3.5 setDetectorIDs()

```
template<typename SOURCE , typename DESTINATION >
void BufferLooper< SOURCE, DESTINATION >::setDetectorIDs (
    const std::vector< DetectorID > & detectorIDs ) [inline]
```

Definition at line 157 of file [BufferLooper.h](#).

```
00157 { m_DetectorIDs = detectorIDs; }
```

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

- [libs/core/include/BufferLooper.h](#)

### 4.3 BufferLooperCounter Struct Reference

```
#include <libs/core/include/BufferLooperCounter.h>
```

#### Public Member Functions

- void [printCounter](#) (const std::string &description, const std::map< int, int > &m)
- void [printAllCounters](#) ()

#### Public Attributes

- int [hasSlowControl](#) = 0
- int [hasBadSlowControl](#) = 0
- std::map< int, int > [DIFStarter](#)
- std::map< int, int > [DIFPtrValueAtReturnedPos](#)
- std::map< int, int > [SizeAfterDIFPtr](#)
- std::map< int, int > [SizeAfterAllData](#)
- std::map< int, int > [NonZeroValusAtEndOfData](#)

#### 4.3.1 Detailed Description

Definition at line 11 of file [BufferLooperCounter.h](#).

#### 4.3.2 Member Function Documentation

### 4.3.2.1 printAllCounters()

```
void BufferLooperCounter::printAllCounters ( )
```

Definition at line 9 of file [BufferLooperCounter.cc](#).

```
00010 {
00011     fmt::print("BUFFER LOOP FINAL STATISTICS : \n");
00012     printCounter("Start of DIF header", DIFStarter);
00013     printCounter("Value after DIF data are processed", DIFPtrValueAtReturnedPos);
00014     printCounter("Size remaining in buffer after end of DIF data", SizeAfterDIFPtr);
00015     fmt::print("Number of Slow Control found {} out of which {} are bad\n", hasSlowControl,
hasBadSlowControl);
00016     printCounter("Size remaining after all of data have been processed", SizeAfterAllData);
00017     printCounter("Number on non zero values in end of data buffer", NonZeroValusAtEndOfData);
00018 }
```

### 4.3.2.2 printCounter()

```
void BufferLooperCounter::printCounter (
    const std::string & description,
    const std::map< int, int > & m )
```

Definition at line 20 of file [BufferLooperCounter.cc](#).

```
00021 {
00022     std::string out{"statistics for " + description + " : \n"};
00023     for(std::map<int, int>::const_iterator it = m.begin(); it != m.end(); it++)
00024     {
00025         if(it != m.begin()) out += ",";
00026         out += " [" + std::to_string(it->first) + "]= " + std::to_string(it->second);
00027     }
00028     out += "\n";
00029     fmt::print(out);
00030 }
```

## 4.3.3 Member Data Documentation

### 4.3.3.1 DIFPtrValueAtReturnedPos

```
std::map<int, int> BufferLooperCounter::DIFPtrValueAtReturnedPos
```

Definition at line 17 of file [BufferLooperCounter.h](#).

### 4.3.3.2 DIFStarter

```
std::map<int, int> BufferLooperCounter::DIFStarter
```

Definition at line 16 of file [BufferLooperCounter.h](#).

#### 4.3.3.3 hasBadSlowControl

```
int BufferLooperCounter::hasBadSlowControl = 0
```

Definition at line 15 of file [BufferLooperCounter.h](#).

#### 4.3.3.4 hasSlowControl

```
int BufferLooperCounter::hasSlowControl = 0
```

Definition at line 14 of file [BufferLooperCounter.h](#).

#### 4.3.3.5 NonZeroValusAtEndOfData

```
std::map<int, int> BufferLooperCounter::NonZeroValusAtEndOfData
```

Definition at line 20 of file [BufferLooperCounter.h](#).

#### 4.3.3.6 SizeAfterAllData

```
std::map<int, int> BufferLooperCounter::SizeAfterAllData
```

Definition at line 19 of file [BufferLooperCounter.h](#).

#### 4.3.3.7 SizeAfterDIFPtr

```
std::map<int, int> BufferLooperCounter::SizeAfterDIFPtr
```

Definition at line 18 of file [BufferLooperCounter.h](#).

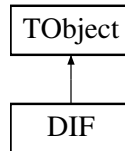
The documentation for this struct was generated from the following files:

- [libs/core/include/BufferLooperCounter.h](#)
- [libs/core/src/BufferLooperCounter.cc](#)

## 4.4 DIF Class Reference

```
#include <libs/interface/ROOT/include/DIF.h>
```

Inheritance diagram for DIF:



### Public Member Functions

- void [addHit](#) (const [Hit](#) &)
- void [setID](#) (const std::uint8\_t &)
- std::uint8\_t [getID](#) () const
- void [setDTC](#) (const std::uint32\_t &)
- std::uint32\_t [getDTC](#) () const
- void [setGTC](#) (const std::uint32\_t &)
- std::uint32\_t [getGTC](#) () const
- void [setDIFBCID](#) (const std::uint32\_t &)
- std::uint32\_t [getDIFBCID](#) () const
- void [setAbsoluteBCID](#) (const std::uint64\_t &)
- std::uint64\_t [getAbsoluteBCID](#) () const

### 4.4.1 Detailed Description

Definition at line 13 of file [DIF.h](#).

### 4.4.2 Member Function Documentation

#### 4.4.2.1 addHit()

```
void DIF::addHit (
    const Hit & hit )
```

Definition at line 10 of file [DIF.cc](#).  
00010 { m\_Hits.push\_back(hit); }

#### 4.4.2.2 getAbsoluteBCID()

```
std::uint64_t DIF::getAbsoluteBCID ( ) const
```

Definition at line 30 of file [DIF.cc](#).

```
00030 { return m_AbsoluteBCID; }
```

#### 4.4.2.3 getDIFBCID()

```
std::uint32_t DIF::getDIFBCID ( ) const
```

Definition at line 26 of file [DIF.cc](#).

```
00026 { return m_DIFBCID; }
```

#### 4.4.2.4 getDTC()

```
std::uint32_t DIF::getDTC ( ) const
```

Definition at line 18 of file [DIF.cc](#).

```
00018 { return m_DTC; }
```

#### 4.4.2.5 getGTC()

```
std::uint32_t DIF::getGTC ( ) const
```

Definition at line 22 of file [DIF.cc](#).

```
00022 { return m_GTC; }
```

#### 4.4.2.6 getID()

```
std::uint8_t DIF::getID ( ) const
```

Definition at line 14 of file [DIF.cc](#).

```
00014 { return m_ID; }
```

#### 4.4.2.7 setAbsoluteBCID()

```
void DIF::setAbsoluteBCID (
    const std::uint64_t & absolutebcid )
```

Definition at line 28 of file [DIF.cc](#).

```
00028 { m_AbsoluteBCID = absolutebcid; }
```

#### 4.4.2.8 setDIFBCID()

```
void DIF::setDIFBCID (
    const std::uint32_t & difbcid )
```

Definition at line 24 of file [DIF.cc](#).

```
00024 { m_DIFBCID = difbcid; }
```

#### 4.4.2.9 setDTC()

```
void DIF::setDTC (
    const std::uint32_t & dtc )
```

Definition at line 16 of file [DIF.cc](#).

```
00016 { m_DTC = dtc; }
```

#### 4.4.2.10 setGTC()

```
void DIF::setGTC (
    const std::uint32_t & gtc )
```

Definition at line 20 of file [DIF.cc](#).

```
00020 { m_GTC = gtc; }
```

#### 4.4.2.11 setID()

```
void DIF::setID (
    const std::uint8_t & id )
```

Definition at line 12 of file [DIF.cc](#).

```
00012 { m_ID = id; }
```

The documentation for this class was generated from the following files:

- [libs/interface/ROOT/include/DIF.h](#)
- [libs/interface/ROOT/src/DIF.cc](#)

## 4.5 DIFPtr Class Reference

```
#include <libs/core/include/DIFPtr.h>
```

## Public Member Functions

- void [setBuffer](#) (unsigned char \*, const std::uint32\_t &)
- unsigned char \* [getPtr](#) () const
- std::uint32\_t [getGetFramePtrReturn](#) () const
- std::vector< unsigned char \* > & [getFramesVector](#) ()
- std::vector< unsigned char \* > & [getLinesVector](#) ()
- std::uint32\_t [getID](#) () const
- std::uint32\_t [getDTC](#) () const
- std::uint32\_t [getGTC](#) () const
- std::uint64\_t [getAbsoluteBCID](#) () const
- std::uint32\_t [getBCID](#) () const
- std::uint32\_t [getLines](#) () const
- bool [hasLine](#) (const std::uint32\_t &) const
- std::uint32\_t [getTASU1](#) () const
- std::uint32\_t [getTASU2](#) () const
- std::uint32\_t [getTDIF](#) () const
- float [getTemperatureDIF](#) () const
- float [getTemperatureASU1](#) () const
- float [getTemperatureASU2](#) () const
- bool [hasTemperature](#) () const
- bool [hasAnalogReadout](#) () const
- std::uint32\_t [getNumberOfFrames](#) () const
- unsigned char \* [getFramePtr](#) (const std::uint32\_t &) const
- std::uint32\_t [getFrameAsicHeader](#) (const std::uint32\_t &) const
- std::uint32\_t [getFrameBCID](#) (const std::uint32\_t &) const
- std::uint32\_t [getFrameTimeToTrigger](#) (const std::uint32\_t &) const
- bool [getFrameLevel](#) (const std::uint32\_t &, const std::uint32\_t &, const std::uint32\_t &) const
- uint32\_t [getDIFid](#) () const
- uint32\_t [getASICid](#) (const std::uint32\_t &) const
- uint32\_t [getThresholdStatus](#) (const std::uint32\_t &, const std::uint32\_t &) const

### 4.5.1 Detailed Description

Definition at line 14 of file [DIFPtr.h](#).

### 4.5.2 Member Function Documentation

#### 4.5.2.1 [getAbsoluteBCID\(\)](#)

```
std::uint64_t DIFPtr::getAbsoluteBCID ( ) const [inline]
```

Definition at line 79 of file [DIFPtr.h](#).

```
00079 { return DIFUnpacker::getAbsoluteBCID(theDIF_); }
```



#### 4.5.2.2 getASICid()

```
uint32_t DIFPtr::getASICid (
    const std::uint32_t & i ) const [inline]
```

Definition at line 99 of file [DIFPtr.h](#).

```
00099 { return getFrameAsicHeader(i) & 0xFF; }
```

#### 4.5.2.3 getBCID()

```
std::uint32_t DIFPtr::getBCID ( ) const [inline]
```

Definition at line 80 of file [DIFPtr.h](#).

```
00080 { return DIFUnpacker::getBCID(theDIF_); }
```

#### 4.5.2.4 getDIFid()

```
uint32_t DIFPtr::getDIFid ( ) const [inline]
```

Definition at line 98 of file [DIFPtr.h](#).

```
00098 { return getID() & 0xFF; }
```

#### 4.5.2.5 getDTC()

```
std::uint32_t DIFPtr::getDTC ( ) const [inline]
```

Definition at line 77 of file [DIFPtr.h](#).

```
00077 { return DIFUnpacker::getDTC(theDIF_); }
```

#### 4.5.2.6 getFrameAsicHeader()

```
std::uint32_t DIFPtr::getFrameAsicHeader (
    const std::uint32_t & i ) const [inline]
```

Definition at line 93 of file [DIFPtr.h](#).

```
00093 { return DIFUnpacker::getFrameAsicHeader(theFrames_[i]); }
```

#### 4.5.2.7 getFrameBCID()

```
std::uint32_t DIFPtr::getFrameBCID (
    const std::uint32_t & i ) const [inline]
```

Definition at line 94 of file [DIFPtr.h](#).

```
00094 { return DIFUnpacker::getFrameBCID(theFrames_[i]); }
```

#### 4.5.2.8 getFrameLevel()

```
bool DIFPtr::getFrameLevel (
    const std::uint32_t & i,
    const std::uint32_t & ipad,
    const std::uint32_t & ilevel ) const [inline]
```

Definition at line 96 of file [DIFPtr.h](#).

```
00096 { return DIFUnpacker::getFrameLevel(theFrames_[i], ipad, ilevel); }
```

#### 4.5.2.9 getFramePtr()

```
unsigned char * DIFPtr::getFramePtr (
    const std::uint32_t & i ) const [inline]
```

Definition at line 92 of file [DIFPtr.h](#).

```
00092 { return theFrames_[i]; }
```

#### 4.5.2.10 getFramesVector()

```
std::vector< unsigned char * > & DIFPtr::getFramesVector ( ) [inline]
```

Definition at line 74 of file [DIFPtr.h](#).

```
00074 { return theFrames_; }
```

#### 4.5.2.11 getFrameTimeToTrigger()

```
std::uint32_t DIFPtr::getFrameTimeToTrigger (
    const std::uint32_t & i ) const [inline]
```

Definition at line 95 of file [DIFPtr.h](#).

```
00095 { return getBCID() - getFrameBCID(i); }
```

#### 4.5.2.12 getGetFramePtrReturn()

```
std::uint32_t DIFPtr::getGetFramePtrReturn ( ) const [inline]
```

Definition at line 73 of file [DIFPtr.h](#).

```
00073 { return theGetFramePtrReturn_; }
```

#### 4.5.2.13 getGTC()

```
std::uint32_t DIFPtr::getGTC ( ) const [inline]
```

Definition at line 78 of file [DIFPtr.h](#).

```
00078 { return DIFUnpacker::getGTC(theDIF_); }
```

#### 4.5.2.14 getID()

```
std::uint32_t DIFPtr::getID ( ) const [inline]
```

Definition at line 76 of file [DIFPtr.h](#).

```
00076 { return DIFUnpacker::getID(theDIF_); }
```

#### 4.5.2.15 getLines()

```
std::uint32_t DIFPtr::getLines ( ) const [inline]
```

Definition at line 81 of file [DIFPtr.h](#).

```
00081 { return DIFUnpacker::getLines(theDIF_); }
```

#### 4.5.2.16 getLinesVector()

```
std::vector< unsigned char * > & DIFPtr::getLinesVector ( ) [inline]
```

Definition at line 75 of file [DIFPtr.h](#).

```
00075 { return theLines_; }
```

#### 4.5.2.17 getNumberOfFrames()

```
std::uint32_t DIFPtr::getNumberOfFrames ( ) const [inline]
```

Definition at line 91 of file [DIFPtr.h](#).

```
00091 { return theFrames_.size(); }
```

#### 4.5.2.18 getPtr()

```
unsigned char * DIFPtr::getPtr ( ) const [inline]
```

Definition at line 72 of file [DIFPtr.h](#).

```
00072 { return theDIF_; }
```

#### 4.5.2.19 getTASU1()

```
std::uint32_t DIFPtr::getTASU1 ( ) const [inline]
```

Definition at line 83 of file [DIFPtr.h](#).

```
00083 { return DIFUnpacker::getTASU1(theDIF_); }
```

#### 4.5.2.20 getTASU2()

```
std::uint32_t DIFPtr::getTASU2 ( ) const [inline]
```

Definition at line 84 of file [DIFPtr.h](#).

```
00084 { return DIFUnpacker::getTASU2(theDIF_); }
```

#### 4.5.2.21 getTDIF()

```
std::uint32_t DIFPtr::getTDIF ( ) const [inline]
```

Definition at line 85 of file [DIFPtr.h](#).

```
00085 { return DIFUnpacker::getTDIF(theDIF_); }
```

#### 4.5.2.22 getTemperatureASU1()

```
float DIFPtr::getTemperatureASU1 ( ) const [inline]
```

Definition at line 87 of file [DIFPtr.h](#).

```
00087 { return (getTASU1() » 3) * 0.0625; }
```

#### 4.5.2.23 getTemperatureASU2()

```
float DIFPtr::getTemperatureASU2 ( ) const [inline]
```

Definition at line 88 of file [DIFPtr.h](#).

```
00088 { return (getTASU2() » 3) * 0.0625; }
```

#### 4.5.2.24 getTemperatureDIF()

```
float DIFPtr::getTemperatureDIF ( ) const [inline]
```

Definition at line 86 of file [DIFPtr.h](#).

```
00086 { return 0.508 * getTDIF() - 9.659; }
```

#### 4.5.2.25 getThresholdStatus()

```
uint32_t DIFPtr::getThresholdStatus (
    const std::uint32_t & i,
    const std::uint32_t & ipad ) const [inline]
```

Definition at line 100 of file [DIFPtr.h](#).

```
00100 { return (((uint32_t)getFrameLevel(i, ipad, 1)) < 1) | ((uint32_t)getFrameLevel(i, ipad, 0)); }
```

#### 4.5.2.26 hasAnalogReadout()

```
bool DIFPtr::hasAnalogReadout ( ) const [inline]
```

Definition at line 90 of file [DIFPtr.h](#).

```
00090 { return DIFUnpacker::hasAnalogReadout(theDIF_); }
```

#### 4.5.2.27 hasLine()

```
bool DIFPtr::hasLine (
    const std::uint32_t & line ) const [inline]
```

Definition at line 82 of file [DIFPtr.h](#).

```
00082 { return DIFUnpacker::hasLine(line, theDIF_); }
```

#### 4.5.2.28 hasTemperature()

```
bool DIFPtr::hasTemperature ( ) const [inline]
```

Definition at line 89 of file [DIFPtr.h](#).

```
00089 { return DIFUnpacker::hasTemperature(theDIF_); }
```

#### 4.5.2.29 setBuffer()

```
void DIFPtr::setBuffer (
    unsigned char * p,
    const std::uint32_t & max_size ) [inline]
```

Definition at line 56 of file [DIFPtr.h](#).

```
00057 {
00058     theFrames_.clear();
00059     theLines_.clear();
00060     theSize_ = max_size;
00061     theDIF_ = p;
00062     try
00063     {
00064         theGetFramePtrReturn_ = DIFUnpacker::getFramePtr(theFrames_, theLines_, theSize_, theDIF_);
00065     }
00066     catch(const std::string& e)
00067     {
00068         spdlog::get("streamout")->error(" DIF {} T ? {} {} ", getID(), hasTemperature(), e);
00069     }
00070 }
```

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

- [libs/core/include/DIFPtr.h](#)

## 4.6 DIFSlowControl Class Reference

Handler of [DIF](#) Slow Control info.

```
#include <libs/core/include/DIFSlowControl.h>
```

### Public Member Functions

- [DIFSlowControl](#) (const std::uint8\_t &version, const std::uint8\_t &DIFid, unsigned char \*buf)  
*Constructor.*
- std::uint8\_t [getDIFid](#) ()  
*get DIF id*
- std::map< int, std::map< std::string, int > > [getChipsMap](#) ()  
*Get chips map.*
- std::map< std::string, int > [getChipSlowControl](#) (const int &asicid)  
*Get one chip map.*
- int [getChipSlowControl](#) (const std::int8\_t &asicid, const std::string &param)  
*Get one Chip value.*
- void [Dump](#) ()  
*print out full map*

#### 4.6.1 Detailed Description

Handler of [DIF](#) Slow Control info.

Author

L.Mirabito

Date

March 2010

Version

1.0

Definition at line 19 of file [DIFSlowControl.h](#).

## 4.6.2 Constructor & Destructor Documentation

### 4.6.2.1 DIFSlowControl()

```
DIFSlowControl::DIFSlowControl (
    const std::uint8_t & version,
    const std::uint8_t & DIFid,
    unsigned char * buf )
```

Constructor.

#### Parameters

<i>version</i>	Data format version
<i>DIFid</i>	<a href="#">DIF</a> id
<i>buf</i>	Pointer to the Raw data buffer

Definition at line 10 of file [DIFSlowControl.cc](#).

```
00010 : m_Version(version), m_DIFid(DifId), m_AsicType(2)
00011 {
00012     if(cbuf[0] != 0xb1) return;
00013     int header_shift{6};
00014     if(m_Version < 8) m_NbrAsic = cbuf[5];
00015     else
00016     {
00017         m_DIFid      = cbuf[1];
00018         m_NbrAsic     = cbuf[2];
00019         header_shift = 3;
00020     }
00021     int size_hardroc1 = m_NbrAsic * 72 + header_shift + 1;
00022     if(cbuf[size_hardroc1 - 1] != 0xal) size_hardroc1 = 0;
00023
00024     int size_hardroc2 = m_NbrAsic * 109 + header_shift + 1;
00025     if(cbuf[size_hardroc2 - 1] != 0xal) size_hardroc2 = 0;
00026     if(size_hardroc1 != 0)
00027     {
00028         FillHR1(header_shift, cbuf);
00029         m_AsicType = 1;
00030     }
00031     else if(size_hardroc2 != 0)
00032         FillHR2(header_shift, cbuf);
00033     else
00034         return;
00035 }
```

## 4.6.3 Member Function Documentation

### 4.6.3.1 Dump()

```
void DIFSlowControl::Dump ( )
```

print out full map

Definition at line 45 of file [DIFSlowControl.cc](#).

```
00046 {
```

```

00047     for(std::map<int, std::map<std::string, int>::iterator it = m_MapSC.begin(); it != m_MapSC.end();
        it++)
00048     {
00049         std::cout << "ASIC " << it->first << std::endl;
00050         for(std::map<std::string, int>::iterator jt = (it->second).begin(); jt != (it->second).end();
            jt++) std::cout << jt->first << " : " << jt->second << std::endl;
00051     }
00052 }

```

#### 4.6.3.2 getChipSlowControl() [1/2]

```

std::map< std::string, int > DIFSlowControl::getChipSlowControl (
    const int & asicid ) [inline]

```

Get one chip map.

##### Parameters

<i>asicid</i>	ASIC ID
---------------	---------

##### Returns

a map of <string (parameter name),int (parameter value) >

Definition at line 41 of file [DIFSlowControl.cc](#).

```

00041 { return m_MapSC[asicid]; }

```

#### 4.6.3.3 getChipSlowControl() [2/2]

```

int DIFSlowControl::getChipSlowControl (
    const std::int8_t & asicid,
    const std::string & param ) [inline]

```

Get one Chip value.

##### Parameters

<i>asicid</i>	ASic ID
<i>param</i>	Parameter name

Definition at line 43 of file [DIFSlowControl.cc](#).

```

00043 { return getChipSlowControl(asicid)[param]; }

```

#### 4.6.3.4 getChipsMap()

```

std::map< int, std::map< std::string, int > > DIFSlowControl::getChipsMap ( ) [inline]

```

Get chips map.



**Returns**

a map of < Asic Id, map of <string (parameter name),int (parameter value) >

Definition at line 39 of file [DIFSlowControl.cc](#).

```
00039 { return m_MapSC; }
```

**4.6.3.5 getDIFId()**

```
std::uint8_t DIFSlowControl::getDIFId ( ) [inline]
```

get DIF id

Definition at line 37 of file [DIFSlowControl.cc](#).

```
00037 { return m_DIFId; }
```

The documentation for this class was generated from the following files:

- [libs/core/include/DIFSlowControl.h](#)
- [libs/core/src/DIFSlowControl.cc](#)

**4.7 DIFUnpacker Class Reference**

```
#include <libs/core/include/DIFUnpacker.h>
```

**Static Public Member Functions**

- static std::uint64\_t [GrayToBin](#) (const std::uint64\_t &n)
- static std::uint32\_t [getStartOfDIF](#) (const unsigned char \*cbuf, const std::uint32\_t &size\_buf, const std::uint32\_t &start=92)
- static std::uint32\_t [getId](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static std::uint32\_t [getDTC](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static std::uint32\_t [getGTC](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static std::uint64\_t [getAbsoluteBCID](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static std::uint32\_t [getBCID](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static std::uint32\_t [getLines](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static bool [hasLine](#) (const std::uint32\_t &line, const unsigned char \*cb, const std::uint32\_t &idx=0)
- static std::uint32\_t [getTASU1](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static std::uint32\_t [getTASU2](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static std::uint32\_t [getTDIF](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static bool [hasTemperature](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static bool [hasAnalogReadout](#) (const unsigned char \*cb, const std::uint32\_t &idx=0)
- static std::uint32\_t [getFrameAsicHeader](#) (const unsigned char \*framePtr)
- static std::uint32\_t [getFrameBCID](#) (const unsigned char \*framePtr)
- static bool [getFramePAD](#) (const unsigned char \*framePtr, const std::uint32\_t &ip)
- static bool [getFrameLevel](#) (const unsigned char \*framePtr, const std::uint32\_t &ip, const std::uint32\_t &level)
- static std::uint32\_t [getAnalogPtr](#) (std::vector< unsigned char \* > &vLines, unsigned char \*cb, const std::uint32\_t &idx=0)
- static std::uint32\_t [getFramePtr](#) (std::vector< unsigned char \* > &vFrame, std::vector< unsigned char \* > &vLines, const std::uint32\_t &max\_size, unsigned char \*cb, const std::uint32\_t &idx=0)

### 4.7.1 Detailed Description

Definition at line 10 of file [DIFUnpacker.h](#).

### 4.7.2 Member Function Documentation

#### 4.7.2.1 getAbsoluteBCID()

```
std::uint64_t DIFUnpacker::getAbsoluteBCID (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 53 of file [DIFUnpacker.cc](#).

```
00054 {
00055     std::uint64_t Shift{16777216ULL}; // to shift the value from the 24 first bits
00056     std::uint64_t pos{idx + DU::ABCID_SHIFT};
00057     std::uint64_t LBC = ((cb[pos] << 16) | (cb[pos + 1] << 8) | (cb[pos + 2])) * Shift + ((cb[pos + 3] <<
16) | (cb[pos + 4] << 8) | (cb[pos + 5]));
00058     return LBC;
00059 }
```

#### 4.7.2.2 getAnalogPtr()

```
std::uint32_t DIFUnpacker::getAnalogPtr (
    std::vector< unsigned char * > & vLines,
    unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 92 of file [DIFUnpacker.cc](#).

```
00093 {
00094     std::uint32_t fshift{idx};
00095     if(cb[fshift] != DU::START_OF_LINES) return fshift;
00096     fshift++;
00097     while(cb[fshift] != DU::END_OF_LINES)
00098     {
00099         vLines.push_back(&cb[fshift]);
00100         std::uint32_t nchip{cb[fshift]};
00101         fshift += 1 + nchip * 64 * 2;
00102     }
00103     return fshift++;
00104 }
```

#### 4.7.2.3 getBCID()

```
std::uint32_t DIFUnpacker::getBCID (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 61 of file [DIFUnpacker.cc](#).

```
00061 { return (cb[idx + DU::BCID_SHIFT] << 16) + (cb[idx + DU::BCID_SHIFT + 1] << 8) + cb[idx +
DU::BCID_SHIFT + 2]; }
```

#### 4.7.2.4 getDTC()

```
std::uint32_t DIFUnpacker::getDTC (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 49 of file [DIFUnpacker.cc](#).

```
00049 { return (cb[idx + DU::DTC_SHIFT] << 24) + (cb[idx + DU::DTC_SHIFT + 1] << 16) + (cb[idx + DU::DTC_SHIFT
+ 2] << 8) + cb[idx + DU::DTC_SHIFT + 3]; }
```

#### 4.7.2.5 getFrameAsicHeader()

```
std::uint32_t DIFUnpacker::getFrameAsicHeader (
    const unsigned char * framePtr ) [static]
```

Definition at line 76 of file [DIFUnpacker.cc](#).

```
00076 { return (framePtr[DU::FRAME_ASIC_HEADER_SHIFT]); }
```

#### 4.7.2.6 getFrameBCID()

```
std::uint32_t DIFUnpacker::getFrameBCID (
    const unsigned char * framePtr ) [static]
```

Definition at line 78 of file [DIFUnpacker.cc](#).

```
00079 {
00080     std::uint32_t igray = (framePtr[DU::FRAME_BCID_SHIFT] << 16) + (framePtr[DU::FRAME_BCID_SHIFT + 1] <<
8) + framePtr[DU::FRAME_BCID_SHIFT + 2];
00081     return DIFUnpacker::GrayToBin(igray);
00082 }
```

#### 4.7.2.7 getFrameLevel()

```
bool DIFUnpacker::getFrameLevel (
    const unsigned char * framePtr,
    const std::uint32_t & ip,
    const std::uint32_t & level ) [static]
```

Definition at line 90 of file [DIFUnpacker.cc](#).

```
00090 { return ((framePtr[DU::FRAME_DATA_SHIFT + ((3 - ip / 16) * 4 + (ip % 16) / 4)] >> (7 - ((ip % 16) %
4) * 2 + level))) & 0x1); }
```

#### 4.7.2.8 getFramePAD()

```
bool DIFUnpacker::getFramePAD (
    const unsigned char * framePtr,
    const std::uint32_t & ip ) [static]
```

Definition at line 84 of file [DIFUnpacker.cc](#).

```
00085 {
00086     std::uint32_t* iframe{(std::uint32_t*)&framePtr[DU::FRAME_DATA_SHIFT]};
00087     return ((iframe[3 - ip / 32] » (ip % 32)) & 0x1);
00088 }
```

#### 4.7.2.9 getFramePtr()

```
std::uint32_t DIFUnpacker::getFramePtr (
    std::vector< unsigned char * > & vFrame,
    std::vector< unsigned char * > & vLines,
    const std::uint32_t & max_size,
    unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 106 of file [DIFUnpacker.cc](#).

```
00107 {
00108     std::uint32_t fshift{0};
00109     if(DATA_FORMAT_VERSION >= 13)
00110     {
00111         fshift = idx + DU::LINES_SHIFT + 1;
00112         if(DIFUnpacker::hasTemperature(cb, idx)) fshift = idx + DU::TDIF_SHIFT + 1;
00113         // jenlev 1
00114         if(DIFUnpacker::hasAnalogReadout(cb, idx)) fshift = DIFUnpacker::getAnalogPtr(vLines, cb, fshift);
00115         // to be implemented
00116     }
00117     else
00118     {
00119         fshift = idx + DU::BCID_SHIFT + 3;
00120         if(cb[fshift] != DU::START_OF_FRAME)
00121         {
00122             std::cout << "This is not a start of frame " << to_hex(cb[fshift]) << " \n";
00123             return fshift;
00124         }
00125         do {
00126             // printf("fshift %d and %d \n", fshift, max_size);
00127             if(cb[fshift] == DU::END_OF_DIF) return fshift;
00128             if(cb[fshift] == DU::START_OF_FRAME) fshift++;
00129             if(cb[fshift] == DU::END_OF_FRAME)
00130             {
00131                 fshift++;
00132                 continue;
00133             }
00134             std::uint32_t header = DIFUnpacker::getFrameAsicHeader(&cb[fshift]);
00135             if(header == DU::END_OF_FRAME) return (fshift + 2);
00136             // std::cout<<header<< " " << fshift << std::endl;
00137             if(header < 1 || header > 48) { throw header + " Header problem " + fshift; }
00138             vFrame.push_back(&cb[fshift]);
00139             fshift += DU::FRAME_SIZE;
00140             if(fshift > max_size)
00141             {
00142                 std::cout << "fshift " << fshift << " exceed " << max_size << " \n";
00143                 return fshift;
00144             }
00145             if(cb[fshift] == DU::END_OF_FRAME) fshift++;
00146         } while(true);
00147     }
00148 }
```

#### 4.7.2.10 getGTC()

```
std::uint32_t DIFUnpacker::getGTC (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 51 of file [DIFUnpacker.cc](#).

```
00051 { return (cb[idx + DU::GTC_SHIFT] << 24) + (cb[idx + DU::GTC_SHIFT + 1] << 16) + (cb[idx + DU::GTC_SHIFT
+ 2] << 8) + cb[idx + DU::GTC_SHIFT + 3]; }
```

#### 4.7.2.11 getID()

```
std::uint32_t DIFUnpacker::getID (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 47 of file [DIFUnpacker.cc](#).

```
00047 { return cb[idx + DU::ID_SHIFT]; }
```

#### 4.7.2.12 getLines()

```
std::uint32_t DIFUnpacker::getLines (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 62 of file [DIFUnpacker.cc](#).

```
00062 { return (cb[idx + DU::LINES_SHIFT] >> 4) & 0x5; }
```

#### 4.7.2.13 getStartOfDIF()

```
std::uint32_t DIFUnpacker::getStartOfDIF (
    const unsigned char * cbuf,
    const std::uint32_t & size_buf,
    const std::uint32_t & start = 92 ) [static]
```

Definition at line 30 of file [DIFUnpacker.cc](#).

```
00031 {
00032     std::uint32_t id0{0};
00033     for(std::uint32_t i = start; i < size_buf; i++)
00034     {
00035         if(cbuf[i] != DU::START_OF_DIF && cbuf[i] != DU::START_OF_DIF_TEMP) continue;
00036         else
00037         {
00038             id0 = i;
00039             break;
00040         }
00041         // if (cbuf[id0+DU::ID_SHIFT]>0xFF) continue;
00042     }
00043     // std::cout << "***** " << id0 << std::endl;
00044     return id0;
00045 }
```

#### 4.7.2.14 getTASU1()

```
std::uint32_t DIFUnpacker::getTASU1 (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 66 of file [DIFUnpacker.cc](#).

```
00066 { return (cb[idx + DU::TASU1_SHIFT] << 24) + (cb[idx + DU::TASU1_SHIFT + 1] << 16) + (cb[idx +
    DU::TASU1_SHIFT + 2] << 8) + cb[idx + DU::TASU1_SHIFT + 3]; }
```

#### 4.7.2.15 getTASU2()

```
std::uint32_t DIFUnpacker::getTASU2 (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 68 of file [DIFUnpacker.cc](#).

```
00068 { return (cb[idx + DU::TASU2_SHIFT] << 24) + (cb[idx + DU::TASU2_SHIFT + 1] << 16) + (cb[idx +
    DU::TASU2_SHIFT + 2] << 8) + cb[idx + DU::TASU2_SHIFT + 3]; }
```

#### 4.7.2.16 getTDIF()

```
std::uint32_t DIFUnpacker::getTDIF (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 70 of file [DIFUnpacker.cc](#).

```
00070 { return (cb[idx + DU::TDIF_SHIFT]); }
```

#### 4.7.2.17 GrayToBin()

```
std::uint64_t DIFUnpacker::GrayToBin (
    const std::uint64_t & n ) [static]
```

Definition at line 15 of file [DIFUnpacker.cc](#).

```
00016 {
00017     std::uint64_t ish{1};
00018     std::uint64_t anss{n};
00019     std::uint64_t idiv{0};
00020     std::uint64_t ishmax{sizeof(std::uint64_t) * 8};
00021     while(true)
00022     {
00023         idiv = anss >> ish;
00024         anss ^= idiv;
00025         if(idiv <= 1 || ish == ishmax) return anss;
00026         ish <<= 1;
00027     }
00028 }
```

**4.7.2.18 hasAnalogReadout()**

```
bool DIFUnpacker::hasAnalogReadout (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 74 of file [DIFUnpacker.cc](#).

```
00074 { return (DIFUnpacker::getLines(cb, idx) != 0); }
```

**4.7.2.19 hasLine()**

```
bool DIFUnpacker::hasLine (
    const std::uint32_t & line,
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 64 of file [DIFUnpacker.cc](#).

```
00064 { return ((cb[idx + DU::LINES_SHIFT] >> line) & 0x1); }
```

**4.7.2.20 hasTemperature()**

```
bool DIFUnpacker::hasTemperature (
    const unsigned char * cb,
    const std::uint32_t & idx = 0 ) [static]
```

Definition at line 72 of file [DIFUnpacker.cc](#).

```
00072 { return (cb[idx] == DU::START_OF_DIF_TEMP); }
```

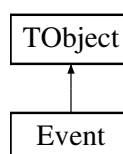
The documentation for this class was generated from the following files:

- [libs/core/include/DIFUnpacker.h](#)
- [libs/core/src/DIFUnpacker.cc](#)

**4.8 Event Class Reference**

```
#include <libs/interface/ROOT/include/Event.h>
```

Inheritance diagram for Event:



## Public Member Functions

- void [clear](#) ()
- void [addDIF](#) (const [DIF](#) &dif)

### 4.8.1 Detailed Description

Definition at line [13](#) of file [Event.h](#).

### 4.8.2 Member Function Documentation

#### 4.8.2.1 addDIF()

```
void Event::addDIF (
    const DIF & dif )
```

Definition at line [10](#) of file [Event.cc](#).  
00010 { DIFs[dif.getID()] = dif; }

#### 4.8.2.2 clear()

```
void Event::clear ( )
```

Definition at line [8](#) of file [Event.cc](#).  
00008 { DIFs.clear(); }

The documentation for this class was generated from the following files:

- [libs/interface/ROOT/include/Event.h](#)
- [libs/interface/ROOT/src/Event.cc](#)

## 4.9 Hit Class Reference

```
#include <libs/interface/ROOT/include/Hit.h>
```

Inheritance diagram for Hit:





## Public Member Functions

- void [setDIF](#) (const std::uint8\_t &)
- void [setASIC](#) (const std::uint8\_t &)
- void [setChannel](#) (const std::uint8\_t &)
- void [setThreshold](#) (const std::uint8\_t &)
- void [setDTC](#) (const std::uint32\_t &)
- void [setGTC](#) (const std::uint32\_t &)
- void [setDIFBCID](#) (const std::uint32\_t &)
- void [setFrameBCID](#) (const std::uint32\_t &)
- void [setTimestamp](#) (const std::uint32\_t &)
- void [setAbsoluteBCID](#) (const std::uint64\_t &)
- std::uint8\_t [getDIFid](#) ()
- std::uint8\_t [getASICid](#) ()
- std::uint8\_t [getChannelId](#) ()
- std::uint8\_t [getThreshold](#) ()
- std::uint32\_t [getDTC](#) ()
- std::uint32\_t [getGTC](#) ()
- std::uint32\_t [getDIFBCID](#) ()
- std::uint32\_t [getFrameBCID](#) ()
- std::uint32\_t [getTimestamp](#) ()
- std::uint64\_t [getAbsoluteBCID](#) ()

### 4.9.1 Detailed Description

Definition at line 10 of file [Hit.h](#).

### 4.9.2 Member Function Documentation

#### 4.9.2.1 [getAbsoluteBCID\(\)](#)

```
std::uint64_t Hit::getAbsoluteBCID ( )
```

Definition at line 48 of file [Hit.cc](#).

```
00048 { return m_AbsoluteBCID; }
```

#### 4.9.2.2 [getASICid\(\)](#)

```
std::uint8_t Hit::getASICid ( )
```

Definition at line 32 of file [Hit.cc](#).

```
00032 { return m_ASIC; }
```

#### 4.9.2.3 getChannelId()

```
std::uint8_t Hit::getChannelId ( )
```

Definition at line 34 of file [Hit.cc](#).

```
00034 { return m_Channel; }
```

#### 4.9.2.4 getDIFBCID()

```
std::uint32_t Hit::getDIFBCID ( )
```

Definition at line 42 of file [Hit.cc](#).

```
00042 { return m_DIFBCID; }
```

#### 4.9.2.5 getDIFid()

```
std::uint8_t Hit::getDIFid ( )
```

Definition at line 30 of file [Hit.cc](#).

```
00030 { return m_DIF; }
```

#### 4.9.2.6 getDTC()

```
std::uint32_t Hit::getDTC ( )
```

Definition at line 38 of file [Hit.cc](#).

```
00038 { return m_DTC; }
```

#### 4.9.2.7 getFrameBCID()

```
std::uint32_t Hit::getFrameBCID ( )
```

Definition at line 44 of file [Hit.cc](#).

```
00044 { return m_FrameBCID; }
```

#### 4.9.2.8 getGTC()

```
std::uint32_t Hit::getGTC ( )
```

Definition at line 40 of file [Hit.cc](#).

```
00040 { return m_GTC; }
```

#### 4.9.2.9 getThreshold()

```
std::uint8_t Hit::getThreshold ( )
```

Definition at line 36 of file [Hit.cc](#).

```
00036 { return m_Threshold; }
```

#### 4.9.2.10 getTimestamp()

```
std::uint32_t Hit::getTimestamp ( )
```

Definition at line 46 of file [Hit.cc](#).

```
00046 { return m_Timestamp; }
```

#### 4.9.2.11 setAbsoluteBCID()

```
void Hit::setAbsoluteBCID (
    const std::uint64_t & absolutebcid )
```

Definition at line 28 of file [Hit.cc](#).

```
00028 { m_AbsoluteBCID = absolutebcid; }
```

#### 4.9.2.12 setASIC()

```
void Hit::setASIC (
    const std::uint8_t & asic )
```

Definition at line 12 of file [Hit.cc](#).

```
00012 { m_ASIC = asic; }
```

#### 4.9.2.13 setChannel()

```
void Hit::setChannel (
    const std::uint8_t & channel )
```

Definition at line 14 of file [Hit.cc](#).

```
00014 { m_Channel = channel; }
```

#### 4.9.2.14 setDIF()

```
void Hit::setDIF (
    const std::uint8_t & dif )
```

Definition at line 10 of file [Hit.cc](#).

```
00010 { m_DIF = dif; }
```

#### 4.9.2.15 setDIFBCID()

```
void Hit::setDIFBCID (
    const std::uint32_t & difbcid )
```

Definition at line 22 of file [Hit.cc](#).

```
00022 { m_DIFBCID = difbcid; }
```

#### 4.9.2.16 setDTC()

```
void Hit::setDTC (
    const std::uint32_t & dtc )
```

Definition at line 18 of file [Hit.cc](#).

```
00018 { m_DTC = dtc; }
```

#### 4.9.2.17 setFrameBCID()

```
void Hit::setFrameBCID (
    const std::uint32_t & framebcid )
```

Definition at line 24 of file [Hit.cc](#).

```
00024 { m_FrameBCID = framebcid; }
```

#### 4.9.2.18 setGTC()

```
void Hit::setGTC (
    const std::uint32_t & gtc )
```

Definition at line 20 of file [Hit.cc](#).

```
00020 { m_GTC = gtc; }
```

**4.9.2.19 setThreshold()**

```
void Hit::setThreshold (
    const std::uint8_t & threshold )
```

Definition at line 16 of file [Hit.cc](#).

```
00016 { m_Threshold = threshold; }
```

**4.9.2.20 setTimestamp()**

```
void Hit::setTimestamp (
    const std::uint32_t & timestamp )
```

Definition at line 26 of file [Hit.cc](#).

```
00026 { m_Timestamp = timestamp; }
```

The documentation for this class was generated from the following files:

- [libs/interface/ROOT/include/Hit.h](#)
- [libs/interface/ROOT/src/Hit.cc](#)

**4.10 Interface Class Reference**

template class should implement void SOURCE::start(); bool SOURCE::next(); void SOURCE::end(); const [Buffer&](#) SOURCE::getSDHCALBuffer();

```
#include <libs/core/include/Interface.h>
```

Inheritance diagram for Interface:

**Public Member Functions**

- [Interface](#) ()
- virtual [~Interface](#) ()
- virtual void [startEvent](#) ()
- virtual void [endEvent](#) ()
- virtual void [startDIF](#) ()
- virtual void [endDIF](#) ()
- virtual void [startFrame](#) ()
- virtual void [endFrame](#) ()
- virtual void [startPad](#) ()
- virtual void [endPad](#) ()
- std::shared\_ptr< spdlog::logger > & [log](#) ()
- void [setLogger](#) (const std::shared\_ptr< spdlog::logger > &logger)

### 4.10.1 Detailed Description

template class should implement void SOURCE::start(); bool SOURCE::next(); void SOURCE::end(); const Buffer& SOURCE::getSDHCALBuffer();

void DESTINATION::begin(); void DESTINATION::processDIF(const DIFPtr&); void DESTINATION::processFrame(const DIFPtr&,const std::uint32\_t& frameIndex); void DESTINATION::processPadInFrame(const DIFPtr&,const std::uint32\_t& frameIndex,const std::uint32\_t& channelIndex); void DESTINATION::processSlowControl(const Buffer&); void DESTINATION::end();

Definition at line 26 of file [Interface.h](#).

### 4.10.2 Constructor & Destructor Documentation

#### 4.10.2.1 Interface()

```
Interface::Interface ( ) [inline]
```

Definition at line 29 of file [Interface.h](#).

```
00029 {}
```

#### 4.10.2.2 ~Interface()

```
virtual Interface::~~Interface ( ) [inline], [virtual]
```

Definition at line 30 of file [Interface.h](#).

```
00030 {}
```

### 4.10.3 Member Function Documentation

#### 4.10.3.1 endDIF()

```
virtual void Interface::endDIF ( ) [inline], [virtual]
```

Reimplemented in [ROOTWriter](#).

Definition at line 34 of file [Interface.h](#).

```
00034 {}
```

#### 4.10.3.2 endEvent()

```
virtual void Interface::endEvent ( ) [inline], [virtual]
```

Reimplemented in [ROOTWriter](#).

Definition at line 32 of file [Interface.h](#).

```
00032 {}
```

#### 4.10.3.3 endFrame()

```
virtual void Interface::endFrame ( ) [inline], [virtual]
```

Reimplemented in [ROOTWriter](#).

Definition at line 36 of file [Interface.h](#).

```
00036 {}
```

#### 4.10.3.4 endPad()

```
virtual void Interface::endPad ( ) [inline], [virtual]
```

Reimplemented in [ROOTWriter](#).

Definition at line 38 of file [Interface.h](#).

```
00038 {}
```

#### 4.10.3.5 log()

```
std::shared_ptr< spdlog::logger > & Interface::log ( ) [inline]
```

Definition at line 39 of file [Interface.h](#).

```
00039 { return m_Logger; }
```

#### 4.10.3.6 setLogger()

```
void Interface::setLogger (
    const std::shared_ptr< spdlog::logger > & logger ) [inline]
```

Definition at line 40 of file [Interface.h](#).

```
00040 { m_Logger = logger; }
```

#### 4.10.3.7 startDIF()

```
virtual void Interface::startDIF ( ) [inline], [virtual]
```

Reimplemented in [ROOTWriter](#).

Definition at line 33 of file [Interface.h](#).

```
00033 {}
```

#### 4.10.3.8 startEvent()

```
virtual void Interface::startEvent ( ) [inline], [virtual]
```

Reimplemented in [ROOTWriter](#).

Definition at line 31 of file [Interface.h](#).

```
00031 {}
```

#### 4.10.3.9 startFrame()

```
virtual void Interface::startFrame ( ) [inline], [virtual]
```

Reimplemented in [ROOTWriter](#).

Definition at line 35 of file [Interface.h](#).

```
00035 {}
```

#### 4.10.3.10 startPad()

```
virtual void Interface::startPad ( ) [inline], [virtual]
```

Reimplemented in [ROOTWriter](#).

Definition at line 37 of file [Interface.h](#).

```
00037 {}
```

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

- [libs/core/include/Interface.h](#)

## 4.11 RawBufferNavigator Class Reference

```
#include <libs/core/include/RawBufferNavigator.h>
```



## Public Member Functions

- [RawBufferNavigator](#) ()=default
- [~RawBufferNavigator](#) ()=default
- [RawBufferNavigator](#) (const [Buffer](#) &b, const int &start=-1)
- void [setBuffer](#) (const [Buffer](#) &b, const int &start=-1)
- std::uint8\_t [getDetectorID](#) ()
- bool [validBuffer](#) ()
- std::uint32\_t [getStartOfDIF](#) ()
- unsigned char \* [getDIFBufferStart](#) ()
- std::uint32\_t [getDIFBufferSize](#) ()
- [Buffer](#) [getDIFBuffer](#) ()
- [DIFPtr](#) & [getDIFPtr](#) ()
- std::uint32\_t [getEndOfDIFData](#) ()
- std::uint32\_t [getSizeAfterDIFPtr](#) ()
- std::uint32\_t [getDIF\\_CRC](#) ()
- bool [hasSlowControlData](#) ()
- [Buffer](#) [getSCBuffer](#) ()
- bool [badSCData](#) ()
- [Buffer](#) [getEndOfAllData](#) ()

## Static Public Member Functions

- static void [StartAt](#) (const int &start)

### 4.11.1 Detailed Description

Definition at line 12 of file [RawBufferNavigator.h](#).

### 4.11.2 Constructor & Destructor Documentation

#### 4.11.2.1 RawBufferNavigator() [1/2]

```
RawBufferNavigator::RawBufferNavigator ( ) [default]
```

#### 4.11.2.2 ~RawBufferNavigator()

```
RawBufferNavigator::~~RawBufferNavigator ( ) [default]
```

#### 4.11.2.3 RawBufferNavigator() [2/2]

```
RawBufferNavigator::RawBufferNavigator (
    const Buffer & b,
    const int & start = -1 ) [explicit]
```

Definition at line 16 of file [RawBufferNavigator.cc](#).

```
00016 : m_Buffer(b) { setBuffer(b, start); }
```

### 4.11.3 Member Function Documentation

#### 4.11.3.1 badSCData()

```
bool RawBufferNavigator::badSCData ( )
```

Definition at line 57 of file [RawBufferNavigator.cc](#).

```
00058 {
00059     setSCBuffer();
00060     return m_BadSCdata;
00061 }
```

#### 4.11.3.2 getDetectorID()

```
std::uint8_t RawBufferNavigator::getDetectorID ( )
```

Definition at line 18 of file [RawBufferNavigator.cc](#).

```
00018 { return m_Buffer[0]; }
```

#### 4.11.3.3 getDIF\_CRC()

```
std::uint32_t RawBufferNavigator::getDIF_CRC ( )
```

Definition at line 40 of file [RawBufferNavigator.cc](#).

```
00041 {
00042     uint32_t i{getEndOfDIFData()};
00043     uint32_t ret{0};
00044     ret |= (m_Buffer.begin()[i - 2]) << 8);
00045     ret |= m_Buffer.begin()[i - 1];
00046     return ret;
00047 }
```

#### 4.11.3.4 getDIFBuffer()

```
Buffer RawBufferNavigator::getDIFBuffer ( )
```

Definition at line 28 of file [RawBufferNavigator.cc](#).

```
00028 { return Buffer(getDIFBufferStart(), getDIFBufferSize()); }
```

#### 4.11.3.5 getDIFBufferSize()

```
std::uint32_t RawBufferNavigator::getDIFBufferSize ( )
```

Definition at line 26 of file [RawBufferNavigator.cc](#).

```
00026 { return m_Buffer.size() - m_DIFstartIndex; }
```

#### 4.11.3.6 getDIFBufferStart()

```
unsigned char * RawBufferNavigator::getDIFBufferStart ( )
```

Definition at line 24 of file [RawBufferNavigator.cc](#).

```
00024 { return &(m_Buffer.begin()[m_DIFstartIndex]); }
```

#### 4.11.3.7 getDIFPtr()

```
DIFPtr & RawBufferNavigator::getDIFPtr ( )
```

Definition at line 30 of file [RawBufferNavigator.cc](#).

```
00031 {
00032     m_TheDIFPtr.setBuffer(getDIFBufferStart(), getDIFBufferSize());
00033     return m_TheDIFPtr;
00034 }
```

#### 4.11.3.8 getEndOfAllData()

```
Buffer RawBufferNavigator::getEndOfAllData ( )
```

Definition at line 96 of file [RawBufferNavigator.cc](#).

```
00097 {
00098     setSCBuffer();
00099     if(hasSlowControlData() && !m_BadSCdata) { return Buffer(&(m_SCbuffer.begin()[m_SCbuffer.size()]),
00099         getSizeAfterDIFPtr() - 3 - m_SCbuffer.size()); }
00100     else
00101         return Buffer(&(getDIFBufferStart()[getEndOfDIFData()]), getSizeAfterDIFPtr() - 3); // remove the
00101         2 bytes for CRC and the DIF trailer
00102 }
```

#### 4.11.3.9 getEndOfDIFData()

```
std::uint32_t RawBufferNavigator::getEndOfDIFData ( )
```

Definition at line 36 of file [RawBufferNavigator.cc](#).

```
00036 { return getDIFPtr().getGetFramePtrReturn() + 3; }
```

#### 4.11.3.10 getSCBuffer()

`Buffer RawBufferNavigator::getSCBuffer ( )`

Definition at line 51 of file [RawBufferNavigator.cc](#).

```
00052 {
00053     setSCBuffer();
00054     return m_SCbuffer;
00055 }
```

#### 4.11.3.11 getSizeAfterDIFPtr()

`std::uint32_t RawBufferNavigator::getSizeAfterDIFPtr ( )`

Definition at line 38 of file [RawBufferNavigator.cc](#).

```
00038 { return getDIFBufferSize() - getDIFPtr().getGetFramePtrReturn(); }
```

#### 4.11.3.12 getStartOfDIF()

`std::uint32_t RawBufferNavigator::getStartOfDIF ( )`

Definition at line 22 of file [RawBufferNavigator.cc](#).

```
00022 { return m_DIFstartIndex; }
```

#### 4.11.3.13 hasSlowControlData()

`bool RawBufferNavigator::hasSlowControlData ( )`

Definition at line 49 of file [RawBufferNavigator.cc](#).

```
00049 { return getDIFBufferStart()[getEndOfDIFData()] == 0xb1; }
```

#### 4.11.3.14 setBuffer()

`void RawBufferNavigator::setBuffer (`  
     `const Buffer & b,`  
     `const int & start = -1 ) [inline]`

Definition at line 18 of file [RawBufferNavigator.h](#).

```
00019 {
00020     m_BadSCdata = false;
00021     m_Buffer     = b;
00022     StartAt(start);
00023     m_DIFstartIndex = DIFUnpacker::getStartOfDIF(m_Buffer.begin(), m_Buffer.size(), m_Start);
00024 }
```

## 4.11.3.15 StartAt()

```
void RawBufferNavigator::StartAt (
    const int & start ) [static]
```

Definition at line 11 of file [RawBufferNavigator.cc](#).

```
00012 {
00013     if(start >= 0) m_Start = start;
00014 }
```

## 4.11.3.16 validBuffer()

```
bool RawBufferNavigator::validBuffer ( )
```

Definition at line 20 of file [RawBufferNavigator.cc](#).

```
00020 { return m_DIFstartIndex != 0; }
```

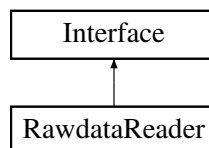
The documentation for this class was generated from the following files:

- [libs/core/include/RawBufferNavigator.h](#)
- [libs/core/src/RawBufferNavigator.cc](#)

## 4.12 RawdataReader Class Reference

```
#include <libs/interface/RawDataReader/include/RawdataReader.h>
```

Inheritance diagram for RawdataReader:



## Public Member Functions

- [RawdataReader](#) (const char \*fileName)
- void [start](#) ()
- void [end](#) ()
- float [getFileSize](#) ()
- void [openFile](#) (const std::string &fileName)
- void [closeFile](#) ()
- bool [nextEvent](#) ()
- bool [nextDIFbuffer](#) ()
- const [Buffer](#) & [getSDHCALBuffer](#) ()
- virtual [~RawdataReader](#) ()

## Static Public Member Functions

- static void [setDefaultBufferSize](#) (const std::size\_t &size)

### 4.12.1 Detailed Description

Definition at line 17 of file [RawdataReader.h](#).

### 4.12.2 Constructor & Destructor Documentation

#### 4.12.2.1 RawdataReader()

```
RawdataReader::RawdataReader (
    const char * fileName ) [explicit]
```

Definition at line 16 of file [RawdataReader.cc](#).

```
00017 {
00018     m_buf.reserve(m_BufferSize);
00019     m_Filename = fileName;
00020 }
```

#### 4.12.2.2 ~RawdataReader()

```
virtual RawdataReader::~~RawdataReader ( ) [inline], [virtual]
```

Definition at line 29 of file [RawdataReader.h](#).

```
00029 { closeFile(); }
```

### 4.12.3 Member Function Documentation

#### 4.12.3.1 closeFile()

```
void RawdataReader::closeFile ( )
```

Definition at line 42 of file [RawdataReader.cc](#).

```
00043 {
00044     try
00045     {
00046         if(m_FileStream.is_open()) m_FileStream.close();
00047     }
00048     catch(const std::ios_base::failure& e)
00049     {
00050         log()->error("Caught an ios_base::failure in closeFile : {} {}", e.what(), e.code().value());
00051         throw;
00052     }
00053 }
```

#### 4.12.3.2 end()

```
void RawdataReader::end ( )
```

Definition at line 24 of file [RawdataReader.cc](#).

```
00024 { closeFile(); }
```

#### 4.12.3.3 getFileSize()

```
float RawdataReader::getFileSize ( )
```

Definition at line 126 of file [RawdataReader.cc](#).

```
00126 { return m_FileSize; }
```

#### 4.12.3.4 getSDHCALBuffer()

```
const Buffer & RawdataReader::getSDHCALBuffer ( )
```

Definition at line 118 of file [RawdataReader.cc](#).

```
00119 {  
00120     uncompress();  
00121     return m_Buffer;  
00122 }
```

#### 4.12.3.5 nextDIFbuffer()

```
bool RawdataReader::nextDIFbuffer ( )
```

Definition at line 91 of file [RawdataReader.cc](#).

```
00092 {  
00093     try  
00094     {  
00095         static int DIF_processed{0};  
00096         if(DIF_processed >= m_NumberOfDIF)  
00097         {  
00098             DIF_processed = 0;  
00099             return false;  
00100         }  
00101         else  
00102         {  
00103             DIF_processed++;  
00104             std::uint32_t bsize{0};  
00105             m_FileStream.read(reinterpret_cast<char*>(&bsize), sizeof(std::uint32_t));  
00106             m_FileStream.read(reinterpret_cast<char*>(&m_buf[0]), bsize);  
00107             m_Buffer = Buffer(m_buf);  
00108         }  
00109     }  
00110     catch(const std::ios_base::failure& e)  
00111     {  
00112         log()->error("Caught an ios_base::failure in openFile : {}", e.what());  
00113         return false;  
00114     }  
00115     return true;  
00116 }
```

#### 4.12.3.6 nextEvent()

```
bool RawdataReader::nextEvent ( )
```

Definition at line 76 of file [RawdataReader.cc](#).

```
00077 {
00078     try
00079     {
00080         m_FileStream.read(reinterpret_cast<char*>(&m_EventNumber), sizeof(std::uint32_t));
00081         m_FileStream.read(reinterpret_cast<char*>(&m_NumberOfDIF), sizeof(std::uint32_t));
00082     }
00083     catch(const std::ios_base::failure& e)
00084     {
00085         log()->error("Caught an ios_base::failure in openFile : {}", e.what());
00086         return false;
00087     }
00088     return true;
00089 }
```

#### 4.12.3.7 openFile()

```
void RawdataReader::openFile (
    const std::string & fileName )
```

Definition at line 55 of file [RawdataReader.cc](#).

```
00056 {
00057     try
00058     {
00059         m_FileStream.rdbuf()->pubsetbuf(0, 0);
00060         m_FileStream.exceptions(std::ifstream::failbit | std::ifstream::badbit);
00061         m_FileStream.open(fileName.c_str(), std::ios::in | std::ios::binary | std::ios::ate); // Start at
the end to directly calculate the size of the file then come back to beginning
00062         m_FileStream.rdbuf()->pubsetbuf(0, 0);
00063         if(m_FileStream.is_open())
00064         {
00065             setFileSize(m_FileStream.tellg());
00066             m_FileStream.seekg(0, std::ios::beg);
00067         }
00068     }
00069     catch(const std::ios_base::failure& e)
00070     {
00071         log()->error("Caught an ios_base::failure in openFile : {}", e.what());
00072         throw;
00073     }
00074 }
```

#### 4.12.3.8 setDefaultBufferSize()

```
void RawdataReader::setDefaultBufferSize (
    const std::size_t & size ) [static]
```

Definition at line 14 of file [RawdataReader.cc](#).

```
00014 { m_BufferSize = size; }
```



#### 4.12.3.9 start()

```
void RawdataReader::start ( )
```

Definition at line 22 of file [RawdataReader.cc](#).

```
00022 { openFile(m_Filename); }
```

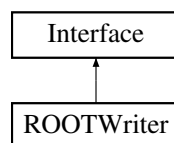
The documentation for this class was generated from the following files:

- [libs/interface/RawDataReader/include/RawdataReader.h](#)
- [libs/interface/RawDataReader/src/RawdataReader.cc](#)

## 4.13 ROOTWriter Class Reference

```
#include <libs/interface/ROOT/include/ROOTWriter.h>
```

Inheritance diagram for ROOTWriter:



### Public Member Functions

- [ROOTWriter](#) ()
- void [setFilename](#) (const std::string &)
- void [start](#) ()
- void [processDIF](#) (const [DIFPtr](#) &)
- void [processFrame](#) (const [DIFPtr](#) &, const std::uint32\_t &frameIndex)
- void [processPadInFrame](#) (const [DIFPtr](#) &, const std::uint32\_t &frameIndex, const std::uint32\_t &channelIndex)
- void [processSlowControl](#) (const [Buffer](#) &)
- void [end](#) ()
- virtual void [startEvent](#) ()
- virtual void [endEvent](#) ()
- virtual void [startDIF](#) ()
- virtual void [endDIF](#) ()
- virtual void [startFrame](#) ()
- virtual void [endFrame](#) ()
- virtual void [startPad](#) ()
- virtual void [endPad](#) ()

#### 4.13.1 Detailed Description

Definition at line 18 of file [ROOTWriter.h](#).

## 4.13.2 Constructor & Destructor Documentation

### 4.13.2.1 ROOTWriter()

```
ROOTWriter::ROOTWriter ( )
```

Definition at line 10 of file [ROOTWriter.cc](#).

```
00010 {}
```

## 4.13.3 Member Function Documentation

### 4.13.3.1 end()

```
void ROOTWriter::end ( )
```

Definition at line 19 of file [ROOTWriter.cc](#).

```
00020 {  
00021     if(m_Tree) m_Tree->Write();  
00022     if(m_File)  
00023     {  
00024         m_File->Write();  
00025         m_File->Close();  
00026     }  
00027     if(m_File) delete m_File;  
00028 }
```

### 4.13.3.2 endDIF()

```
void ROOTWriter::endDIF ( ) [virtual]
```

Reimplemented from [Interface](#).

Definition at line 67 of file [ROOTWriter.cc](#).

```
00068 {  
00069     m_Event->addDIF(*m_DIF);  
00070     delete m_DIF;  
00071 }
```

### 4.13.3.3 endEvent()

```
void ROOTWriter::endEvent ( ) [virtual]
```

Reimplemented from [Interface](#).

Definition at line 59 of file [ROOTWriter.cc](#).

```
00060 {  
00061     m_Tree->Fill();  
00062     if(m_Event) delete m_Event;  
00063 }
```

#### 4.13.3.4 endFrame()

```
void ROOTWriter::endFrame ( ) [virtual]
```

Reimplemented from [Interface](#).

Definition at line 75 of file [ROOTWriter.cc](#).

```
00076 {
00077     if(m_Hit->getThreshold() != 0) { m_DIF->addHit(*m_Hit); }
00078     delete m_Hit;
00079 }
```

#### 4.13.3.5 endPad()

```
void ROOTWriter::endPad ( ) [virtual]
```

Reimplemented from [Interface](#).

Definition at line 83 of file [ROOTWriter.cc](#).

```
00083 {}
```

#### 4.13.3.6 processDIF()

```
void ROOTWriter::processDIF (
    const DIFPtr & d )
```

Definition at line 30 of file [ROOTWriter.cc](#).

```
00031 {
00032     m_DIF->setID(d.getDIFid());
00033     m_DIF->setDTC(d.getDTC());
00034     m_DIF->setGTC(d.getGTC());
00035     m_DIF->setDIFBCID(d.getBCID());
00036     m_DIF->setAbsoluteBCID(d.getAbsoluteBCID());
00037 }
```

#### 4.13.3.7 processFrame()

```
void ROOTWriter::processFrame (
    const DIFPtr & d,
    const std::uint32_t & frameIndex )
```

Definition at line 39 of file [ROOTWriter.cc](#).

```
00040 {
00041     m_Hit->setDIF(d.getDIFid());
00042     m_Hit->setASIC(d.getASICid(frameIndex));
00043     m_Hit->setDTC(d.getDTC());
00044     m_Hit->setGTC(d.getGTC());
00045     m_Hit->setDIFBCID(d.getBCID());
00046     m_Hit->setAbsoluteBCID(d.getAbsoluteBCID());
00047     m_Hit->setFrameBCID(d.getFrameBCID(frameIndex));
00048     m_Hit->setTimestamp(d.getFrameTimeToTrigger(frameIndex));
00049 }
```

#### 4.13.3.8 processPadInFrame()

```
void ROOTWriter::processPadInFrame (
    const DIFPtr & d,
    const std::uint32_t & frameIndex,
    const std::uint32_t & channelIndex )
```

Definition at line 51 of file [ROOTWriter.cc](#).

```
00052 {
00053     m_Hit->setChannel (static_cast<std::uint8_t>(channelIndex));
00054     m_Hit->setThreshold (static_cast<std::uint8_t>(d.getThresholdStatus (frameIndex, channelIndex)));
00055 }
```

#### 4.13.3.9 processSlowControl()

```
void ROOTWriter::processSlowControl (
    const Buffer & ) [inline]
```

Definition at line 29 of file [ROOTWriter.h](#).

```
00029 { ; }
```

#### 4.13.3.10 setFilename()

```
void ROOTWriter::setFilename (
    const std::string & filename )
```

Definition at line 8 of file [ROOTWriter.cc](#).

```
00008 { m_Filename = filename; }
```

#### 4.13.3.11 start()

```
void ROOTWriter::start ( )
```

Definition at line 12 of file [ROOTWriter.cc](#).

```
00013 {
00014     m_File = TFile::Open(m_Filename.c_str(), "RECREATE", m_Filename.c_str(),
        ROOT::CompressionSettings (ROOT::kLZMA, 9));
00015     m_Tree = new TTree("RawData", "Raw SDHCAL data tree");
00016     m_Tree->Branch("Events", &m_Event, 10, 0);
00017 }
```

#### 4.13.3.12 startDIF()

```
void ROOTWriter::startDIF ( ) [virtual]
```

Reimplemented from [Interface](#).

Definition at line 65 of file [ROOTWriter.cc](#).

```
00065 { m_DIF = new DIF(); }
```

#### 4.13.3.13 startEvent()

```
void ROOTWriter::startEvent ( ) [virtual]
```

Reimplemented from [Interface](#).

Definition at line 57 of file [ROOTWriter.cc](#).

```
00057 { m_Event = new Event(); }
```

#### 4.13.3.14 startFrame()

```
void ROOTWriter::startFrame ( ) [virtual]
```

Reimplemented from [Interface](#).

Definition at line 73 of file [ROOTWriter.cc](#).

```
00073 { m_Hit = new Hit(); }
```

#### 4.13.3.15 startPad()

```
void ROOTWriter::startPad ( ) [virtual]
```

Reimplemented from [Interface](#).

Definition at line 81 of file [ROOTWriter.cc](#).

```
00081 {}
```

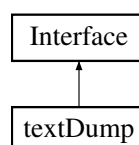
The documentation for this class was generated from the following files:

- [libs/interface/ROOT/include/ROOTWriter.h](#)
- [libs/interface/ROOT/src/ROOTWriter.cc](#)

## 4.14 textDump Class Reference

```
#include <libs/interface/Dump/include/textDump.h>
```

Inheritance diagram for textDump:



## Public Member Functions

- [textDump](#) ()
- void [start](#) ()
- void [processDIF](#) (const [DIFPtr](#) &)
- void [processFrame](#) (const [DIFPtr](#) &, uint32\_t frameIndex)
- void [processPadInFrame](#) (const [DIFPtr](#) &, uint32\_t frameIndex, uint32\_t channelIndex)
- void [processSlowControl](#) ([Buffer](#))
- void [end](#) ()
- std::shared\_ptr< spdlog::logger > & [print](#) ()
- void [setLevel](#) (const spdlog::level::level\_enum &level)

### 4.14.1 Detailed Description

Definition at line 14 of file [textDump.h](#).

### 4.14.2 Constructor & Destructor Documentation

#### 4.14.2.1 textDump()

```
textDump::textDump ( ) [inline]
```

Definition at line 17 of file [textDump.h](#).

```
00018 {
00019     m_InternalLogger = std::make_shared<spdlog::logger>("textDump",
        std::make_shared<spdlog::sinks::stdout_color_sink_mt>());
00020     m_InternalLogger->set_level(spdlog::level::trace);
00021 }
```

### 4.14.3 Member Function Documentation

#### 4.14.3.1 end()

```
void textDump::end ( )
```

Definition at line 25 of file [textDump.cc](#).

```
00025 { print()->info("textDump end of report"); }
```

#### 4.14.3.2 print()

```
std::shared_ptr< spdlog::logger > & textDump::print ( ) [inline]
```

Definition at line 28 of file [textDump.h](#).

```
00028 { return m_InternalLogger; }
```

#### 4.14.3.3 processDIF()

```
void textDump::processDIF (
    const DIFPtr & d )
```

Definition at line 11 of file [textDump.cc](#).

```
00011 { print()->info("DIF_ID : {}, DTC : {}, GTC : {}, DIF BCID {}, Absolute BCID : {}, Nbr frames {}",
    d.getDIFid(), d.getDTC(), d.getGTC(), d.getBCID(), d.getAbsoluteBCID(), d.getNumberOfFrames()); }
```

#### 4.14.3.4 processFrame()

```
void textDump::processFrame (
    const DIFPtr & d,
    uint32_t frameIndex )
```

Definition at line 13 of file [textDump.cc](#).

```
00014 {
00015     print()->info("\tDisplaying frame number {} : ASIC ID {}, Frame BCID {}, Frame Time To Trigger
    (a.k.a timestamp) is {}", frameIndex, d.getASICid(frameIndex), d.getFrameBCID(frameIndex),
    d.getFrameTimeToTrigger(frameIndex));
00016 }
```

#### 4.14.3.5 processPadInFrame()

```
void textDump::processPadInFrame (
    const DIFPtr & d,
    uint32_t frameIndex,
    uint32_t channelIndex )
```

Definition at line 18 of file [textDump.cc](#).

```
00019 {
00020     if(d.getThresholdStatus(frameIndex, channelIndex) > 0) { print()->info("\t\tChannel {}, Threshold
    {} ", channelIndex, d.getThresholdStatus(frameIndex, channelIndex)); }
00021 }
```

#### 4.14.3.6 processSlowControl()

```
void textDump::processSlowControl (
    Buffer )
```

Definition at line 23 of file [textDump.cc](#).

```
00023 { print()->error("textDump::processSlowControl not implemented yet."); }
```

#### 4.14.3.7 setLevel()

```
void textDump::setLevel (
    const spdlog::level::level_enum & level ) [inline]
```

Definition at line 29 of file [textDump.h](#).

```
00029 { m_InternalLogger->set_level(level); }
```

#### 4.14.3.8 start()

```
void textDump::start ( )
```

Definition at line 9 of file [textDump.cc](#).

```
00009 { print()->info("Will dump bunch of DIF data"); }
```

The documentation for this class was generated from the following files:

- [libs/interface/Dump/include/textDump.h](#)
- [libs/interface/Dump/src/textDump.cc](#)

## 4.15 Timer Class Reference

```
#include <libs/core/include/Timer.h>
```

### Public Member Functions

- void [start](#) ()
- void [stop](#) ()
- float [getElapsedTime](#) ()

#### 4.15.1 Detailed Description

Definition at line 10 of file [Timer.h](#).

#### 4.15.2 Member Function Documentation

##### 4.15.2.1 getElapsedTime()

```
float Timer::getElapsedTime ( ) [inline]
```

Definition at line 15 of file [Timer.h](#).

```
00015 { return std::chrono::duration_cast<std::chrono::microseconds>(m_StopTime - m_StartTime).count(); }
```



#### 4.15.2.2 start()

```
void Timer::start ( ) [inline]
```

Definition at line 13 of file [Timer.h](#).

```
00013 { m_StartTime = std::chrono::high_resolution_clock::now(); }
```

#### 4.15.2.3 stop()

```
void Timer::stop ( ) [inline]
```

Definition at line 14 of file [Timer.h](#).

```
00014 { m_StopTime = std::chrono::high_resolution_clock::now(); }
```

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

- [libs/core/include/Timer.h](#)



## Chapter 5

# File Documentation

### 5.1 libs/core/include/Bits.h File Reference

```
#include <cstdint>
#include <iosfwd>
```

#### Typedefs

- using [bit8\\_t](#) = std::uint8\_t
- using [bit16\\_t](#) = std::uint16\_t
- using [bit32\\_t](#) = std::uint32\_t
- using [bit64\\_t](#) = std::uint64\_t

#### Functions

- std::ostream & [operator<<](#) (std::ostream &os, const [bit8\\_t](#) &c)  
*Stream operator to print bit8\_t aka std::uint8\_t and not char or unsigned char.*

#### 5.1.1 Detailed Description

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Definition in file [Bits.h](#).

#### 5.1.2 Typedef Documentation

#### 5.1.2.1 `bit16_t`

```
using bit16_t = std::uint16_t
```

Definition at line 11 of file [Bits.h](#).

#### 5.1.2.2 `bit32_t`

```
using bit32_t = std::uint32_t
```

Definition at line 12 of file [Bits.h](#).

#### 5.1.2.3 `bit64_t`

```
using bit64_t = std::uint64_t
```

Definition at line 13 of file [Bits.h](#).

#### 5.1.2.4 `bit8_t`

```
using bit8_t = std::uint8_t
```

Definition at line 10 of file [Bits.h](#).

### 5.1.3 Function Documentation

#### 5.1.3.1 `operator<<()`

```
std::ostream & operator<< (  
    std::ostream & os,  
    const bit8_t & c )
```

Stream operator to print `bit8_t` aka `std::uint8_t` and not char or unsigned char.

Definition at line 8 of file [Bits.cc](#).

```
00008 { return os << c + 0; }
```

## 5.2 Bits.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006
00007 #include <stdint>
00008 #include <iosfwd>
00009
00010 using bit8_t = std::uint8_t; /*<! type to represent 8bits words (1 byte) */
00011 using bit16_t = std::uint16_t; /*<! type to represent 16bits words (2 bytes) */
00012 using bit32_t = std::uint32_t; /*<! type to represent 32bits words (4 bytes) */
00013 using bit64_t = std::uint64_t; /*<! type to represent 64bits words (8 bytes) */
00014
00016 std::ostream& operator<<(std::ostream& os, const bit8_t& c);
```

## 5.3 libs/core/include/Buffer.h File Reference

```
#include "Bits.h"
#include <array>
#include <vector>
```

### Classes

- class [Buffer](#)

### 5.3.1 Detailed Description

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#### See also

<https://github.com/apingault/Trivent4HEP>

Definition in file [Buffer.h](#).

## 5.4 Buffer.h

[Go to the documentation of this file.](#)

```
00001
00006 #pragma once
00007
00008 #include "Bits.h"
00009
00010 #include <array>
00011 #include <vector>
00012
00013 class Buffer
00014 {
00015 public:
00016     Buffer() : m_Buffer(nullptr), m_Size(0), m_Capacity(0) {}
00017     virtual ~Buffer() {}
00018     Buffer(const bit8_t b[], const std::size_t& i) : m_Buffer(const_cast<bit8_t*>(&b[0])), m_Size(i),
m_Capacity(i) {}
```

```

00019   Buffer(const char b[], const std::size_t& i) : m_Buffer(const_cast<bit8_t*>(reinterpret_cast<const
bit8_t*>(&b[0])), m_Size(i * sizeof(char)), m_Capacity(i * sizeof(char)) {}
00020   template<typename T> Buffer(const std::vector<T>& rawdata) :
m_Buffer(const_cast<bit8_t*>(reinterpret_cast<const bit8_t*>(rawdata.data()))), m_Size(rawdata.size()
* sizeof(T)), m_Capacity(rawdata.capacity() * sizeof(T)) {}
00021   template<typename T, std::size_t N> Buffer(const std::array<T, N>& rawdata) :
m_Buffer(const_cast<bit8_t*>(reinterpret_cast<const bit8_t*>(rawdata.data()))), m_Size(rawdata.size()
* sizeof(T)), m_Capacity(rawdata.size() * sizeof(T)) {}
00022
00023   std::size_t size()const { return m_Size; }
00024   std::size_t capacity()const { return m_Capacity; }
00025
00026   void set(unsigned char* b) { m_Buffer = b; }
00027   bit8_t* begin()const { return m_Buffer; }
00028   bit8_t* end()const { return m_Buffer + m_Size; }
00029   bit8_t& operator[](const std::size_t& pos) { return m_Buffer[pos]; }
00030   bit8_t& operator[](const std::size_t& pos)const { return m_Buffer[pos]; }
00031
00032   void setSize(const std::size_t& size) { m_Size = size; }
00033
00034 private:
00035   bit8_t* m_Buffer{nullptr};
00036   std::size_t m_Size{0};
00037   std::size_t m_Capacity{0};
00038 };

```

## 5.5 libs/core/include/BufferLooper.h File Reference

```

#include "Buffer.h"
#include "BufferLooperCounter.h"
#include "DetectorId.h"
#include "Formatters.h"
#include "RawBufferNavigator.h"
#include "Timer.h"
#include "Words.h"
#include <algorithm>
#include <cassert>
#include <memory>
#include <spdlog/sinks/null_sink.h>
#include <spdlog/spdlog.h>
#include <vector>

```

### Classes

- class [BufferLooper< SOURCE, DESTINATION >](#)

### 5.5.1 Detailed Description

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Definition in file [BufferLooper.h](#).

## 5.6 BufferLooper.h

[Go to the documentation of this file.](#)

```

00001
00005 #pragma once
00006
00007 #include "Buffer.h"
00008 #include "BufferLooperCounter.h"
00009 #include "DetectorId.h"
00010 #include "Formatters.h"
00011 #include "RawBufferNavigator.h"
00012 #include "Timer.h"
00013 #include "Words.h"
00014
00015 #include <algorithm>
00016 #include <cassert>
00017 #include <memory>
00018 #include <spdlog/sinks/null_sink.h>
00019 #include <spdlog/spdlog.h>
00020 #include <vector>
00021 // function to loop on buffers
00022
00023 template<typename SOURCE, typename DESTINATION> class BufferLooper
00024 {
00025 public:
00026     BufferLooper(SOURCE& source, DESTINATION& dest, bool debug = false) : m_Source(source),
00027     m_Destination(dest), m_Debug(debug)
00028     {
00029         m_Logger = spdlog::create<spdlog::sinks::null_sink_mt>("streamout");
00030         if(!spdlog::get("streamout")) { spdlog::register_logger(m_Logger); }
00031         m_Source.setLogger(m_Logger);
00032         m_Destination.setLogger(m_Logger);
00033     }
00034     void addSink(const spdlog::sink_ptr& sink, const spdlog::level::level_enum& level =
00035     spdlog::get_level())
00036     {
00037         sink->set_level(level);
00038         m_Sinks.push_back(sink);
00039         m_Logger = std::make_shared<spdlog::logger>("streamout", begin(m_Sinks), end(m_Sinks));
00040         m_Source.setLogger(m_Logger);
00041         m_Destination.setLogger(m_Logger);
00042     }
00043     void loop(const std::uint32_t& m_NbrEventsToProcess = 0)
00044     {
00045         Timer timer;
00046         timer.start();
00047         m_Source.start();
00048         m_Destination.start();
00049         RawBufferNavigator bufferNavigator;
00050         while(m_Source.nextEvent() && m_NbrEventsToProcess >= m_NbrEvents)
00051         {
00052             m_Source.startEvent();
00053             m_Destination.startEvent();
00054
00055             m_Logger->warn("====* Event number {} *====", m_NbrEvents);
00056             while(m_Source.nextDIFbuffer())
00057             {
00058                 const Buffer& buffer = m_Source.getSDHCALBuffer();
00059                 bufferNavigator.setBuffer(buffer);
00060
00061                 bit8_t* debug_variable_1 = buffer.end();
00062                 bit8_t* debug_variable_2 = bufferNavigator.getDIFBuffer().end();
00063                 if(debug_variable_1 != debug_variable_2) m_Logger->info("DIF BUFFER END {} {}",
00064                 fmt::ptr(debug_variable_1), fmt::ptr(debug_variable_2));
00065                 if(m_Debug) assert(debug_variable_1 == debug_variable_2);
00066
00067                 if(std::find(m_DetectorIDs.begin(), m_DetectorIDs.end(),
00068                 static_cast<DetectorID>(bufferNavigator.getDetectorID())) == m_DetectorIDs.end())
00069                 {
00070                     m_Logger->trace("{} ", bufferNavigator.getDetectorID());
00071                     continue;
00072                 }
00073
00074                 m_Source.startDIF();
00075                 m_Destination.startDIF();
00076
00077                 uint32_t idstart = bufferNavigator.getStartOfDIF();
00078                 if(m_Debug && idstart == 0) m_Logger->info(to_hex(buffer));
00079                 c.DIFStarter[idstart]++;
00080                 if(!bufferNavigator.validBuffer())
00081                 {
00082                     m_Logger->error("!bufferNavigator.validBuffer()");
00083                     continue;
00084                 }
00085             }
00086         }
00087     }

```

```

00086     }
00087     DIFPtr& d = bufferNavigator.getDIFPtr();
00088     c.DIFPtrValueAtReturnedPos[bufferNavigator.getDIFBufferStart()[d.getGetFramePtrReturn()]]++;
00089     if(m_Debug) assert(bufferNavigator.getDIFBufferStart()[d.getGetFramePtrReturn()] == 0xa0);
00090     c.SizeAfterDIFPtr[bufferNavigator.getSizeAfterDIFPtr()]++;
00091     m_Destination.processDIF(d);
00092     for(std::size_t i = 0; i < d.getNumberOfFrames(); ++i)
00093     {
00094         m_Source.startFrame();
00095         m_Destination.startFrame();
00096         m_Destination.processFrame(d, i);
00097         for(std::size_t j = 0; j < DU::NUMBER_PAD; ++j)
00098         {
00099             m_Source.startPad();
00100             m_Destination.startPad();
00101             m_Destination.processPadInFrame(d, i, j);
00102             m_Source.endPad();
00103             m_Destination.endPad();
00104         }
00105         m_Source.endFrame();
00106         m_Destination.endFrame();
00107     }
00108
00109     bool processSC = false;
00110     if(bufferNavigator.hasSlowControlData())
00111     {
00112         c.hasSlowControl++;
00113         processSC = true;
00114     }
00115     if(bufferNavigator.badSCData())
00116     {
00117         c.hasBadSlowControl++;
00118         processSC = false;
00119     }
00120     if(processSC) { m_Destination.processSlowControl(bufferNavigator.getSCBuffer()); }
00121
00122     Buffer eod = bufferNavigator.getEndOfAllData();
00123     c.SizeAfterAllData[eod.size()]++;
00124     bit8_t* debug_variable_3 = eod.end();
00125     if(debug_variable_1 != debug_variable_3) m_Logger->info("END DATA BUFFER END {} {}",
00126         fmt::ptr(debug_variable_1), fmt::ptr(debug_variable_3));
00127     if(m_Debug) assert(debug_variable_1 == debug_variable_3);
00128     if(eod.size() != 0) m_Logger->info("End of Data remaining stuff : {}", to_hex(eod));
00129
00130     int nonzeroCount = 0;
00131     for(bit8_t it = eod.begin(); it != eod.end(); it++)
00132         if(static_cast<int>(*it) != 0) nonzeroCount++;
00133     c.NonZeroValueAtEndOfData[nonzeroCount]++;
00134     m_Source.endDIF();
00135     m_Destination.endDIF();
00136     } // end of DIF while loop
00137     m_Logger->warn("***** Event number {} *****", m_NbrEvents);
00138     m_NbrEvents++;
00139     m_Source.endEvent();
00140     m_Destination.endEvent();
00141     } // end of event while loop
00142     m_Destination.end();
00143     m_Source.end();
00144     timer.stop();
00145     fmt::print("=== elapsed time {}ms ({}ms/event) ===\n", timer.getElapsedTime() / 1000,
00146         timer.getElapsedTime() / (1000 * m_NbrEvents));
00147 }
00148 void printAllCounters() { c.printAllCounters(); }
00149 std::shared_ptr<spdlog::logger> log() { return m_Logger; }
00150
00151 void setDetectorIDs(const std::vector<DetectorID>& detectorIDs) { m_DetectorIDs = detectorIDs; }
00152
00153 private:
00154     std::vector<DetectorID> m_DetectorIDs;
00155     std::shared_ptr<spdlog::logger> m_Logger{nullptr};
00156     std::vector<spdlog::sink_ptr> m_Sinks;
00157     BufferLooperCounter c;
00158     SOURCE& m_Source{nullptr};
00159     DESTINATION& m_Destination{nullptr};
00160     bool m_Debug{false};
00161     std::uint32_t m_NbrEvents{1};
00162 };

```

## 5.7 libs/core/include/BufferLooperCounter.h File Reference

```

#include <map>
#include <memory>

```



```
#include <string>
```

## Classes

- struct [BufferLooperCounter](#)

### 5.7.1 Detailed Description

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Definition in file [BufferLooperCounter.h](#).

## 5.8 BufferLooperCounter.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006
00007 #include <map>
00008 #include <memory>
00009 #include <string>
00010
00011 struct BufferLooperCounter
00012 {
00013 public:
00014     int                hasSlowControl    = 0;
00015     int                hasBadSlowControl = 0;
00016     std::map<int, int> DIFStarter;
00017     std::map<int, int> DIFPtrValueAtReturnedPos;
00018     std::map<int, int> SizeAfterDIFPtr;
00019     std::map<int, int> SizeAfterAllData;
00020     std::map<int, int> NonZeroValusAtEndOfData;
00021
00022     void printCounter(const std::string& description, const std::map<int, int>& m);
00023     void printAllCounters();
00024 };
```

## 5.9 libs/core/include/DetectorId.h File Reference

```
#include <stdint>
```

## Enumerations

- enum class [DetectorID](#) : std::uint16\_t { [HARDROC](#) = 100 , [HARDROC\\_NEW](#) = 150 , [RUNHEADER](#) = 255 }

### 5.9.1 Detailed Description

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Definition in file [DetectorId.h](#).

## 5.9.2 Enumeration Type Documentation

### 5.9.2.1 DetectorID

```
enum class DetectorID : std::uint16_t [strong]
```

#### Enumerator

HARDROC	
HARDROC_NEW	
RUNHEADER	

Definition at line 9 of file [DetectorId.h](#).

```
00010 {
00011     HARDROC      = 100,
00012     HARDROC_NEW  = 150,
00013     RUNHEADER    = 255
00014 };
```

## 5.10 DetectorId.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006
00007 #include <stdint>
00008
00009 enum class DetectorID : std::uint16_t
00010 {
00011     HARDROC      = 100,
00012     HARDROC_NEW  = 150,
00013     RUNHEADER    = 255
00014 };
```

## 5.11 libs/core/include/DIFPtr.h File Reference

```
#include "DIFUnpacker.h"
#include <stdint>
#include <spdlog/spdlog.h>
#include <string>
#include <vector>
```

### Classes

- class [DIFPtr](#)

### 5.11.1 Detailed Description

#### Copyright

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Definition in file [DIFPtr.h](#).

## 5.12 DIFPtr.h

[Go to the documentation of this file.](#)

```

00001
00005 #pragma once
00006
00007 #include "DIFUnpacker.h"
00008
00009 #include <cstdint>
00010 #include <spdlog/spdlog.h>
00011 #include <string>
00012 #include <vector>
00013
00014 class DIFPtr
00015 {
00016 public:
00017     void setBuffer(unsigned char*, const std::uint32_t&);
00018     unsigned char* getPtr() const;
00019     std::uint32_t getGetFramePtrReturn() const;
00020     std::vector<unsigned char*>& getFramesVector();
00021     std::vector<unsigned char*>& getLinesVector();
00022     std::uint32_t getID() const;
00023     std::uint32_t getDTC() const;
00024     std::uint32_t getGTC() const;
00025     std::uint64_t getAbsoluteBCID() const;
00026     std::uint32_t getBCID() const;
00027     std::uint32_t getLines() const;
00028     bool hasLine(const std::uint32_t&) const;
00029     std::uint32_t getTASU1() const;
00030     std::uint32_t getTASU2() const;
00031     std::uint32_t getTDIF() const;
00032     float getTemperatureDIF() const;
00033     float getTemperatureASU1() const;
00034     float getTemperatureASU2() const;
00035     bool hasTemperature() const;
00036     bool hasAnalogReadout() const;
00037     std::uint32_t getNumberOfFrames() const;
00038     unsigned char* getFramePtr(const std::uint32_t&) const;
00039     std::uint32_t getFrameAsicHeader(const std::uint32_t&) const;
00040     std::uint32_t getFrameBCID(const std::uint32_t&) const;
00041     std::uint32_t getFrameTimeToTrigger(const std::uint32_t&) const;
00042     bool getFrameLevel(const std::uint32_t&, const std::uint32_t&, const
std::uint32_t&) const;
00043     // Addition by GG
00044     uint32_t getDIFid() const;
00045     uint32_t getASICid(const std::uint32_t&) const;
00046     uint32_t getThresholdStatus(const std::uint32_t&, const std::uint32_t&) const;
00047
00048 private:
00049     std::uint32_t theSize_{0};
00050     std::uint32_t theGetFramePtrReturn_{0};
00051     unsigned char* theDIF_{nullptr};
00052     std::vector<unsigned char*> theFrames_;
00053     std::vector<unsigned char*> theLines_;
00054 };
00055
00056 inline void DIFPtr::setBuffer(unsigned char* p, const std::uint32_t& max_size)
00057 {
00058     theFrames_.clear();
00059     theLines_.clear();
00060     theSize_ = max_size;
00061     theDIF_ = p;
00062     try
00063     {
00064         theGetFramePtrReturn_ = DIFUnpacker::getFramePtr(theFrames_, theLines_, theSize_, theDIF_);
00065     }
00066     catch(const std::string& e)
00067     {
00068         spdlog::get("streamout")->error(" DIF {} T ? {} {} ", getID(), hasTemperature(), e);

```

```

00069     }
00070 }
00071
00072 inline unsigned char*      DIFPtr::getPtr()const { return theDIF_; }
00073 inline std::uint32_t      DIFPtr::getGetFramePtrReturn()const { return
    theGetFramePtrReturn_; }
00074 inline std::vector<unsigned char*>& DIFPtr::getFramesVector() { return theFrames_; }
00075 inline std::vector<unsigned char*>& DIFPtr::getLinesVector() { return theLines_; }
00076 inline std::uint32_t      DIFPtr::getID()const { return DIFUnpacker::getID(theDIF_); }
00077 inline std::uint32_t      DIFPtr::getDTC()const { return DIFUnpacker::getDTC(theDIF_); }
00078 inline std::uint32_t      DIFPtr::getGTC()const { return DIFUnpacker::getGTC(theDIF_); }
00079 inline std::uint64_t      DIFPtr::getAbsoluteBCID()const { return
    DIFUnpacker::getAbsoluteBCID(theDIF_); }
00080 inline std::uint32_t      DIFPtr::getBCID()const { return DIFUnpacker::getBCID(theDIF_); }
00081 inline std::uint32_t      DIFPtr::getLines()const { return DIFUnpacker::getLines(theDIF_); }
00082 inline bool              DIFPtr::hasLine(const std::uint32_t& line)const { return
    DIFUnpacker::hasLine(line, theDIF_); }
00083 inline std::uint32_t      DIFPtr::getTASU1()const { return DIFUnpacker::getTASU1(theDIF_); }
00084 inline std::uint32_t      DIFPtr::getTASU2()const { return DIFUnpacker::getTASU2(theDIF_); }
00085 inline std::uint32_t      DIFPtr::getTDIF()const { return DIFUnpacker::getTDIF(theDIF_); }
00086 inline float             DIFPtr::getTemperatureDIF()const { return 0.508 * getTDIF() -
    9.659; }
00087 inline float             DIFPtr::getTemperatureASU1()const { return (getTASU1() >> 3) *
    0.0625; }
00088 inline float             DIFPtr::getTemperatureASU2()const { return (getTASU2() >> 3) *
    0.0625; }
00089 inline bool              DIFPtr::hasTemperature()const { return
    DIFUnpacker::hasTemperature(theDIF_); }
00090 inline bool              DIFPtr::hasAnalogReadout()const { return
    DIFUnpacker::hasAnalogReadout(theDIF_); }
00091 inline std::uint32_t      DIFPtr::getNumberOfFrames()const { return theFrames_.size(); }
00092 inline unsigned char*      DIFPtr::getFramePtr(const std::uint32_t& i)const { return
    theFrames_[i]; }
00093 inline std::uint32_t      DIFPtr::getFrameAsicHeader(const std::uint32_t& i)const { return
    DIFUnpacker::getFrameAsicHeader(theFrames_[i]); }
00094 inline std::uint32_t      DIFPtr::getFrameBCID(const std::uint32_t& i)const { return
    DIFUnpacker::getFrameBCID(theFrames_[i]); }
00095 inline std::uint32_t      DIFPtr::getFrameTimeToTrigger(const std::uint32_t& i)const {
    return getBCID() - getFrameBCID(i); }
00096 inline bool              DIFPtr::getFrameLevel(const std::uint32_t& i, const std::uint32_t&
    ipad, const std::uint32_t& ilevel)const { return DIFUnpacker::getFrameLevel(theFrames_[i], ipad,
    ilevel); }
00097 // Addition by GG
00098 inline uint32_t          DIFPtr::getDIFid()const { return getID() & 0xFF; }
00099 inline uint32_t          DIFPtr::getASICid(const std::uint32_t& i)const { return
    getFrameAsicHeader(i) & 0xFF; }
00100 inline uint32_t          DIFPtr::getThresholdStatus(const std::uint32_t& i, const
    std::uint32_t& ipad)const { return (((uint32_t)getFrameLevel(i, ipad, 1)) << 1) |
    ((uint32_t)getFrameLevel(i, ipad, 0)); }

```

## 5.13 libs/core/include/DIFSlowControl.h File Reference

```

#include <bitset>
#include <cstdint>
#include <map>
#include <string>

```

### Classes

- class [DIFSlowControl](#)  
Handler of *DIF* Slow Control info.

### 5.13.1 Detailed Description

#### Copyright

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Definition in file [DIFSlowControl.h](#).

## 5.14 DIFSlowControl.h

[Go to the documentation of this file.](#)

```

00001
00005 #pragma once
00006
00007 #include <bitset>
00008 #include <cstdint>
00009 #include <map>
00010 #include <string>
00019 class DIFSlowControl
00020 {
00021 public:
00023
00028     DIFSlowControl(const std::uint8_t& version, const std::uint8_t& DIFid, unsigned char* buf);
00029
00031     inline std::uint8_t getDIFid();
00032
00034
00037     inline std::map<int, std::map<std::string, int>> getChipsMap();
00038
00040
00044     inline std::map<std::string, int> getChipSlowControl(const int& asicid);
00045
00047
00051     inline int getChipSlowControl(const std::int8_t& asicid, const std::string& param);
00052
00054     void Dump();
00055
00056 private:
00058     DIFSlowControl() = delete;
00060     void FillHR1(const int& header_shift, unsigned char* cbuf);
00062     void FillHR2(const int& header_shift, unsigned char* cbuf);
00064     void FillAsicHR1(const std::bitset<72 * 8>& bs);
00066     void FillAsicHR2(const std::bitset<109 * 8>& bs);
00067
00068     unsigned int                m_DIFid{0};
00069     unsigned int                m_Version{0};
00070     unsigned int                m_AsicType{0}; // asicType_
00071     unsigned int                m_NbrAsic{0};
00072     std::map<int, std::map<std::string, int>> m_MapSC;
00073 };

```

## 5.15 libs/core/include/DIFUnpacker.h File Reference

```

#include <cstdint>
#include <vector>

```

### Classes

- class [DIFUnpacker](#)

### 5.15.1 Detailed Description

#### Copyright

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Definition in file [DIFUnpacker.h](#).

## 5.16 DIFUnpacker.h

[Go to the documentation of this file.](#)

```

00001
00005 #pragma once
00006
00007 #include <cstdint>
00008 #include <vector>
00009
00010 class DIFUnpacker
00011 {
00012 public:
00013     static std::uint64_t GrayToBin(const std::uint64_t& n);
00014     static std::uint32_t getStartOfDIF(const unsigned char* cbuf, const std::uint32_t& size_buf, const
std::uint32_t& start = 92);
00015     static std::uint32_t getID(const unsigned char* cb, const std::uint32_t& idx = 0);
00016     static std::uint32_t getDTC(const unsigned char* cb, const std::uint32_t& idx = 0);
00017     static std::uint32_t getGTC(const unsigned char* cb, const std::uint32_t& idx = 0);
00018     static std::uint64_t getAbsoluteBCID(const unsigned char* cb, const std::uint32_t& idx = 0);
00019     static std::uint32_t getBCID(const unsigned char* cb, const std::uint32_t& idx = 0);
00020     static std::uint32_t getLines(const unsigned char* cb, const std::uint32_t& idx = 0);
00021     static bool
std::uint32_t& idx = 0);
00022     static std::uint32_t getTASU1(const unsigned char* cb, const std::uint32_t& idx = 0);
00023     static std::uint32_t getTASU2(const unsigned char* cb, const std::uint32_t& idx = 0);
00024     static std::uint32_t getTDIF(const unsigned char* cb, const std::uint32_t& idx = 0);
00025     static bool
hasTemperature(const unsigned char* cb, const std::uint32_t& idx = 0);
00026     static bool
hasAnalogReadout(const unsigned char* cb, const std::uint32_t& idx = 0);
00027
00028     static std::uint32_t getFrameAsicHeader(const unsigned char* framePtr);
00029     static std::uint32_t getFrameBCID(const unsigned char* framePtr);
00030
00031     static bool getFramePAD(const unsigned char* framePtr, const std::uint32_t& ip);
00032     static bool getFrameLevel(const unsigned char* framePtr, const std::uint32_t& ip, const
std::uint32_t& level);
00033
00034     static std::uint32_t getAnalogPtr(std::vector<unsigned char*>& vLines, unsigned char* cb, const
std::uint32_t& idx = 0);
00035     static std::uint32_t getFramePtr(std::vector<unsigned char*>& vFrame, std::vector<unsigned char*>&
vLines, const std::uint32_t& max_size, unsigned char* cb, const std::uint32_t& idx = 0);
00036 };

```

## 5.17 libs/core/include/Formatters.h File Reference

```

#include "Bits.h"
#include <iosfwd>
#include <string>

```

### Functions

- std::string [to\\_dec](#) (const [Buffer](#) &b, const std::size\_t &begin=0, const std::size\_t &end=-1)
- std::string [to\\_dec](#) (const [bit8\\_t](#) &)
- std::string [to\\_dec](#) (const [bit16\\_t](#) &)
- std::string [to\\_dec](#) (const [bit32\\_t](#) &)
- std::string [to\\_dec](#) (const [bit64\\_t](#) &)
- std::string [to\\_hex](#) (const [Buffer](#) &b, const std::size\_t &begin=0, const std::size\_t &end=-1)
- std::string [to\\_hex](#) (const [bit8\\_t](#) &)
- std::string [to\\_hex](#) (const [bit16\\_t](#) &)
- std::string [to\\_hex](#) (const [bit32\\_t](#) &)
- std::string [to\\_hex](#) (const [bit64\\_t](#) &)
- std::string [to\\_bin](#) (const [Buffer](#) &b, const std::size\_t &begin=0, const std::size\_t &end=-1)
- std::string [to\\_bin](#) (const [bit8\\_t](#) &)
- std::string [to\\_bin](#) (const [bit16\\_t](#) &)
- std::string [to\\_bin](#) (const [bit32\\_t](#) &)

- `std::string to_bin` (const `bit64_t` &)
- `std::string to_oct` (const `Buffer` &b, const `std::size_t` &begin=0, const `std::size_t` &end=-1)
- `std::string to_oct` (const `bit8_t` &)
- `std::string to_oct` (const `bit16_t` &)
- `std::string to_oct` (const `bit32_t` &)
- `std::string to_oct` (const `bit64_t` &)

### 5.17.1 Detailed Description

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Definition in file [Formatters.h](#).

### 5.17.2 Function Documentation

#### 5.17.2.1 to\_bin() [1/5]

```
std::string to_bin (  
    const bit16_t & b )
```

Definition at line 71 of file [Formatters.cc](#).

```
00071 { return fmt::format("{:016b}", b); }
```

#### 5.17.2.2 to\_bin() [2/5]

```
std::string to_bin (  
    const bit32_t & b )
```

Definition at line 73 of file [Formatters.cc](#).

```
00073 { return fmt::format("{:032b}", b); }
```

#### 5.17.2.3 to\_bin() [3/5]

```
std::string to_bin (  
    const bit64_t & b )
```

Definition at line 75 of file [Formatters.cc](#).

```
00075 { return fmt::format("{:064b}", b); }
```

#### 5.17.2.4 to\_bin() [4/5]

```
std::string to_bin (
    const bit8_t & b )
```

Definition at line 69 of file [Formatters.cc](#).

```
00069 { return fmt::format("{:08b}", b); }
```

#### 5.17.2.5 to\_bin() [5/5]

```
std::string to_bin (
    const Buffer & b,
    const std::size_t & begin = 0,
    const std::size_t & end = -1 )
```

Definition at line 56 of file [Formatters.cc](#).

```
00057 {
00058     std::size_t iend = end;
00059     if(iend == -1) iend = b.size();
00060     std::string ret;
00061     for(std::size_t k = begin; k < iend; k++)
00062     {
00063         ret += to_bin(b[k]);
00064         ret += " - ";
00065     }
00066     return ret;
00067 }
```

#### 5.17.2.6 to\_dec() [1/5]

```
std::string to_dec (
    const bit16_t & b )
```

Definition at line 29 of file [Formatters.cc](#).

```
00029 { return fmt::format("{:d}", b); }
```

#### 5.17.2.7 to\_dec() [2/5]

```
std::string to_dec (
    const bit32_t & b )
```

Definition at line 31 of file [Formatters.cc](#).

```
00031 { return fmt::format("{:d}", b); }
```



### 5.17.2.8 to\_dec() [3/5]

```
std::string to_dec (
    const bit64_t & b )
```

Definition at line 33 of file [Formatters.cc](#).

```
00033 { return fmt::format("{:#d}", b); }
```

### 5.17.2.9 to\_dec() [4/5]

```
std::string to_dec (
    const bit8_t & b )
```

Definition at line 27 of file [Formatters.cc](#).

```
00027 { return fmt::format("{:#d}", b); }
```

### 5.17.2.10 to\_dec() [5/5]

```
std::string to_dec (
    const Buffer & b,
    const std::size_t & begin = 0,
    const std::size_t & end = -1 )
```

Definition at line 14 of file [Formatters.cc](#).

```
00015 {
00016     std::size_t iend = end;
00017     if(iend == -1) iend = b.size();
00018     std::string ret;
00019     for(std::size_t k = begin; k < iend; k++)
00020     {
00021         ret += to_dec(b[k]);
00022         ret += " - ";
00023     }
00024     return ret;
00025 }
```

### 5.17.2.11 to\_hex() [1/5]

```
std::string to_hex (
    const bit16_t & b )
```

Definition at line 50 of file [Formatters.cc](#).

```
00050 { return fmt::format("{:#04x}", b); }
```

#### 5.17.2.12 to\_hex() [2/5]

```
std::string to_hex (
    const bit32_t & b )
```

Definition at line 52 of file [Formatters.cc](#).

```
00052 { return fmt::format("{:08x}", b); }
```

#### 5.17.2.13 to\_hex() [3/5]

```
std::string to_hex (
    const bit64_t & b )
```

Definition at line 54 of file [Formatters.cc](#).

```
00054 { return fmt::format("{:016x}", b); }
```

#### 5.17.2.14 to\_hex() [4/5]

```
std::string to_hex (
    const bit8_t & b )
```

Definition at line 48 of file [Formatters.cc](#).

```
00048 { return fmt::format("{:02x}", b); }
```

#### 5.17.2.15 to\_hex() [5/5]

```
std::string to_hex (
    const Buffer & b,
    const std::size_t & begin = 0,
    const std::size_t & end = -1 )
```

Definition at line 35 of file [Formatters.cc](#).

```
00036 {
00037     std::size_t iend = end;
00038     if(iend == -1) iend = b.size();
00039     std::string ret;
00040     for(std::size_t k = begin; k < iend; k++)
00041     {
00042         ret += to_hex(b[k]);
00043         ret += " - ";
00044     }
00045     return ret;
00046 }
```

### 5.17.2.16 to\_oct() [1/5]

```
std::string to_oct (
    const bit16_t & b )
```

Definition at line 92 of file [Formatters.cc](#).

```
00092 { return fmt::format("{:#08o}", b); }
```

### 5.17.2.17 to\_oct() [2/5]

```
std::string to_oct (
    const bit32_t & b )
```

Definition at line 94 of file [Formatters.cc](#).

```
00094 { return fmt::format("{:#016o}", b); }
```

### 5.17.2.18 to\_oct() [3/5]

```
std::string to_oct (
    const bit64_t & b )
```

Definition at line 96 of file [Formatters.cc](#).

```
00096 { return fmt::format("{:#032o}", b); }
```

### 5.17.2.19 to\_oct() [4/5]

```
std::string to_oct (
    const bit8_t & b )
```

Definition at line 90 of file [Formatters.cc](#).

```
00090 { return fmt::format("{:#04o}", b); }
```

### 5.17.2.20 to\_oct() [5/5]

```
std::string to_oct (
    const Buffer & b,
    const std::size_t & begin = 0,
    const std::size_t & end = -1 )
```

Definition at line 77 of file [Formatters.cc](#).

```
00078 {
00079     std::size_t iend = end;
00080     if(iend == -1) iend = b.size();
00081     std::string ret;
00082     for(std::size_t k = begin; k < iend; k++)
00083     {
00084         ret += to_oct(b[k]);
00085         ret += " - ";
00086     }
00087     return ret;
00088 }
```

## 5.18 Formatters.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006
00007 #include "Bits.h"
00008
00009 #include <iosfwd>
00010 #include <string>
00011
00012 class Buffer;
00013
00014 std::string to_dec(const Buffer& b, const std::size_t& begin = 0, const std::size_t& end = -1);
00015 std::string to_dec(const bit8_t&);
00016 std::string to_dec(const bit16_t&);
00017 std::string to_dec(const bit32_t&);
00018 std::string to_dec(const bit64_t&);
00019
00020 std::string to_hex(const Buffer& b, const std::size_t& begin = 0, const std::size_t& end = -1);
00021 std::string to_hex(const bit8_t&);
00022 std::string to_hex(const bit16_t&);
00023 std::string to_hex(const bit32_t&);
00024 std::string to_hex(const bit64_t&);
00025
00026 std::string to_bin(const Buffer& b, const std::size_t& begin = 0, const std::size_t& end = -1);
00027 std::string to_bin(const bit8_t&);
00028 std::string to_bin(const bit16_t&);
00029 std::string to_bin(const bit32_t&);
00030 std::string to_bin(const bit64_t&);
00031
00032 std::string to_oct(const Buffer& b, const std::size_t& begin = 0, const std::size_t& end = -1);
00033 std::string to_oct(const bit8_t&);
00034 std::string to_oct(const bit16_t&);
00035 std::string to_oct(const bit32_t&);
00036 std::string to_oct(const bit64_t&);
```

## 5.19 libs/core/include/Interface.h File Reference

```
#include "Buffer.h"
#include <memory>
#include <spdlog/logger.h>
```

### Classes

- class [Interface](#)

*template class should implement void SOURCE::start(); bool SOURCE::next(); void SOURCE::end(); const Buffer& SOURCE::getSDHCALBuffer();*

### 5.19.1 Detailed Description

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Definition in file [Interface.h](#).

## 5.20 Interface.h

[Go to the documentation of this file.](#)

```

00001
00004 #pragma once
00005
00006 #include "Buffer.h"
00007
00008 #include <memory>
00009 #include <spdlog/logger.h>
00010
00026 class Interface
00027 {
00028 public:
00029     Interface() {}
00030     virtual ~Interface() {}
00031     virtual void                startEvent() {}
00032     virtual void                endEvent() {}
00033     virtual void                startDIF() {}
00034     virtual void                endDIF() {}
00035     virtual void                startFrame() {}
00036     virtual void                endFrame() {}
00037     virtual void                startPad() {}
00038     virtual void                endPad() {}
00039     std::shared_ptr<spdlog::logger>& log() { return m_Logger; }
00040     void                setLogger(const std::shared_ptr<spdlog::logger>& logger) { m_Logger
= logger; }
00041
00042 private:
00043     std::shared_ptr<spdlog::logger> m_Logger{nullptr};
00044 };

```

## 5.21 libs/core/include/RawBufferNavigator.h File Reference

```

#include "Buffer.h"
#include "DIFPtr.h"
#include "DIFUnpacker.h"

```

### Classes

- class [RawBufferNavigator](#)

### 5.21.1 Detailed Description

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Definition in file [RawBufferNavigator.h](#).

## 5.22 RawBufferNavigator.h

[Go to the documentation of this file.](#)

```

00001
00005 #pragma once
00006
00007 #include "Buffer.h"
00008 #include "DIFPtr.h"
00009 #include "DIFUnpacker.h"
00010
00011 // class to navigate in the raw data buffer
00012 class RawBufferNavigator
00013 {
00014 public:
00015     RawBufferNavigator() = default;
00016     ~RawBufferNavigator() = default;
00017     explicit RawBufferNavigator(const Buffer& b, const int& start = -1);
00018     void setBuffer(const Buffer& b, const int& start = -1)
00019     {
00020         m_BadSCdata = false;
00021         m_Buffer = b;
00022         StartAt(start);
00023         m_DIFstartIndex = DIFUnpacker::getStartOfDIF(m_Buffer.begin(), m_Buffer.size(), m_Start);
00024     }
00025     std::uint8_t    getDetectorID();
00026     bool            validBuffer();
00027     std::uint32_t    getStartOfDIF();
00028     unsigned char*   getDIFBufferStart();
00029     std::uint32_t    getDIFBufferSize();
00030     Buffer            getDIFBuffer();
00031     DIFPtr&          getDIFPtr();
00032     std::uint32_t    getEndOfDIFData();
00033     std::uint32_t    getSizeAfterDIFPtr();
00034     std::uint32_t    getDIF_CRC();
00035     bool            hasSlowControlData();
00036     Buffer            getSCBuffer();
00037     bool            badSCData();
00038     Buffer            getEndOfAllData();
00039     static void      StartAt(const int& start);
00040
00041 private:
00042     void            setSCBuffer();
00043     Buffer            m_Buffer;
00044     Buffer            m_SCbuffer;
00045     std::uint32_t    m_DIFstartIndex{0};
00046     DIFPtr           m_TheDIFPtr;
00047     bool            m_BadSCdata{false};
00048     static int       m_Start;
00049 };

```

## 5.23 libs/core/include/Timer.h File Reference

```
#include <chrono>
```

### Classes

- class [Timer](#)

### 5.23.1 Detailed Description

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#### See also

<https://github.com/apingault/Trivent4HEP>

Definition in file [Timer.h](#).

## 5.24 Timer.h

[Go to the documentation of this file.](#)

```
00001
00006 #pragma once
00007
00008 #include <chrono>
00009
00010 class Timer
00011 {
00012 public:
00013     void start() { m_StartTime = std::chrono::high_resolution_clock::now(); }
00014     void stop() { m_StopTime = std::chrono::high_resolution_clock::now(); }
00015     float getElapsedTime() { return std::chrono::duration_cast<std::chrono::microseconds>(m_StopTime -
m_StartTime).count(); }
00016
00017 private:
00018     std::chrono::time_point<std::chrono::high_resolution_clock> m_StartTime;
00019     std::chrono::time_point<std::chrono::high_resolution_clock> m_StopTime;
00020 };
```

## 5.25 libs/core/include/Words.h File Reference

```
#include <cstdint>
```

### Enumerations

- enum [DU](#) : std::uint8\_t {  
[START\\_OF\\_DIF](#) = 0xB0 , [START\\_OF\\_DIF\\_TEMP](#) = 0xBB , [END\\_OF\\_DIF](#) = 0xA0 , [START\\_OF\\_LINES](#) =  
0xC4 ,  
[END\\_OF\\_LINES](#) = 0xD4 , [START\\_OF\\_FRAME](#) = 0xB4 , [END\\_OF\\_FRAME](#) = 0xA3 , [ID\\_SHIFT](#) = 1 ,  
[DTC\\_SHIFT](#) = 2 , [GTC\\_SHIFT](#) = 10 , [ABCID\\_SHIFT](#) = 14 , [BCID\\_SHIFT](#) = 20 ,  
[LINES\\_SHIFT](#) = 23 , [TASU1\\_SHIFT](#) = 24 , [TASU2\\_SHIFT](#) = 28 , [TDIF\\_SHIFT](#) = 32 ,  
[FRAME\\_ASIC\\_HEADER\\_SHIFT](#) = 0 , [FRAME\\_BCID\\_SHIFT](#) = 1 , [FRAME\\_DATA\\_SHIFT](#) = 4 , [FRAME\\_SIZE](#)  
= 20 ,  
[NUMBER\\_PAD](#) = 64 }

### 5.25.1 Detailed Description

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Definition in file [Words.h](#).

### 5.25.2 Enumeration Type Documentation

#### 5.25.2.1 DU

```
enum DU : std::uint8_t
```

## Enumerator

START_OF_DIF	
START_OF_DIF_TEMP	
END_OF_DIF	
START_OF_LINES	
END_OF_LINES	
START_OF_FRAME	
END_OF_FRAME	
ID_SHIFT	
DTC_SHIFT	
GTC_SHIFT	
ABCID_SHIFT	
BCID_SHIFT	
LINES_SHIFT	
TASU1_SHIFT	
TASU2_SHIFT	
TDIF_SHIFT	
FRAME_ASIC_HEADER_SHIFT	
FRAME_BCID_SHIFT	
FRAME_DATA_SHIFT	
FRAME_SIZE	
NUMBER_PAD	

Definition at line 9 of file [Words.h](#).

```

00010 {
00011     START_OF_DIF      = 0xB0,
00012     START_OF_DIF_TEMP = 0xBB,
00013     END_OF_DIF        = 0xA0,
00014     START_OF_LINES    = 0xC4,
00015     END_OF_LINES      = 0xD4,
00016
00017     START_OF_FRAME    = 0xB4,
00018     END_OF_FRAME      = 0xA3,
00019
00020     ID_SHIFT          = 1,
00021     DTC_SHIFT         = 2,
00022     GTC_SHIFT         = 10,
00023     ABCID_SHIFT       = 14,
00024     BCID_SHIFT        = 20,
00025     LINES_SHIFT       = 23,
00026     TASU1_SHIFT       = 24,
00027     TASU2_SHIFT       = 28,
00028     TDIF_SHIFT        = 32,
00029
00030     FRAME_ASIC_HEADER_SHIFT = 0,
00031     FRAME_BCID_SHIFT      = 1,
00032     FRAME_DATA_SHIFT      = 4,
00033     FRAME_SIZE           = 20,
00034
00035     NUMBER_PAD          = 64
00036 };

```

## 5.26 Words.h

[Go to the documentation of this file.](#)

```

00001
00005 #pragma once
00006
00007 #include <cstdint>
00008
00009 enum DU : std::uint8_t
00010 {

```



```

00011  START_OF_DIF      = 0xB0,
00012  START_OF_DIF_TEMP = 0xBB,
00013  END_OF_DIF        = 0xA0,
00014  START_OF_LINES    = 0xC4,
00015  END_OF_LINES      = 0xD4,
00016
00017  START_OF_FRAME    = 0xB4,
00018  END_OF_FRAME      = 0xA3,
00019
00020  ID_SHIFT          = 1,
00021  DTC_SHIFT         = 2,
00022  GTC_SHIFT         = 10,
00023  ABCID_SHIFT       = 14,
00024  BCID_SHIFT        = 20,
00025  LINES_SHIFT       = 23,
00026  TASU1_SHIFT       = 24,
00027  TASU2_SHIFT       = 28,
00028  TDIF_SHIFT        = 32,
00029
00030  FRAME_ASIC_HEADER_SHIFT = 0,
00031  FRAME_BCID_SHIFT       = 1,
00032  FRAME_DATA_SHIFT       = 4,
00033  FRAME_SIZE              = 20,
00034
00035  NUMBER_PAD = 64
00036 };

```

## 5.27 libs/core/src/Bits.cc File Reference

```
#include "Bits.h"
```

### Functions

- `std::ostream & operator<< (std::ostream &os, const bit8\_t &c)`  
*Stream operator to print `bit8_t` aka `std::uint8_t` and not char or unsigned char.*

### 5.27.1 Detailed Description

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Definition in file [Bits.cc](#).

### 5.27.2 Function Documentation

#### 5.27.2.1 `operator<<()`

```

std::ostream & operator<< (
    std::ostream & os,
    const bit8\_t & c )

```

Stream operator to print `bit8_t` aka `std::uint8_t` and not char or unsigned char.

Definition at line 8 of file [Bits.cc](#).

```
00008 { return os << c + 0; }
```

## 5.28 Bits.cc

[Go to the documentation of this file.](#)

```
00001
00006 #include "Bits.h"
00007
00008 std::ostream& operator<<(std::ostream& os, const bit8_t& c) { return os << c + 0; }
```

## 5.29 libs/core/src/Buffer.cc File Reference

```
#include "Buffer.h"
```

## 5.30 Buffer.cc

[Go to the documentation of this file.](#)

```
00001
00006 #include "Buffer.h"
```

## 5.31 libs/core/src/BufferLooperCounter.cc File Reference

```
#include "BufferLooperCounter.h"
#include <fmt/core.h>
```

## 5.32 BufferLooperCounter.cc

[Go to the documentation of this file.](#)

```
00001
00005 #include "BufferLooperCounter.h"
00006
00007 #include <fmt/core.h>
00008
00009 void BufferLooperCounter::printAllCounters()
00010 {
00011     fmt::print("BUFFER LOOP FINAL STATISTICS : \n");
00012     printCounter("Start of DIF header", DIFStarter);
00013     printCounter("Value after DIF data are processed", DIFPtrValueAtReturnedPos);
00014     printCounter("Size remaining in buffer after end of DIF data", SizeAfterDIFPtr);
00015     fmt::print("Number of Slow Control found {} out of which {} are bad\n", hasSlowControl,
00016               hasBadSlowControl);
00017     printCounter("Size remaining after all of data have been processed", SizeAfterAllData);
00018     printCounter("Number on non zero values in end of data buffer", NonZeroValusAtEndOfData);
00019 }
00019
00020 void BufferLooperCounter::printCounter(const std::string& description, const std::map<int, int>& m)
00021 {
00022     std::string out{"statistics for " + description + " : \n"};
00023     for(std::map<int, int>::const_iterator it = m.begin(); it != m.end(); it++)
00024     {
00025         if(it != m.begin()) out += ",";
00026         out += " [" + std::to_string(it->first) + "]" = " + std::to_string(it->second);
00027     }
00028     out += "\n";
00029     fmt::print(out);
00030 }
```

## 5.33 libs/core/src/DIFSlowControl.cc File Reference

```
#include "DIFSlowControl.h"
#include <stdint>
#include <iostream>
```

### 5.33.1 Detailed Description

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Definition in file [DIFSlowControl.cc](#).

## 5.34 DIFSlowControl.cc

[Go to the documentation of this file.](#)

```
00001
00005 #include "DIFSlowControl.h"
00006
00007 #include <stdint>
00008 #include <iostream>
00009
00010 DIFSlowControl::DIFSlowControl(const std::uint8_t& version, const std::uint8_t& DIFId, unsigned char*
    cbuf) : m_Version(version), m_DIFId(DIFId), m_AsicType(2)
00011 {
00012     if(cbuf[0] != 0xb1) return;
00013     int header_shift{6};
00014     if(m_Version < 8) m_NbrAsic = cbuf[5];
00015     else
00016     {
00017         m_DIFId = cbuf[1];
00018         m_NbrAsic = cbuf[2];
00019         header_shift = 3;
00020     }
00021     int size_hardroc1 = m_NbrAsic * 72 + header_shift + 1;
00022     if(cbuf[size_hardroc1 - 1] != 0xal) size_hardroc1 = 0;
00023
00024     int size_hardroc2 = m_NbrAsic * 109 + header_shift + 1;
00025     if(cbuf[size_hardroc2 - 1] != 0xal) size_hardroc2 = 0;
00026     if(size_hardroc1 != 0)
00027     {
00028         FillHR1(header_shift, cbuf);
00029         m_AsicType = 1;
00030     }
00031     else if(size_hardroc2 != 0)
00032         FillHR2(header_shift, cbuf);
00033     else
00034         return;
00035 }
00036
00037 inline std::uint8_t DIFSlowControl::getDIFId() { return m_DIFId; }
00038
00039 inline std::map<int, std::map<std::string, int> DIFSlowControl::getChipsMap() { return m_MapSC; }
00040
00041 inline std::map<std::string, int> DIFSlowControl::getChipSlowControl(const int& asicid) { return
    m_MapSC[asicid]; }
00042
00043 inline int DIFSlowControl::getChipSlowControl(const std::int8_t& asicid, const std::string& param) {
    return getChipSlowControl(asicid)[param]; }
00044
00045 void DIFSlowControl::Dump()
00046 {
00047     for(std::map<int, std::map<std::string, int>::iterator it = m_MapSC.begin(); it != m_MapSC.end();
        it++)
00048     {
00049         std::cout << "ASIC " << it->first << std::endl;
00050         for(std::map<std::string, int>::iterator jt = (it->second).begin(); jt != (it->second).end();
            jt++) std::cout << jt->first << " : " << jt->second << std::endl;
```

```

00051     }
00052 }
00053
00054 void DIFSlowControl::FillHR1(const int& header_shift, unsigned char* cbuf)
00055 {
00056     int nasic{cbuf[header_shift - 1]};
00057     int idx{header_shift};
00058     for(int k = 0; k < nasic; k++)
00059     {
00060         std::bitset<72 * 8> bs;
00061         // printf("%x %x \n",cbuf[idx+k*72+69],cbuf[idx+k*72+70]);
00062         for(int l = 71; l >= 0; l--)
00063         {
00064             // printf("%d %x : %d -->",l,cbuf[idx+k*72+l], (71-l)*8);
00065             for(int m = 0; m < 8; m++)
00066             {
00067                 if(((1 < m) & cbuf[idx + k * 72 + l]) != 0) bs.set((71 - l) * 8 + m, 1);
00068                 else
00069                     bs.set((71 - l) * 8 + m, 0);
00070                 // printf("%d", (int) bs[(71-l)*8+m]);
00071             }
00072             // printf("\n");
00073         }
00074         FillAsicHR1(bs);
00075     }
00076 }
00077
00078 void DIFSlowControl::FillHR2(const int& header_shift, unsigned char* cbuf)
00079 {
00080     // int scsizer=cbuf[header_shift-1]*109+(header_shift-1)+2;
00081     int nasic{cbuf[header_shift - 1]};
00082     int idx{header_shift};
00083     // std::cout<<" DIFSlowControl::FillHR nasic "<nasic<<std::endl;
00084     for(int k = 0; k < nasic; k++)
00085     {
00086         std::bitset<109 * 8> bs;
00087         // printf("%x %x \n",cbuf[idx+k*109+69],cbuf[idx+k*109+70]);
00088         for(int l = 108; l >= 0; l--)
00089         {
00090             // printf("%d %x : %d -->",l,cbuf[idx+k*109+l], (71-l)*8);
00091             for(int m = 0; m < 8; m++)
00092             {
00093                 if(((1 < m) & cbuf[idx + k * 109 + l]) != 0) bs.set((108 - l) * 8 + m, 1);
00094                 else
00095                     bs.set((108 - l) * 8 + m, 0);
00096                 // printf("%d", (int) bs[(71-l)*8+m]);
00097             }
00098             // printf("\n");
00099         }
00100         FillAsicHR2(bs);
00101     }
00102 }
00103
00104 void DIFSlowControl::FillAsicHR1(const std::bitset<72 * 8>& bs)
00105 {
00106     // Asic Id
00107     int asicid{0};
00108     for(int j = 0; j < 8; j++)
00109         if(bs[j + 9] != 0) asicid += (1 < (7 - j));
00110     std::map<std::string, int> mAsic;
00111     // Slow Control
00112     mAsic["SSC0"] = static_cast<int>(bs[575]);
00113     mAsic["SSC1"] = static_cast<int>(bs[574]);
00114     mAsic["SSC2"] = static_cast<int>(bs[573]);
00115     mAsic["Choix_caisson"] = static_cast<int>(bs[572]);
00116     mAsic["SW_50k"] = static_cast<int>(bs[571]);
00117     mAsic["SW_100k"] = static_cast<int>(bs[570]);
00118     mAsic["SW_100f"] = static_cast<int>(bs[569]);
00119     mAsic["SW_50f"] = static_cast<int>(bs[568]);
00120
00121     mAsic["Valid_DC"] = static_cast<int>(bs[567]);
00122     mAsic["ON_Discri"] = static_cast<int>(bs[566]);
00123     mAsic["ON_Fsb"] = static_cast<int>(bs[565]);
00124     mAsic["ON_Otaq"] = static_cast<int>(bs[564]);
00125     mAsic["ON_W"] = static_cast<int>(bs[563]);
00126     mAsic["ON_Ss"] = static_cast<int>(bs[562]);
00127     mAsic["ON_Buf"] = static_cast<int>(bs[561]);
00128     mAsic["ON_Paf"] = static_cast<int>(bs[560]);
00129     // Gain
00130     for(int i = 0; i < 64; i++)
00131     {
00132         int gain{0};
00133         for(int j = 0; j < 6; j++)
00134             if(bs[176 + i * 6 + j] != 0) gain += (1 < j);
00135         mAsic["Channel_" + std::to_string(i) + "_" + "Gain"] = gain;
00136         mAsic["Channel_" + std::to_string(i) + "_" + "cTest"] = bs[112 + i];
00137         mAsic["Channel_" + std::to_string(i) + "_" + "Valid_trig"] = static_cast<int>(bs[25 + i]);

```

```

00138     }
00139
00140     mAsic["ON_Otabg"] = static_cast<int>(bs[111]);
00141     mAsic["ON_Dac"] = static_cast<int>(bs[110]);
00142     mAsic["ON_Otadac"] = static_cast<int>(bs[109]);
00143     // DAC
00144     int dac1{0};
00145     for(int j = 0; j < 10; j++)
00146         if(bs[j + 99] != 0) dac1 += (1 << j);
00147     mAsic["DAC1"] = dac1;
00148     int dac0{0};
00149     for(int j = 0; j < 10; j++)
00150         if(bs[j + 89] != 0) dac0 += (1 << j);
00151     mAsic["DAC0"] = dac0;
00152     mAsic["EN_Raz_Ext"] = static_cast<int>(bs[23]);
00153     mAsic["EN_Raz_Int"] = static_cast<int>(bs[22]);
00154     mAsic["EN_Out_Raz_Int"] = static_cast<int>(bs[21]);
00155     mAsic["EN_Trig_Ext"] = static_cast<int>(bs[20]);
00156     mAsic["EN_Trig_Int"] = static_cast<int>(bs[19]);
00157     mAsic["EN_Out_Trig_Int"] = static_cast<int>(bs[18]);
00158     mAsic["Bypass_Chip"] = static_cast<int>(bs[17]);
00159     mAsic["HardrocHeader"] = static_cast<int>(asicid);
00160     mAsic["EN_Out_Discr"] = static_cast<int>(bs[8]);
00161     mAsic["EN_Transmit_On"] = static_cast<int>(bs[7]);
00162     mAsic["EN_Dout"] = static_cast<int>(bs[6]);
00163     mAsic["EN_RamFull"] = static_cast<int>(bs[5]);
00164     m_MapSC[asicid] = mAsic;
00165 }
00166
00167 void DIFSlowControl::FillAsicHR2(const std::bitset<109 * 8>& bs)
00168 {
00169     int asicid{0};
00170     for(int j = 0; j < 8; j++)
00171         if(bs[j + (108 - 7) * 8 + 2] != 0) asicid += (1 << (7 - j));
00172     std::map<std::string, int> mAsic;
00173     for(int i = 0; i < 64; i++)
00174     {
00175         int gain{0};
00176         int mask{0};
00177         mAsic["Channel_" + std::to_string(i) + "_" + "cTest"] = bs[i];
00178         for(int j = 0; j < 8; j++)
00179             if(bs[64 + i * 8 + j] != 0) gain += (1 << j);
00180         mAsic["Channel_" + std::to_string(i) + "_" + "Gain"] = gain;
00181         for(int j = 0; j < 3; j++)
00182             if(bs[8 * 77 + 2 + i * 3 + j] != 0) mask += (1 << j);
00183         mAsic["Channel_" + std::to_string(i) + "_" + "Mask"] = mask;
00184     }
00185     mAsic["PwrOnPA"] = static_cast<int>(bs[8 * 72]);
00186     mAsic["Cmdb3SS"] = static_cast<int>(bs[8 * 72 + 1]);
00187     mAsic["Cmdb2SS"] = static_cast<int>(bs[8 * 72 + 2]);
00188     mAsic["Cmdb1SS"] = static_cast<int>(bs[8 * 72 + 3]);
00189     mAsic["Cmdb0SS"] = static_cast<int>(bs[8 * 72 + 4]);
00190     mAsic["SwSsc0"] = static_cast<int>(bs[8 * 72 + 5]);
00191     mAsic["SwSsc1"] = static_cast<int>(bs[8 * 72 + 6]);
00192     mAsic["SwSsc2"] = static_cast<int>(bs[8 * 72 + 7]);
00193
00194     mAsic["PwrOnBuff"] = static_cast<int>(bs[8 * 73]);
00195     mAsic["PwrOnSS"] = static_cast<int>(bs[8 * 73 + 1]);
00196     mAsic["PwrOnW"] = static_cast<int>(bs[8 * 73 + 2]);
00197     mAsic["Cmdb3Fsb2"] = static_cast<int>(bs[8 * 73 + 3]);
00198     mAsic["Cmdb2Fsb2"] = static_cast<int>(bs[8 * 73 + 4]);
00199     mAsic["Cmdb1Fsb2"] = static_cast<int>(bs[8 * 73 + 5]);
00200     mAsic["Cmdb0Fsb2"] = static_cast<int>(bs[8 * 73 + 6]);
00201     mAsic["Sw50k2"] = static_cast<int>(bs[8 * 73 + 7]);
00202
00203     mAsic["Sw100k2"] = static_cast<int>(bs[8 * 74]);
00204     mAsic["Sw100f2"] = static_cast<int>(bs[8 * 74 + 1]);
00205     mAsic["Sw50f2"] = static_cast<int>(bs[8 * 74 + 2]);
00206     mAsic["Cmdb3Fsb1"] = static_cast<int>(bs[8 * 74 + 3]);
00207     mAsic["Cmdb2Fsb1"] = static_cast<int>(bs[8 * 74 + 4]);
00208     mAsic["Cmdb1Fsb1"] = static_cast<int>(bs[8 * 74 + 5]);
00209     mAsic["Cmdb0Fsb1"] = static_cast<int>(bs[8 * 74 + 6]);
00210     mAsic["Sw50k1"] = static_cast<int>(bs[8 * 74 + 7]);
00211
00212     mAsic["Sw100k1"] = static_cast<int>(bs[8 * 75]);
00213     mAsic["Sw100f1"] = static_cast<int>(bs[8 * 75 + 1]);
00214     mAsic["Sw50f1"] = static_cast<int>(bs[8 * 75 + 2]);
00215     mAsic["Sel0"] = static_cast<int>(bs[8 * 75 + 3]);
00216     mAsic["Sel1"] = static_cast<int>(bs[8 * 75 + 4]);
00217     mAsic["PwrOnFsb"] = static_cast<int>(bs[8 * 75 + 5]);
00218     mAsic["PwrOnFsb1"] = static_cast<int>(bs[8 * 75 + 6]);
00219     mAsic["PwrOnFsb2"] = static_cast<int>(bs[8 * 75 + 7]);
00220
00221     mAsic["Sw50k0"] = static_cast<int>(bs[8 * 76]);
00222     mAsic["Sw100k0"] = static_cast<int>(bs[8 * 76 + 1]);
00223     mAsic["Sw100f0"] = static_cast<int>(bs[8 * 76 + 2]);
00224     mAsic["Sw50f0"] = static_cast<int>(bs[8 * 76 + 3]);

```

```

00225     mAsic["EnOtaQ"]           = static_cast<int>(bs[8 * 76 + 4]);
00226     mAsic["OtaQ_PwrADC"]      = static_cast<int>(bs[8 * 76 + 5]);
00227     mAsic["Discr1_PwrA"]      = static_cast<int>(bs[8 * 76 + 6]);
00228     mAsic["Discr12"]          = static_cast<int>(bs[8 * 76 + 7]);
00229
00230     mAsic["Discr11"]           = static_cast<int>(bs[8 * 77]);
00231     mAsic["RS_or_Discr1"]      = static_cast<int>(bs[8 * 77 + 1]);
00232
00233     mAsic["Header"] = asicid;
00234     for(int i = 0; i < 3; i++)
00235     {
00236         int B = 0;
00237         for(int j = 0; j < 10; j++)
00238             if(bs[8 * 102 + 2 + i * 10 + j] != 0) B += (1 << j);
00239         mAsic["B" + std::to_string(i)] = B;
00240     }
00241
00242     mAsic["Smallldac"]         = static_cast<int>(bs[8 * 106]);
00243     mAsic["DacSw"]             = static_cast<int>(bs[8 * 106 + 1]);
00244     mAsic["OtagBgSw"]          = static_cast<int>(bs[8 * 106 + 2]);
00245     mAsic["Trig2b"]            = static_cast<int>(bs[8 * 106 + 3]);
00246     mAsic["Trigl1b"]           = static_cast<int>(bs[8 * 106 + 4]);
00247     mAsic["Trig0b"]            = static_cast<int>(bs[8 * 106 + 5]);
00248     mAsic["EnTrigOut"]         = static_cast<int>(bs[8 * 106 + 6]);
00249     mAsic["DiscrOrOr"]         = static_cast<int>(bs[8 * 106 + 7]);
00250
00251     mAsic["TrigExtVal"]         = static_cast<int>(bs[8 * 107]);
00252     mAsic["RazChnIntVal"]       = static_cast<int>(bs[8 * 107 + 1]);
00253     mAsic["RazChnExtVal"]       = static_cast<int>(bs[8 * 107 + 2]);
00254     mAsic["ScOn"]               = static_cast<int>(bs[8 * 107 + 3]);
00255     mAsic["CLKMux"]             = static_cast<int>(bs[8 * 107 + 4]);
00256
00257     // EnOCDout1b   EnOCDout2b   EnOCTransmitOn1b   EnOCTransmitOn2b   EnOCChipsatb   SelStartReadout
SelEndReadout
00258     mAsic["SelEndReadout"]       = static_cast<int>(bs[8 * 108 + 1]);
00259     mAsic["SelStartReadout"]     = static_cast<int>(bs[8 * 108 + 2]);
00260     mAsic["EnOCChipsatb"]        = static_cast<int>(bs[8 * 108 + 3]);
00261     mAsic["EnOCTransmitOn2b"]    = static_cast<int>(bs[8 * 108 + 4]);
00262     mAsic["EnOCTransmitOn1b"]    = static_cast<int>(bs[8 * 108 + 5]);
00263     mAsic["EnOCDout2b"]          = static_cast<int>(bs[8 * 108 + 6]);
00264     mAsic["EnOCDout1b"]          = static_cast<int>(bs[8 * 108 + 7]);
00265     m_MapSC[asicid]              = mAsic;
00266 }

```

## 5.35 libs/core/src/DIFUnpacker.cc File Reference

```

#include "DIFUnpacker.h"
#include "Formatters.h"
#include "Words.h"
#include <bitset>
#include <cstdint>
#include <iostream>
#include <spdlog/spdlog.h>

```

### 5.35.1 Detailed Description

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Definition in file [DIFUnpacker.cc](#).

## 5.36 DIFUnpacker.cc

[Go to the documentation of this file.](#)

```

00001
00005 #include "DIFUnpacker.h"
00006
00007 #include "Formatters.h"
00008 #include "Words.h"
00009
00010 #include <bitset>
00011 #include <cstdint>
00012 #include <iostream>
00013 #include <spdlog/spdlog.h>
00014
00015 std::uint64_t DIFUnpacker::GrayToBin(const std::uint64_t& n)
00016 {
00017     std::uint64_t ish{1};
00018     std::uint64_t anss{n};
00019     std::uint64_t idiv{0};
00020     std::uint64_t ishmax{sizeof(std::uint64_t) * 8};
00021     while(true)
00022     {
00023         idiv = anss >> ish;
00024         anss ^= idiv;
00025         if(idiv <= 1 || ish == ishmax) return anss;
00026         ish <= 1;
00027     }
00028 }
00029
00030 std::uint32_t DIFUnpacker::getStartOfDIF(const unsigned char* cbuf, const std::uint32_t& size_buf,
const std::uint32_t& start)
00031 {
00032     std::uint32_t id0{0};
00033     for(std::uint32_t i = start; i < size_buf; i++)
00034     {
00035         if(cbuf[i] != DU::START_OF_DIF && cbuf[i] != DU::START_OF_DIF_TEMP) continue;
00036         else
00037         {
00038             id0 = i;
00039             break;
00040         }
00041         // if (cbuf[id0+DU::ID_SHIFT]>0xFF) continue;
00042     }
00043     // std::cout << "***** " << id0 << std::endl;
00044     return id0;
00045 }
00046
00047 std::uint32_t DIFUnpacker::getID(const unsigned char* cb, const std::uint32_t& idx) { return cb[idx +
DU::ID_SHIFT]; }
00048
00049 std::uint32_t DIFUnpacker::getDTC(const unsigned char* cb, const std::uint32_t& idx) { return (cb[idx
+ DU::DTC_SHIFT] << 24) + (cb[idx + DU::DTC_SHIFT + 1] << 16) + (cb[idx + DU::DTC_SHIFT + 2] << 8) +
cb[idx + DU::DTC_SHIFT + 3]; }
00050
00051 std::uint32_t DIFUnpacker::getGTC(const unsigned char* cb, const std::uint32_t& idx) { return (cb[idx
+ DU::GTC_SHIFT] << 24) + (cb[idx + DU::GTC_SHIFT + 1] << 16) + (cb[idx + DU::GTC_SHIFT + 2] << 8) +
cb[idx + DU::GTC_SHIFT + 3]; }
00052
00053 std::uint64_t DIFUnpacker::getAbsoluteBCID(const unsigned char* cb, const std::uint32_t& idx)
00054 {
00055     std::uint64_t Shift{16777216ULL}; // to shift the value from the 24 first bits
00056     std::uint64_t pos{idx + DU::ABCID_SHIFT};
00057     std::uint64_t LBC = ((cb[pos] << 16) | (cb[pos + 1] << 8) | (cb[pos + 2])) * Shift + ((cb[pos + 3] <
16) | (cb[pos + 4] << 8) | (cb[pos + 5]));
00058     return LBC;
00059 }
00060
00061 std::uint32_t DIFUnpacker::getBCID(const unsigned char* cb, const std::uint32_t& idx) { return (cb[idx
+ DU::BCID_SHIFT] << 16) + (cb[idx + DU::BCID_SHIFT + 1] << 8) + cb[idx + DU::BCID_SHIFT + 2]; }
00062 std::uint32_t DIFUnpacker::getLines(const unsigned char* cb, const std::uint32_t& idx) { return
(cb[idx + DU::LINES_SHIFT] >> 4) & 0x5; }
00063
00064 bool DIFUnpacker::hasLine(const std::uint32_t& line, const unsigned char* cb, const std::uint32_t&
idx) { return ((cb[idx + DU::LINES_SHIFT] >> line) & 0x1); }
00065
00066 std::uint32_t DIFUnpacker::getTASU1(const unsigned char* cb, const std::uint32_t& idx) { return
(cb[idx + DU::TASU1_SHIFT] << 24) + (cb[idx + DU::TASU1_SHIFT + 1] << 16) + (cb[idx + DU::TASU1_SHIFT +
2] << 8) + cb[idx + DU::TASU1_SHIFT + 3]; }
00067
00068 std::uint32_t DIFUnpacker::getTASU2(const unsigned char* cb, const std::uint32_t& idx) { return
(cb[idx + DU::TASU2_SHIFT] << 24) + (cb[idx + DU::TASU2_SHIFT + 1] << 16) + (cb[idx + DU::TASU2_SHIFT +
2] << 8) + cb[idx + DU::TASU2_SHIFT + 3]; }
00069
00070 std::uint32_t DIFUnpacker::getTDIF(const unsigned char* cb, const std::uint32_t& idx) { return (cb[idx
+ DU::TDIF_SHIFT]); }

```

```

00071
00072 bool DIFUnpacker::hasTemperature(const unsigned char* cb, const std::uint32_t& idx) { return (cb[idx]
== DU::START_OF_DIF_TEMP); }
00073
00074 bool DIFUnpacker::hasAnalogReadout(const unsigned char* cb, const std::uint32_t& idx) { return
(DIFUnpacker::getLines(cb, idx) != 0); }
00075
00076 std::uint32_t DIFUnpacker::getFrameAsicHeader(const unsigned char* framePtr) { return
(framePtr[DU::FRAME_ASIC_HEADER_SHIFT]); }
00077
00078 std::uint32_t DIFUnpacker::getFrameBCID(const unsigned char* framePtr)
00079 {
00080     std::uint32_t igray = (framePtr[DU::FRAME_BCID_SHIFT] << 16) + (framePtr[DU::FRAME_BCID_SHIFT + 1] <<
8) + framePtr[DU::FRAME_BCID_SHIFT + 2];
00081     return DIFUnpacker::GrayToBin(igray);
00082 }
00083
00084 bool DIFUnpacker::getFramePAD(const unsigned char* framePtr, const std::uint32_t& ip)
00085 {
00086     std::uint32_t* iframe{(std::uint32_t*)&framePtr[DU::FRAME_DATA_SHIFT]};
00087     return ((iframe[3 - ip / 32] >> (ip % 32)) & 0x1);
00088 }
00089
00090 bool DIFUnpacker::getFrameLevel(const unsigned char* framePtr, const std::uint32_t& ip, const
std::uint32_t& level) { return ((framePtr[DU::FRAME_DATA_SHIFT + ((3 - ip / 16) * 4 + (ip % 16) / 4)]
>> (7 - (((ip % 16) % 4) * 2 + level))) & 0x1); }
00091
00092 std::uint32_t DIFUnpacker::getAnalogPtr(std::vector<unsigned char*>& vLines, unsigned char* cb, const
std::uint32_t& idx)
00093 {
00094     std::uint32_t fshift{idx};
00095     if(cb[fshift] != DU::START_OF_LINES) return fshift;
00096     fshift++;
00097     while(cb[fshift] != DU::END_OF_LINES)
00098     {
00099         vLines.push_back(&cb[fshift]);
00100         std::uint32_t nchip{cb[fshift]};
00101         fshift += 1 + nchip * 64 * 2;
00102     }
00103     return fshift++;
00104 }
00105
00106 std::uint32_t DIFUnpacker::getFramePtr(std::vector<unsigned char*>& vFrame, std::vector<unsigned
char*>& vLines, const std::uint32_t& max_size, unsigned char* cb, const std::uint32_t& idx)
00107 {
00108     std::uint32_t fshift{0};
00109     if(DATA_FORMAT_VERSION >= 13)
00110     {
00111         fshift = idx + DU::LINES_SHIFT + 1;
00112         if(DIFUnpacker::hasTemperature(cb, idx)) fshift = idx + DU::TDIF_SHIFT + 1;
00113         // jenlev 1
00114         if(DIFUnpacker::hasAnalogReadout(cb, idx)) fshift = DIFUnpacker::getAnalogPtr(vLines, cb, fshift);
00115         // to be implemented
00116     }
00117     else
00118     {
00119         fshift = idx + DU::BCID_SHIFT + 3;
00120         if(cb[fshift] != DU::START_OF_FRAME)
00121         {
00122             std::cout << "This is not a start of frame " << to_hex(cb[fshift]) << " \n";
00123             return fshift;
00124         }
00125         do {
00126             // printf("fshift %d and %d \n", fshift, max_size);
00127             if(cb[fshift] == DU::END_OF_DIF) return fshift;
00128             if(cb[fshift] == DU::START_OF_FRAME) fshift++;
00129             if(cb[fshift] == DU::END_OF_FRAME)
00130             {
00131                 fshift++;
00132                 continue;
00133             }
00134             std::uint32_t header = DIFUnpacker::getFrameAsicHeader(&cb[fshift]);
00135             if(header == DU::END_OF_FRAME) return (fshift + 2);
00136             // std::cout<<header<<" "<<fshift<<std::endl;
00137             if(header < 1 || header > 48) { throw header + " Header problem " + fshift; }
00138             vFrame.push_back(&cb[fshift]);
00139             fshift += DU::FRAME_SIZE;
00140             if(fshift > max_size)
00141             {
00142                 std::cout << "fshift " << fshift << " exceed " << max_size << " \n";
00143                 return fshift;
00144             }
00145             if(cb[fshift] == DU::END_OF_FRAME) fshift++;
00146         } while(true);
00147     }
00148 }

```



## 5.37 libs/core/src/Formatters.cc File Reference

```
#include "Formatters.h"
#include "Bits.h"
#include "Buffer.h"
#include "Words.h"
#include <fmt/format.h>
```

### Functions

- `std::string to_dec` (const [Buffer](#) &b, const `std::size_t` &begin, const `std::size_t` &end)
- `std::string to_dec` (const [bit8\\_t](#) &b)
- `std::string to_dec` (const [bit16\\_t](#) &b)
- `std::string to_dec` (const [bit32\\_t](#) &b)
- `std::string to_dec` (const [bit64\\_t](#) &b)
- `std::string to_hex` (const [Buffer](#) &b, const `std::size_t` &begin, const `std::size_t` &end)
- `std::string to_hex` (const [bit8\\_t](#) &b)
- `std::string to_hex` (const [bit16\\_t](#) &b)
- `std::string to_hex` (const [bit32\\_t](#) &b)
- `std::string to_hex` (const [bit64\\_t](#) &b)
- `std::string to_bin` (const [Buffer](#) &b, const `std::size_t` &begin, const `std::size_t` &end)
- `std::string to_bin` (const [bit8\\_t](#) &b)
- `std::string to_bin` (const [bit16\\_t](#) &b)
- `std::string to_bin` (const [bit32\\_t](#) &b)
- `std::string to_bin` (const [bit64\\_t](#) &b)
- `std::string to_oct` (const [Buffer](#) &b, const `std::size_t` &begin, const `std::size_t` &end)
- `std::string to_oct` (const [bit8\\_t](#) &b)
- `std::string to_oct` (const [bit16\\_t](#) &b)
- `std::string to_oct` (const [bit32\\_t](#) &b)
- `std::string to_oct` (const [bit64\\_t](#) &b)

### 5.37.1 Detailed Description

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Definition in file [Formatters.cc](#).

### 5.37.2 Function Documentation

#### 5.37.2.1 to\_bin() [1/5]

```
std::string to_bin (
    const bit16\_t & b )
```

Definition at line 71 of file [Formatters.cc](#).

```
00071 { return fmt::format("{:#016b}", b); }
```

### 5.37.2.2 to\_bin() [2/5]

```
std::string to_bin (
    const bit32_t & b )
```

Definition at line 73 of file [Formatters.cc](#).

```
00073 { return fmt::format("{:#032b}", b); }
```

### 5.37.2.3 to\_bin() [3/5]

```
std::string to_bin (
    const bit64_t & b )
```

Definition at line 75 of file [Formatters.cc](#).

```
00075 { return fmt::format("{:#064b}", b); }
```

### 5.37.2.4 to\_bin() [4/5]

```
std::string to_bin (
    const bit8_t & b )
```

Definition at line 69 of file [Formatters.cc](#).

```
00069 { return fmt::format("{:#08b}", b); }
```

### 5.37.2.5 to\_bin() [5/5]

```
std::string to_bin (
    const Buffer & b,
    const std::size_t & begin,
    const std::size_t & end )
```

Definition at line 56 of file [Formatters.cc](#).

```
00057 {
00058     std::size_t iend = end;
00059     if(iend == -1) iend = b.size();
00060     std::string ret;
00061     for(std::size_t k = begin; k < iend; k++)
00062     {
00063         ret += to_bin(b[k]);
00064         ret += " - ";
00065     }
00066     return ret;
00067 }
```

**5.37.2.6 to\_dec() [1/5]**

```
std::string to_dec (
    const bit16_t & b )
```

Definition at line 29 of file [Formatters.cc](#).

```
00029 { return fmt::format("{:d}", b); }
```

**5.37.2.7 to\_dec() [2/5]**

```
std::string to_dec (
    const bit32_t & b )
```

Definition at line 31 of file [Formatters.cc](#).

```
00031 { return fmt::format("{:d}", b); }
```

**5.37.2.8 to\_dec() [3/5]**

```
std::string to_dec (
    const bit64_t & b )
```

Definition at line 33 of file [Formatters.cc](#).

```
00033 { return fmt::format("{:d}", b); }
```

**5.37.2.9 to\_dec() [4/5]**

```
std::string to_dec (
    const bit8_t & b )
```

Definition at line 27 of file [Formatters.cc](#).

```
00027 { return fmt::format("{:d}", b); }
```

**5.37.2.10 to\_dec() [5/5]**

```
std::string to_dec (
    const Buffer & b,
    const std::size_t & begin,
    const std::size_t & end )
```

Definition at line 14 of file [Formatters.cc](#).

```
00015 {
00016     std::size_t iend = end;
00017     if(iend == -1) iend = b.size();
00018     std::string ret;
00019     for(std::size_t k = begin; k < iend; k++)
00020     {
00021         ret += to_dec(b[k]);
00022         ret += " - ";
00023     }
00024     return ret;
00025 }
```

#### 5.37.2.11 to\_hex() [1/5]

```
std::string to_hex (
    const bit16_t & b )
```

Definition at line 50 of file [Formatters.cc](#).

```
00050 { return fmt::format("{:#04x}", b); }
```

#### 5.37.2.12 to\_hex() [2/5]

```
std::string to_hex (
    const bit32_t & b )
```

Definition at line 52 of file [Formatters.cc](#).

```
00052 { return fmt::format("{:#08x}", b); }
```

#### 5.37.2.13 to\_hex() [3/5]

```
std::string to_hex (
    const bit64_t & b )
```

Definition at line 54 of file [Formatters.cc](#).

```
00054 { return fmt::format("{:#016x}", b); }
```

#### 5.37.2.14 to\_hex() [4/5]

```
std::string to_hex (
    const bit8_t & b )
```

Definition at line 48 of file [Formatters.cc](#).

```
00048 { return fmt::format("{:#02x}", b); }
```

#### 5.37.2.15 to\_hex() [5/5]

```
std::string to_hex (
    const Buffer & b,
    const std::size_t & begin,
    const std::size_t & end )
```

Definition at line 35 of file [Formatters.cc](#).

```
00036 {
00037     std::size_t iend = end;
00038     if(iend == -1) iend = b.size();
00039     std::string ret;
00040     for(std::size_t k = begin; k < iend; k++)
00041     {
00042         ret += to_hex(b[k]);
00043         ret += " - ";
00044     }
00045     return ret;
00046 }
```

### 5.37.2.16 to\_oct() [1/5]

```
std::string to_oct (
    const bit16_t & b )
```

Definition at line 92 of file [Formatters.cc](#).

```
00092 { return fmt::format("{:#08o}", b); }
```

### 5.37.2.17 to\_oct() [2/5]

```
std::string to_oct (
    const bit32_t & b )
```

Definition at line 94 of file [Formatters.cc](#).

```
00094 { return fmt::format("{:#016o}", b); }
```

### 5.37.2.18 to\_oct() [3/5]

```
std::string to_oct (
    const bit64_t & b )
```

Definition at line 96 of file [Formatters.cc](#).

```
00096 { return fmt::format("{:#032o}", b); }
```

### 5.37.2.19 to\_oct() [4/5]

```
std::string to_oct (
    const bit8_t & b )
```

Definition at line 90 of file [Formatters.cc](#).

```
00090 { return fmt::format("{:#04o}", b); }
```

### 5.37.2.20 to\_oct() [5/5]

```
std::string to_oct (
    const Buffer & b,
    const std::size_t & begin,
    const std::size_t & end )
```

Definition at line 77 of file [Formatters.cc](#).

```
00078 {
00079     std::size_t iend = end;
00080     if(iend == -1) iend = b.size();
00081     std::string ret;
00082     for(std::size_t k = begin; k < iend; k++)
00083     {
00084         ret += to_oct(b[k]);
00085         ret += " - ";
00086     }
00087     return ret;
00088 }
```

## 5.38 Formatters.cc

[Go to the documentation of this file.](#)

```

00001
00006 #include "Formatters.h"
00007
00008 #include "Bits.h"
00009 #include "Buffer.h"
00010 #include "Words.h"
00011
00012 #include <fmt/format.h>
00013
00014 std::string to_dec(const Buffer& b, const std::size_t& begin, const std::size_t& end)
00015 {
00016     std::size_t iend = end;
00017     if(iend == -1) iend = b.size();
00018     std::string ret;
00019     for(std::size_t k = begin; k < iend; k++)
00020     {
00021         ret += to_dec(b[k]);
00022         ret += " - ";
00023     }
00024     return ret;
00025 }
00026
00027 std::string to_dec(const bit8_t& b) { return fmt::format(":{:d}", b); }
00028
00029 std::string to_dec(const bit16_t& b) { return fmt::format(":{:d}", b); }
00030
00031 std::string to_dec(const bit32_t& b) { return fmt::format(":{:d}", b); }
00032
00033 std::string to_dec(const bit64_t& b) { return fmt::format(":{:d}", b); }
00034
00035 std::string to_hex(const Buffer& b, const std::size_t& begin, const std::size_t& end)
00036 {
00037     std::size_t iend = end;
00038     if(iend == -1) iend = b.size();
00039     std::string ret;
00040     for(std::size_t k = begin; k < iend; k++)
00041     {
00042         ret += to_hex(b[k]);
00043         ret += " - ";
00044     }
00045     return ret;
00046 }
00047
00048 std::string to_hex(const bit8_t& b) { return fmt::format(":{:02x}", b); }
00049
00050 std::string to_hex(const bit16_t& b) { return fmt::format(":{:04x}", b); }
00051
00052 std::string to_hex(const bit32_t& b) { return fmt::format(":{:08x}", b); }
00053
00054 std::string to_hex(const bit64_t& b) { return fmt::format(":{:016x}", b); }
00055
00056 std::string to_bin(const Buffer& b, const std::size_t& begin, const std::size_t& end)
00057 {
00058     std::size_t iend = end;
00059     if(iend == -1) iend = b.size();
00060     std::string ret;
00061     for(std::size_t k = begin; k < iend; k++)
00062     {
00063         ret += to_bin(b[k]);
00064         ret += " - ";
00065     }
00066     return ret;
00067 }
00068
00069 std::string to_bin(const bit8_t& b) { return fmt::format(":{:08b}", b); }
00070
00071 std::string to_bin(const bit16_t& b) { return fmt::format(":{:016b}", b); }
00072
00073 std::string to_bin(const bit32_t& b) { return fmt::format(":{:032b}", b); }
00074
00075 std::string to_bin(const bit64_t& b) { return fmt::format(":{:064b}", b); }
00076
00077 std::string to_oct(const Buffer& b, const std::size_t& begin, const std::size_t& end)
00078 {
00079     std::size_t iend = end;
00080     if(iend == -1) iend = b.size();
00081     std::string ret;
00082     for(std::size_t k = begin; k < iend; k++)
00083     {
00084         ret += to_oct(b[k]);
00085         ret += " - ";
00086     }

```

```

00087     return ret;
00088 }
00089
00090 std::string to_oct(const bit8_t& b) { return fmt::format("{:#04o}", b); }
00091
00092 std::string to_oct(const bit16_t& b) { return fmt::format("{:#08o}", b); }
00093
00094 std::string to_oct(const bit32_t& b) { return fmt::format("{:#016o}", b); }
00095
00096 std::string to_oct(const bit64_t& b) { return fmt::format("{:#032o}", b); }

```

## 5.39 libs/core/src/RawBufferNavigator.cc File Reference

```

#include "RawBufferNavigator.h"
#include <iostream>

```

### 5.39.1 Detailed Description

#### Copyright

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Definition in file [RawBufferNavigator.cc](#).

## 5.40 RawBufferNavigator.cc

[Go to the documentation of this file.](#)

```

00001
00005 #include "RawBufferNavigator.h"
00006
00007 #include <iostream>
00008
00009 int RawBufferNavigator::m_Start = 92;
00010
00011 void RawBufferNavigator::StartAt(const int& start)
00012 {
00013     if(start >= 0) m_Start = start;
00014 }
00015
00016 RawBufferNavigator::RawBufferNavigator(const Buffer& b, const int& start) : m_Buffer(b) {
00017     setBuffer(b, start); }
00018
00018 std::uint8_t RawBufferNavigator::getDetectorID() { return m_Buffer[0]; }
00019
00020 bool RawBufferNavigator::validBuffer() { return m_DIFstartIndex != 0; }
00021
00022 std::uint32_t RawBufferNavigator::getStartOfDIF() { return m_DIFstartIndex; }
00023
00024 unsigned char* RawBufferNavigator::getDIFBufferStart() { return &(m_Buffer.begin())[m_DIFstartIndex]; }
00025
00026 std::uint32_t RawBufferNavigator::getDIFBufferSize() { return m_Buffer.size() - m_DIFstartIndex; }
00027
00028 Buffer RawBufferNavigator::getDIFBuffer() { return Buffer(getDIFBufferStart(), getDIFBufferSize()); }
00029
00030 DIFPtr& RawBufferNavigator::getDIFPtr()
00031 {
00032     m_TheDIFPtr.setBuffer(getDIFBufferStart(), getDIFBufferSize());
00033     return m_TheDIFPtr;
00034 }
00035
00036 std::uint32_t RawBufferNavigator::getEndOfDIFData() { return getDIFPtr().getGetFramePtrReturn() + 3; }
00037
00038 std::uint32_t RawBufferNavigator::getSizeAfterDIFPtr() { return getDIFBufferSize() -
00039     getDIFPtr().getGetFramePtrReturn(); }
00039

```

```

00040 std::uint32_t RawBufferNavigator::getDIF_CRC()
00041 {
00042     uint32_t i{getEndOfDIFData()};
00043     uint32_t ret{0};
00044     ret |= ((m_Buffer.begin()[i - 2]) << 8);
00045     ret |= m_Buffer.begin()[i - 1];
00046     return ret;
00047 }
00048
00049 bool RawBufferNavigator::hasSlowControlData() { return getDIFBufferStart()[getEndOfDIFData()] == 0xb1;
00050 }
00051 Buffer RawBufferNavigator::getSCBuffer()
00052 {
00053     setSCBuffer();
00054     return m_SCbuffer;
00055 }
00056
00057 bool RawBufferNavigator::badSCData()
00058 {
00059     setSCBuffer();
00060     return m_BadSCdata;
00061 }
00062
00063 void RawBufferNavigator::setSCBuffer()
00064 {
00065     if(!hasSlowControlData()) return;
00066     if(m_SCbuffer.size() != 0) return; // deja fait
00067     if(m_BadSCdata) return;
00068     m_SCbuffer.set(&(getDIFBufferStart()[getEndOfDIFData()]));
00069     // compute Slow Control size
00070     std::size_t maxsize{m_Buffer.size() - m_DIFstartIndex - getEndOfDIFData() + 1}; // should I +1 here
00071     ?
00072     uint32_t k{1}; // SC Header
00073     uint32_t dif_ID{m_SCbuffer[1]};
00074     uint32_t chipSize{m_SCbuffer[3]};
00075     while((dif_ID != 0xal && m_SCbuffer[k] != 0xal && k < maxsize) || (dif_ID == 0xal && m_SCbuffer[k +
00076 2] == chipSize && k < maxsize))
00077     {
00078         k += 2; // DIF ID + ASIC Header
00079         uint32_t scsize = m_SCbuffer[k];
00080         if(scsize != 74 && scsize != 109)
00081         {
00082             std::cout << "PROBLEM WITH SC SIZE " << scsize << std::endl;
00083             k = 0;
00084             m_BadSCdata = true;
00085             break;
00086         }
00087         k++; // skip size bit
00088         k += scsize; // skip the data
00089     }
00090     if(m_SCbuffer[k] == 0xal && !m_BadSCdata) m_SCbuffer.setSize(k + 1); // add the trailer
00091     else
00092     {
00093         m_BadSCdata = true;
00094         std::cout << "PROBLEM SC TRAILER NOT FOUND " << std::endl;
00095     }
00096 }
00097
00098 Buffer RawBufferNavigator::getEndOfAllData()
00099 {
00100     setSCBuffer();
00101     if(hasSlowControlData() && !m_BadSCdata) { return Buffer(&(m_SCbuffer.begin()[m_SCbuffer.size()]),
00102         getSizeAfterDIFPtr() - 3 - m_SCbuffer.size()); }
00103     else
00104     {
00105         return Buffer(&(getDIFBufferStart()[getEndOfDIFData()]), getSizeAfterDIFPtr() - 3); // remove the
00106         2 bytes for CRC and the DIF trailer
00107     }
00108 }

```

## 5.41 libs/interface/Dump/include/textDump.h File Reference

```

#include "DIFPtr.h"
#include "Interface.h"
#include "spdlog/sinks/stdout_color_sinks.h"
#include <memory>
#include <spdlog/logger.h>

```



## Classes

- class [textDump](#)

### 5.41.1 Detailed Description

#### Copyright

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Definition in file [textDump.h](#).

## 5.42 textDump.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006
00007 #include "DIFPtr.h"
00008 #include "Interface.h"
00009 #include "spdlog/sinks/stdout_color_sinks.h"
00010
00011 #include <memory>
00012 #include <spdlog/logger.h>
00013
00014 class textDump : public Interface
00015 {
00016 public:
00017     textDump()
00018     {
00019         m_InternalLogger = std::make_shared<spdlog::logger>("textDump",
00020             std::make_shared<spdlog::sinks::stdout_color_sink_mt>());
00021         m_InternalLogger->set_level(spdlog::level::trace);
00022     }
00023     void start();
00024     void processDIF(const DIFPtr&);
00025     void processFrame(const DIFPtr&, uint32_t frameIndex);
00026     void processPadInFrame(const DIFPtr&, uint32_t frameIndex, uint32_t
00027         channelIndex);
00028     void processSlowControl(Buffer);
00029     void end();
00030     std::shared_ptr<spdlog::logger>& print() { return m_InternalLogger; }
00031     void setLevel(const spdlog::level::level_enum& level) {
00032         m_InternalLogger->set_level(level); }
00033 private:
00034     // This class is a dumb class to print on terminal so we need the logger + the standard one given by
00035     the interface.
00036     std::shared_ptr<spdlog::logger> m_InternalLogger{nullptr};
00037 };
```

## 5.43 libs/interface/Dump/src/textDump.cc File Reference

```
#include "textDump.h"
#include "DIFPtr.h"
```

### 5.43.1 Detailed Description

#### Copyright

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Definition in file [textDump.cc](#).

## 5.44 textDump.cc

[Go to the documentation of this file.](#)

```
00001
00005 #include "textDump.h"
00006
00007 #include "DIFPtr.h"
00008
00009 void textDump::start() { print()->info("Will dump bunch of DIF data"); }
00010
00011 void textDump::processDIF(const DIFPtr& d) { print()->info("DIF_ID : {}, DTC : {}, GTC : {}, DIF BCID
    {}, Absolute BCID : {}, Nbr frames {}", d.getDIFid(), d.getDTC(), d.getGTC(), d.getBCID(),
    d.getAbsoluteBCID(), d.getNumberOfFrames()); }
00012
00013 void textDump::processFrame(const DIFPtr& d, uint32_t frameIndex)
00014 {
00015     print()->info("\tDisplaying frame number {} : ASIC ID {}, Frame BCID {}, Frame Time To Trigger
    (a.k.a timestamp) is {}", frameIndex, d.getASICid(frameIndex), d.getFrameBCID(frameIndex),
    d.getFrameTimeToTrigger(frameIndex));
00016 }
00017
00018 void textDump::processPadInFrame(const DIFPtr& d, uint32_t frameIndex, uint32_t channelIndex)
00019 {
00020     if(d.getThresholdStatus(frameIndex, channelIndex) > 0) { print()->info("\t\tChannel {}, Threshold
    {}", channelIndex, d.getThresholdStatus(frameIndex, channelIndex)); }
00021 }
00022
00023 void textDump::processSlowControl(Buffer) { print()->error("textDump::processSlowControl not
    implemented yet."); }
00024
00025 void textDump::end() { print()->info("textDump end of report"); }
```

## 5.45 libs/interface/LCIO/include/LCIOWriter.h File Reference

### 5.45.1 Detailed Description

Copyright

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Definition in file [LCIOWriter.h](#).

## 5.46 LCIOWriter.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
```

## 5.47 libs/interface/LCIO/src/LCIOWriter.cc File Reference

### 5.47.1 Detailed Description

Copyright

2022 G.Grenier F.Lagarde

Definition in file [LCIOWriter.cc](#).

## 5.48 LCIOWriter.cc

[Go to the documentation of this file.](#)

00001

## 5.49 libs/interface/RawDataReader/include/RawdataReader.h File Reference

```
#include "Interface.h"
#include <array>
#include <cstdint>
#include <fstream>
#include <string>
#include <vector>
```

### Classes

- class [RawdataReader](#)

### 5.49.1 Detailed Description

#### Copyright

2022 G.Grenier F.Lagarde

Definition in file [RawdataReader.h](#).

## 5.50 RawdataReader.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006
00007 #include "Interface.h"
00008
00009 #include <array>
00010 #include <cstdint>
00011 #include <fstream>
00012 #include <string>
00013 #include <vector>
00014
00015 class Buffer;
00016
00017 class RawdataReader : public Interface
00018 {
00019 public:
00020     explicit RawdataReader(const char* fileName);
00021     void start();
00022     void end();
00023     float getFileSize();
00024     void openFile(const std::string& fileName);
00025     void closeFile();
00026     bool nextEvent();
00027     bool nextDIFbuffer();
00028     const Buffer& getSDHCALBuffer();
00029     virtual ~RawdataReader() { closeFile(); }
```

```

00030     static void setDefaultBufferSize(const std::size_t& size);
00031
00032 private:
00033     void                uncompress();
00034     std::ifstream       m_FileStream;
00035     void                setFileSize(const std::size_t& size);
00036     static std::size_t m_BufferSize;
00037     std::size_t         m_FileSize{0};
00038     std::uint32_t        m_NumberOfDIF{0};
00039     std::uint32_t        m_EventNumber{0};
00040     std::vector<bit8_t> m_buf;
00041     Buffer               m_Buffer;
00042     std::string          m_Filename;
00043 };

```

## 5.51 libs/interface/RawDataReader/src/RawdataReader.cc File Reference

```

#include "RawdataReader.h"
#include <stdint>
#include <cstring>
#include <stdexcept>
#include <zlib.h>

```

### 5.51.1 Detailed Description

#### Copyright

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Definition in file [RawdataReader.cc](#).

## 5.52 RawdataReader.cc

[Go to the documentation of this file.](#)

```

00001
00004 #include "RawdataReader.h"
00005
00006 #include <stdint>
00007 #include <cstring>
00008 #include <stdexcept>
00009 #include <zlib.h>
00010
00012 std::size_t RawdataReader::m_BufferSize = 0x100000;
00013
00014 void RawdataReader::setDefaultBufferSize(const std::size_t& size) { m_BufferSize = size; }
00015
00016 RawdataReader::RawdataReader(const char* fileName)
00017 {
00018     m_buf.reserve(m_BufferSize);
00019     m_Filename = fileName;
00020 }
00021
00022 void RawdataReader::start() { openFile(m_Filename); }
00023
00024 void RawdataReader::end() { closeFile(); }
00025
00026 void RawdataReader::uncompress()
00027 {
00028     static const std::size_t size_buffer{0x20000};
00029     std::size_t              shift{3 * sizeof(std::uint32_t) + sizeof(std::uint64_t)};
00030     static bit8_t            obuf[size_buffer];
00031     unsigned long             size_buffer_end{0x20000}; // NOLINT(runtime/int)
00032     std::int8_t               rc = ::uncompress(obuf, &size_buffer_end, &m_Buffer[shift], m_Buffer.size()
- shift);

```

```

00033     switch(rc)
00034     {
00035         case Z_OK: break;
00036         default: throw "decompress error"; break;
00037     }
00038     memcpy(&m_Buffer[shift], obuf, size_buffer_end);
00039     m_Buffer.setSize(size_buffer_end + shift);
00040 }
00041
00042 void RawdataReader::closeFile()
00043 {
00044     try
00045     {
00046         if(m_FileStream.is_open()) m_FileStream.close();
00047     }
00048     catch(const std::ios_base::failure& e)
00049     {
00050         log()->error("Caught an ios_base::failure in closeFile : {} {}", e.what(), e.code().value());
00051         throw;
00052     }
00053 }
00054
00055 void RawdataReader::openFile(const std::string& fileName)
00056 {
00057     try
00058     {
00059         m_FileStream.rdbuf()->pubsetbuf(0, 0);
00060         m_FileStream.exceptions(std::ifstream::failbit | std::ifstream::badbit);
00061         m_FileStream.open(fileName.c_str(), std::ios::in | std::ios::binary | std::ios::ate); // Start at
the end to directly calculate the size of the file then come back to beginning
00062         m_FileStream.rdbuf()->pubsetbuf(0, 0);
00063         if(m_FileStream.is_open())
00064         {
00065             setFileSize(m_FileStream.tellg());
00066             m_FileStream.seekg(0, std::ios::beg);
00067         }
00068     }
00069     catch(const std::ios_base::failure& e)
00070     {
00071         log()->error("Caught an ios_base::failure in openFile : {}", e.what());
00072         throw;
00073     }
00074 }
00075
00076 bool RawdataReader::nextEvent()
00077 {
00078     try
00079     {
00080         m_FileStream.read(reinterpret_cast<char*>(&m_EventNumber), sizeof(std::uint32_t));
00081         m_FileStream.read(reinterpret_cast<char*>(&m_NumberOfDIF), sizeof(std::uint32_t));
00082     }
00083     catch(const std::ios_base::failure& e)
00084     {
00085         log()->error("Caught an ios_base::failure in openFile : {}", e.what());
00086         return false;
00087     }
00088     return true;
00089 }
00090
00091 bool RawdataReader::nextDIFbuffer()
00092 {
00093     try
00094     {
00095         static int DIF_processed{0};
00096         if(DIF_processed >= m_NumberOfDIF)
00097         {
00098             DIF_processed = 0;
00099             return false;
00100         }
00101         else
00102         {
00103             DIF_processed++;
00104             std::uint32_t bsize{0};
00105             m_FileStream.read(reinterpret_cast<char*>(&bsize), sizeof(std::uint32_t));
00106             m_FileStream.read(reinterpret_cast<char*>(&m_buf[0]), bsize);
00107             m_Buffer = Buffer(m_buf);
00108         }
00109     }
00110     catch(const std::ios_base::failure& e)
00111     {
00112         log()->error("Caught an ios_base::failure in openFile : {}", e.what());
00113         return false;
00114     }
00115     return true;
00116 }
00117
00118 const Buffer& RawdataReader::getSDHCALBuffer()

```

```

00119 {
00120     uncompress();
00121     return m_Buffer;
00122 }
00123
00124 void RawdataReader::setFileSize(const std::size_t& size) { m_FileSize = size; }
00125
00126 float RawdataReader::getFileSize() { return m_FileSize; }

```

## 5.53 libs/interface/ROOT/include/DIF.h File Reference

```

#include "Hit.h"
#include <TObject.h>
#include <cstdlib>
#include <vector>

```

### Classes

- class [DIF](#)

### 5.53.1 Detailed Description

#### Copyright

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Definition in file [DIF.h](#).

## 5.54 DIF.h

[Go to the documentation of this file.](#)

```

00001
00005 #pragma once
00006
00007 #include "Hit.h"
00008
00009 #include <TObject.h>
00010 #include <cstdlib>
00011 #include <vector>
00012
00013 class DIF : public TObject
00014 {
00015 public:
00016     void addHit(const Hit&);
00017     void setID(const std::uint8_t&);
00018     std::uint8_t getID() const;
00019     void setDTC(const std::uint32_t&);
00020     std::uint32_t getDTC() const;
00021     void setGTC(const std::uint32_t&);
00022     std::uint32_t getGTC() const;
00023     void setDIFBCID(const std::uint32_t&);
00024     std::uint32_t getDIFBCID() const;
00025     void setAbsoluteBCID(const std::uint64_t&);
00026     std::uint64_t getAbsoluteBCID() const;
00027
00028 private:
00029     std::uint8_t m_ID{0};
00030     std::uint32_t m_DTC{0};
00031     std::uint32_t m_GTC{0};
00032     std::uint32_t m_DIFBCID{0};
00033     std::uint64_t m_AbsoluteBCID{0};
00034     std::vector<Hit> m_Hits;
00035     ClassDef(DIF, 1);
00036 };

```

## 5.55 libs/interface/ROOT/include/DIFLinkDef.h File Reference

```
#include <vector>
```

### 5.55.1 Detailed Description

#### Copyright

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Definition in file [DIFLinkDef.h](#).

## 5.56 DIFLinkDef.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006 #include <vector>
00007
00008 #ifdef __CLING__
00009 #pragma link C++ class DIF;
00010 #pragma link C++ class Hit;
00011 #pragma link C++ class std::vector < Hit>;
00012 #endif
```

## 5.57 libs/interface/ROOT/include/Event.h File Reference

```
#include "DIF.h"
#include <TObject.h>
#include <cstdint>
#include <map>
```

### Classes

- class [Event](#)

### 5.57.1 Detailed Description

#### Copyright

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Definition in file [Event.h](#).

## 5.58 Event.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006
00007 #include "DIF.h"
00008
00009 #include <TObject.h>
00010 #include <cstdint>
00011 #include <map>
00012
00013 class Event : public TObject
00014 {
00015 public:
00016     void clear();
00017     void addDIF(const DIF& dif);
00018
00019 private:
00020     std::map<std::uint8_t, DIF> DIFs;
00021     ClassDef(Event, 1);
00022 };
```

## 5.59 libs/interface/ROOT/include/EventLinkDef.h File Reference

```
#include <cstdint>
#include <map>
#include <vector>
```

### 5.59.1 Detailed Description

Copyright

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Definition in file [EventLinkDef.h](#).

## 5.60 EventLinkDef.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006 #include <cstdint>
00007 #include <map>
00008 #include <vector>
00009 #ifdef __CLING__
00010 #pragma link C++ class DIF;
00011 #pragma link C++ class std::vector < DIF>;
00012 #pragma link C++ class Hit;
00013 #pragma link C++ class std::vector < Hit>;
00014 #pragma link C++ class Event;
00015 #pragma link C++ class std::vector < Event>;
00016 #pragma link C++ class std::map < std::uint8_t, DIF>;
00017 #endif
```

## 5.61 libs/interface/ROOT/include/Hit.h File Reference

```
#include <TObject.h>
#include <cstdint>
```



## Classes

- class [Hit](#)

### 5.61.1 Detailed Description

#### Copyright

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Definition in file [Hit.h](#).

## 5.62 Hit.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006
00007 #include <TObject.h>
00008 #include <cstdint>
00009
00010 class Hit : public TObject
00011 {
00012 public:
00013     void          setDIF(const std::uint8_t&);
00014     void          setASIC(const std::uint8_t&);
00015     void          setChannel(const std::uint8_t&);
00016     void          setThreshold(const std::uint8_t&);
00017     void          setDTC(const std::uint32_t&);
00018     void          setGTC(const std::uint32_t&);
00019     void          setDIFBCID(const std::uint32_t&);
00020     void          setFrameBCID(const std::uint32_t&);
00021     void          setTimestamp(const std::uint32_t&);
00022     void          setAbsoluteBCID(const std::uint64_t&);
00023     std::uint8_t  getDIFid();
00024     std::uint8_t  getASICid();
00025     std::uint8_t  getChannelId();
00026     std::uint8_t  getThreshold();
00027     std::uint32_t  getDTC();
00028     std::uint32_t  getGTC();
00029     std::uint32_t  getDIFBCID();
00030     std::uint32_t  setFrameBCID();
00031     std::uint32_t  getTimestamp();
00032     std::uint64_t  getAbsoluteBCID();
00033
00034 private:
00035     std::uint8_t  m_DIF{0};
00036     std::uint8_t  m_ASIC{0};
00037     std::uint8_t  m_Channel{0};
00038     std::uint8_t  m_Threshold{0};
00039     std::uint32_t  m_DTC{0};
00040     std::uint32_t  m_GTC{0};
00041     std::uint32_t  m_DIFBCID{0};
00042     std::uint32_t  m_FrameBCID{0};
00043     std::uint32_t  m_Timestamp{0};
00044     std::uint64_t  m_AbsoluteBCID{0};
00045     ClassDef(Hit, 1);
00046 };
```

## 5.63 libs/interface/ROOT/include/HitLinkDef.h File Reference

### 5.63.1 Detailed Description

#### Copyright

2022 G.Grenier F.Lagarde

Definition in file [HitLinkDef.h](#).

## 5.64 HitLinkDef.h

[Go to the documentation of this file.](#)

```
00001
00005 #pragma once
00006 #ifdef __CLING__
00007 #pragma link C++ class Hit;
00008 #endif
```

## 5.65 libs/interface/ROOT/include/ROOTWriter.h File Reference

```
#include "Buffer.h"
#include "DIFPtr.h"
#include "Event.h"
#include "Interface.h"
#include <TFile.h>
#include <TTree.h>
#include <string>
#include <vector>
```

### Classes

- class [ROOTWriter](#)

## 5.66 ROOTWriter.h

[Go to the documentation of this file.](#)

```
00001
00006 #pragma once
00007
00008 #include "Buffer.h"
00009 #include "DIFPtr.h"
00010 #include "Event.h"
00011 #include "Interface.h"
00012
00013 #include <TFile.h>
00014 #include <TTree.h>
00015 #include <string>
00016 #include <vector>
00017
00018 class ROOTWriter : public Interface
00019 {
00020 public:
00021     ROOTWriter();
00022
00023     void setFilename(const std::string&);
00024
00025     void start();
00026     void processDIF(const DIFPtr&);
00027     void processFrame(const DIFPtr&, const std::uint32_t& frameIndex);
00028     void processPadInFrame(const DIFPtr&, const std::uint32_t& frameIndex, const std::uint32_t&
channelIndex);
00029     void processSlowControl(const Buffer&) { ; }
00030     void end();
00031
00032     virtual void startEvent();
00033     virtual void endEvent();
00034     virtual void startDIF();
00035     virtual void endDIF();
00036     virtual void startFrame();
00037     virtual void endFrame();
00038     virtual void startPad();
00039     virtual void endPad();
00040
```

```

00041 private:
00042     TFile*      m_File{nullptr};
00043     TTree*      m_Tree{nullptr};
00044     Event*      m_Event{nullptr};
00045     DIF*        m_DIF{nullptr};
00046     Hit*        m_Hit{nullptr};
00047     std::string m_Filename;
00048 };

```

## 5.67 libs/interface/ROOT/src/DIF.cc File Reference

```

#include "DIF.h"
#include <cstdint>

```

### 5.67.1 Detailed Description

#### Copyright

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Definition in file [DIF.cc](#).

## 5.68 DIF.cc

[Go to the documentation of this file.](#)

```

00001
00006 #include "DIF.h"
00007
00008 #include <cstdint>
00009
00010 void DIF::addHit(const Hit& hit) { m_Hits.push_back(hit); }
00011
00012 void DIF::setID(const std::uint8_t& id) { m_ID = id; }
00013
00014 std::uint8_t DIF::getID()const { return m_ID; }
00015
00016 void DIF::setDTC(const std::uint32_t& dtc) { m_DTC = dtc; }
00017
00018 std::uint32_t DIF::getDTC()const { return m_DTC; }
00019
00020 void DIF::setGTC(const std::uint32_t& gtc) { m_GTC = gtc; }
00021
00022 std::uint32_t DIF::getGTC()const { return m_GTC; }
00023
00024 void DIF::setDIFBCID(const std::uint32_t& difbcid) { m_DIFBCID = difbcid; }
00025
00026 std::uint32_t DIF::getDIFBCID()const { return m_DIFBCID; }
00027
00028 void DIF::setAbsoluteBCID(const std::uint64_t& absolutebcid) { m_AbsoluteBCID = absolutebcid; }
00029
00030 std::uint64_t DIF::getAbsoluteBCID()const { return m_AbsoluteBCID; }

```

## 5.69 libs/interface/ROOT/src/Event.cc File Reference

```

#include "Event.h"

```

### 5.69.1 Detailed Description

#### Copyright

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Definition in file [Event.cc](#).

## 5.70 Event.cc

[Go to the documentation of this file.](#)

```
00001
00006 #include "Event.h"
00007
00008 void Event::clear() { DIFs.clear(); }
00009
00010 void Event::addDIF(const DIF& dif) { DIFs[dif.getID()] = dif; }
```

## 5.71 libs/interface/ROOT/src/Hit.cc File Reference

```
#include "Hit.h"
#include <cstdint>
```

### 5.71.1 Detailed Description

#### Copyright

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Definition in file [Hit.cc](#).

## 5.72 Hit.cc

[Go to the documentation of this file.](#)

```
00001
00006 #include "Hit.h"
00007
00008 #include <cstdint>
00009
00010 void Hit::setDIF(const std::uint8_t& dif) { m_DIF = dif; }
00011
00012 void Hit::setASIC(const std::uint8_t& asic) { m_ASIC = asic; }
00013
00014 void Hit::setChannel(const std::uint8_t& channel) { m_Channel = channel; }
00015
00016 void Hit::setThreshold(const std::uint8_t& threshold) { m_Threshold = threshold; }
00017
00018 void Hit::setDTC(const std::uint32_t& dtc) { m_DTC = dtc; }
00019
00020 void Hit::setGTC(const std::uint32_t& gtc) { m_GTC = gtc; }
00021
00022 void Hit::setDIFBCID(const std::uint32_t& difbcid) { m_DIFBCID = difbcid; }
00023
00024 void Hit::setFrameBCID(const std::uint32_t& framebcid) { m_FrameBCID = framebcid; }
00025
00026 void Hit::setTimestamp(const std::uint32_t& timestamp) { m_Timestamp = timestamp; }
```

```

00027
00028 void Hit::setAbsoluteBCID(const std::uint64_t& absolutebcid) { m_AbsoluteBCID = absolutebcid; }
00029
00030 std::uint8_t Hit::getDIFid() { return m_DIF; }
00031
00032 std::uint8_t Hit::getASICid() { return m_ASIC; }
00033
00034 std::uint8_t Hit::getChannelId() { return m_Channel; }
00035
00036 std::uint8_t Hit::getThreshold() { return m_Threshold; }
00037
00038 std::uint32_t Hit::getDTC() { return m_DTC; }
00039
00040 std::uint32_t Hit::getGTC() { return m_GTC; }
00041
00042 std::uint32_t Hit::getDIFBCID() { return m_DIFBCID; }
00043
00044 std::uint32_t Hit::getFrameBCID() { return m_FrameBCID; }
00045
00046 std::uint32_t Hit::getTimestamp() { return m_Timestamp; }
00047
00048 std::uint64_t Hit::getAbsoluteBCID() { return m_AbsoluteBCID; }

```

## 5.73 libs/interface/ROOT/src/ROOTWriter.cc File Reference

```
#include "ROOTWriter.h"
```

### 5.73.1 Detailed Description

#### Copyright

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Definition in file [ROOTWriter.cc](#).

## 5.74 ROOTWriter.cc

[Go to the documentation of this file.](#)

```

00001
00006 #include "ROOTWriter.h"
00007
00008 void ROOTWriter::setFilename(const std::string& filename) { m_Filename = filename; }
00009
00010 ROOTWriter::ROOTWriter() {}
00011
00012 void ROOTWriter::start()
00013 {
00014     m_File = TFile::Open(m_Filename.c_str(), "RECREATE", m_Filename.c_str(),
00015         ROOT::CompressionSettings(ROOT::kLZMA, 9));
00016     m_Tree = new TTree("RawData", "Raw SDHCAL data tree");
00017     m_Tree->Branch("Events", &m_Event, 10, 0);
00018 }
00019 void ROOTWriter::end()
00020 {
00021     if(m_Tree) m_Tree->Write();
00022     if(m_File)
00023     {
00024         m_File->Write();
00025         m_File->Close();
00026     }
00027     if(m_File) delete m_File;
00028 }
00029
00030 void ROOTWriter::processDIF(const DIFPtr& d)
00031 {

```

```

00032     m_DIF->setID(d.getDIFid());
00033     m_DIF->setDTC(d.getDTC());
00034     m_DIF->setGTC(d.getGTC());
00035     m_DIF->setDIFBCID(d.getBCID());
00036     m_DIF->setAbsoluteBCID(d.getAbsoluteBCID());
00037 }
00038
00039 void ROOTWriter::processFrame(const DIFPtr& d, const std::uint32_t& frameIndex)
00040 {
00041     m_Hit->setDIF(d.getDIFid());
00042     m_Hit->setASIC(d.getASICid(frameIndex));
00043     m_Hit->setDTC(d.getDTC());
00044     m_Hit->setGTC(d.getGTC());
00045     m_Hit->setDIFBCID(d.getBCID());
00046     m_Hit->setAbsoluteBCID(d.getAbsoluteBCID());
00047     m_Hit->setFrameBCID(d.getFrameBCID(frameIndex));
00048     m_Hit->setTimestamp(d.getFrameTimeToTrigger(frameIndex));
00049 }
00050
00051 void ROOTWriter::processPadInFrame(const DIFPtr& d, const std::uint32_t& frameIndex, const
std::uint32_t& channelIndex)
00052 {
00053     m_Hit->setChannel(static_cast<std::uint8_t>(channelIndex));
00054     m_Hit->setThreshold(static_cast<std::uint8_t>(d.getThresholdStatus(frameIndex, channelIndex)));
00055 }
00056
00057 void ROOTWriter::startEvent() { m_Event = new Event(); }
00058
00059 void ROOTWriter::endEvent()
00060 {
00061     m_Tree->Fill();
00062     if(m_Event) delete m_Event;
00063 }
00064
00065 void ROOTWriter::startDIF() { m_DIF = new DIF(); }
00066
00067 void ROOTWriter::endDIF()
00068 {
00069     m_Event->addDIF(*m_DIF);
00070     delete m_DIF;
00071 }
00072
00073 void ROOTWriter::startFrame() { m_Hit = new Hit(); }
00074
00075 void ROOTWriter::endFrame()
00076 {
00077     if(m_Hit->getThreshold() != 0) { m_DIF->addHit(*m_Hit); }
00078     delete m_Hit;
00079 }
00080
00081 void ROOTWriter::startPad() {}
00082
00083 void ROOTWriter::endPad() {}

```