streamout

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Chapter 1

Hierarchical Index

1.1 Class Hierarchy

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

Chapter 2

Class Index

2.1 Class List

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

Chapter 3

File Index

3.1 File List

Here is a list of all files with brief descriptions:

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         {
00095           m_Source.startFrame();
00096           m_Destination.startFrame();
00098           m_Destination.processFrame(d, i);
00099           for(std::size_t j = 0; j < DU::NUMBER_PAD; ++j)
00100           {
00101             m_Source.startPad();
00102             m_Destination.startPad();
00103             m_Destination.processPadInFrame(d, i, j);
00104             m_Source.endPad();
00105             m_Destination.endPad();
00106           }
00108           m_Source.endFrame();
00109           m_Destination.endFrame();
00111         }
00112
00113         bool processSC = false;
00114         if(bufferNavigator.hasSlowControlData())
00115         {
00116           c.hasSlowControl++;
00117           processSC = true;
00118         }
00119         if(bufferNavigator.badSCData())
00120         {
00121           c.hasBadSlowControl++;
00122           processSC = false;
00123         }
00124         if(processSC) { m_Destination.processSlowControl(bufferNavigator.getSCBuffer()); }
00125
00126         Buffer eod = bufferNavigator.getEndOfAllData();
00127         c.SizeAfterAllData[eod.size()]++;
00128         bit8_t* debug_variable_3 = eod.end();
00129         if(debug_variable_1 != debug_variable_3) m_Logger->info("END DATA BUFFER END {} {}",
      fmt::ptr(debug_variable_1), fmt::ptr(debug_variable_3));
00130         if(m_Debug) assert(debug_variable_1 == debug_variable_3);
00131         if(eod.size() != 0) m_Logger->info("End of Data remaining stuff :  {}", to_hex(eod));
00132
00133         int nonzeroCount = 0;
00134         for(bit8_t* it = eod.begin(); it != eod.end(); it++)
00135           if(static_cast<int>(*it) != 0) nonzeroCount++;
00136         c.NonZeroValusAtEndOfData[nonzeroCount]++;
00138         m_Source.endDIF();
00139         m_Destination.endDIF();
00141       }  // end of DIF while loop
00142       m_Logger->warn("***=== Event number {} ===***", m_NbrEvents);
00143       m_NbrEvents++;
00145       m_Source.endEvent();
00146       m_Destination.endEvent();
00148     }  // end of event while loop
00149     m_Destination.end();
00150     m_Source.end();
00151     timer.stop();
00152     fmt::print("=== elapsed time {}ms ({}ms/event) ===\n", timer.getElapsedTime() / 1000,
      timer.getElapsedTime() / (1000 * m_NbrEvents));
00153   }
```

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.

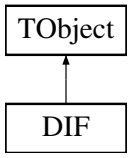
The documentation for this struct was generated from the following files:

- 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

version	Data format version
DIFid	DIF id
buf	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] != 0xa1) size_hardroc1 = 0;
00023
00024   int size_hardroc2 = m_NbrAsic * 109 + header_shift + 1;
00025   if(cbuf[size_hardroc2 - 1] != 0xa1) 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

asicid	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

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

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); }
```

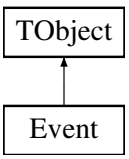
The documentation for this class was generated from the following files:

- 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(); }
```

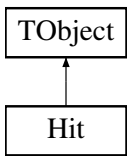
The documentation for this class was generated from the following files:

- 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:

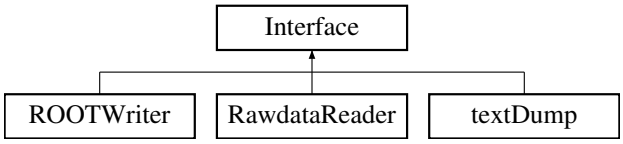
- libs/interface/ROOT/include/Hit.h
- libs/interface/ROOT/src/Hit.cc

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::process↩ Frame(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()]),
      getSizeAfterDIFPtr() - 3 - m_SCbuffer.size()); }
00100   else
00101     return Buffer(&(getDIFBufferStart()[getEndOfDIFData()]), getSizeAfterDIFPtr() - 3);  // remove the
      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; }
```

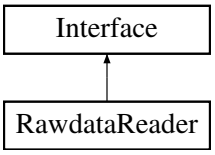
The documentation for this class was generated from the following files:

- 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); }
```

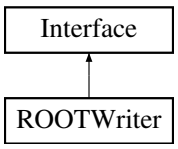
The documentation for this class was generated from the following files:

- 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 &channel↩ Index)
- 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 {}
```

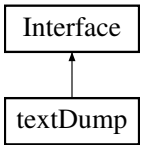
The documentation for this class was generated from the following files:

- 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 <cstdint>
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),
      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   }
00033
00034   void addSink(const spdlog::sink_ptr& sink, const spdlog::level::level_enum& level =
      spdlog::get_level())
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   }
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     {
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         {
00095           m_Source.startFrame();
00096           m_Destination.startFrame();
00098           m_Destination.processFrame(d, i);
00099           for(std::size_t j = 0; j < DU::NUMBER_PAD; ++j)
00100           {
00101             m_Source.startPad();
00102             m_Destination.startPad();
00103             m_Destination.processPadInFrame(d, i, j);
00104             m_Source.endPad();
00105             m_Destination.endPad();
00106           }
00108           m_Source.endFrame();
00109           m_Destination.endFrame();
00111         }
00112
00113         bool processSC = false;
00114         if(bufferNavigator.hasSlowControlData())
00115         {
00116           c.hasSlowControl++;
00117           processSC = true;
00118         }
00119         if(bufferNavigator.badSCData())
00120         {
00121           c.hasBadSlowControl++;
00122           processSC = false;
00123         }
00124         if(processSC) { m_Destination.processSlowControl(bufferNavigator.getSCBuffer()); }
00125
00126         Buffer eod = bufferNavigator.getEndOfAllData();
00127         c.SizeAfterAllData[eod.size()]++;
00128         bit8_t* debug_variable_3 = eod.end();
00129         if(debug_variable_1 != debug_variable_3) m_Logger->info("END DATA BUFFER END {} {}",
      fmt::ptr(debug_variable_1), fmt::ptr(debug_variable_3));
00130         if(m_Debug) assert(debug_variable_1 == debug_variable_3);
00131         if(eod.size() != 0) m_Logger->info("End of Data remaining stuff :  {}", to_hex(eod));
00132
00133         int nonzeroCount = 0;
00134         for(bit8_t* it = eod.begin(); it != eod.end(); it++)
00135           if(static_cast<int>(*it) != 0) nonzeroCount++;
00136         c.NonZeroValusAtEndOfData[nonzeroCount]++;
00138         m_Source.endDIF();
00139         m_Destination.endDIF();
00141       }  // end of DIF while loop
00142       m_Logger->warn("***=== Event number {} ===***", m_NbrEvents);
00143       m_NbrEvents++;
00145       m_Source.endEvent();
00146       m_Destination.endEvent();
00148     }  // end of event while loop
00149     m_Destination.end();
00150     m_Source.end();
00151     timer.stop();
00152     fmt::print("=== elapsed time {}ms ({}ms/event) ===\n", timer.getElapsedTime() / 1000,
      timer.getElapsedTime() / (1000 * m_NbrEvents));
00153   }
00154   void                              printAllCounters() { c.printAllCounters(); }
00155   std::shared_ptr<spdlog::logger> log() { return m_Logger; }
00156
00157   void setDetectorIDs(const std::vector<DetectorID>& detectorIDs) { m_DetectorIDs = detectorIDs; }
00158
00159 private:
00160   std::vector<DetectorID>         m_DetectorIDs;
00161   std::shared_ptr<spdlog::logger> m_Logger{nullptr};
00162   std::vector<spdlog::sink_ptr>   m_Sinks;
00163   BufferLooperCounter             c;
00164   SOURCE&                         m_Source{nullptr};
00165   DESTINATION&                    m_Destination{nullptr};
00166   bool                            m_Debug{false};
00167   std::uint32_t                   m_NbrEvents{1};
00168 };
```

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 <cstdint>
```

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 <cstdint>
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 <cstdint>
#include <spdlog/spdlog.h>
#include <string>
#include <vector>
```

Classes

- class DIFPtr

5.11.1 Detailed Description

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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

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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

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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          hasLine(const std::uint32_t& line, const unsigned char* cb, const
      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,
      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 }
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 <cstdint>
#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 <cstdint>
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] != 0xa1) size_hardroc1 = 0;
00023
00024   int size_hardroc2 = m_NbrAsic * 109 + header_shift + 1;
00025   if(cbuf[size_hardroc2 - 1] != 0xa1) 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 scsize1=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_Discri"]   = 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["Discri_PwrA"] = static_cast<int>(bs[8 * 76 + 6]);
00228   mAsic["Discri2"]     = static_cast<int>(bs[8 * 76 + 7]);
00229
00230   mAsic["Discri1"]      = static_cast<int>(bs[8 * 77]);
00231   mAsic["RS_or_Discri"] = 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["Smalldac"]  = 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["Trig1b"]    = 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;
      // jenlev 1
00113     if(DIFUnpacker::hasAnalogReadout(cb, idx)) fshift = DIFUnpacker::getAnalogPtr(vLines, cb, fshift);
      // to be implemented
00114   }
00115   else
00116     fshift = idx + DU::BCID_SHIFT + 3;
00117   if(cb[fshift] != DU::START_OF_FRAME)
00118   {
00119     std::cout << "This is not a start of frame " << to_hex(cb[fshift]) << " \n";
00120     return fshift;
00121   }
00122   do {
00123     // printf("fshift %d and %d \n",fshift,max_size);
00124     if(cb[fshift] == DU::END_OF_DIF) return fshift;
00125     if(cb[fshift] == DU::START_OF_FRAME) fshift++;
00126     if(cb[fshift] == DU::END_OF_FRAME)
00127     {
00128       fshift++;
00129       continue;
00130     }
00131     std::uint32_t header = DIFUnpacker::getFrameAsicHeader(&cb[fshift]);
00132     if(header == DU::END_OF_FRAME) return (fshift + 2);
00133     // std::cout<<header<<" "<<fshift<<std::endl;
00134     if(header < 1 || header > 48) { throw header + " Header problem " + fshift; }
00135     vFrame.push_back(&cb[fshift]);
00136     fshift += DU::FRAME_SIZE;
00137     if(fshift > max_size)
00138     {
00139       std::cout << "fshift " << fshift << " exceed " << max_size << "\n";
00140       return fshift;
00141     }
00142     if(cb[fshift] == DU::END_OF_FRAME) fshift++;
00143   } while(true);
00144 }
```

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

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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) {
      setBuffer(b, start); }
00017
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() -
      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   uint32_t    k{1};                                                                 // SC Header
00072   uint32_t    dif_ID{m_SCbuffer[1]};
00073   uint32_t    chipSize{m_SCbuffer[3]};
00074   while((dif_ID != 0xa1 && m_SCbuffer[k] != 0xa1 && k < maxsize) || (dif_ID == 0xa1 && m_SCbuffer[k +
      2] == chipSize && k < maxsize))
00075   {
00076     k += 2;  // DIF ID + ASIC Header
00077     uint32_t scsize = m_SCbuffer[k];
00078     if(scsize != 74 && scsize != 109)
00079     {
00080       std::cout « "PROBLEM WITH SC SIZE " « scsize « std::endl;
00081       k           = 0;
00082       m_BadSCdata = true;
00083       break;
00084     }
00085     k++;          // skip size bit
00086     k += scsize;  // skip the data
00087   }
00088   if(m_SCbuffer[k] == 0xa1 && !m_BadSCdata) m_SCbuffer.setSize(k + 1);  // add the trailer
00089   else
00090   {
00091     m_BadSCdata = true;
00092     std::cout « "PROBLEM SC TRAILER NOT FOUND " « std::endl;
00093   }
00094 }
00095
00096 Buffer RawBufferNavigator::getEndOfAllData()
00097 {
00098   setSCBuffer();
00099   if(hasSlowControlData() && !m_BadSCdata) { return Buffer(&(m_SCbuffer.begin()[m_SCbuffer.size()]),
      getSizeAfterDIFPtr() - 3 - m_SCbuffer.size()); }
00100   else
00101     return Buffer(&(getDIFBufferStart()[getEndOfDIFData()]), getSizeAfterDIFPtr() - 3);  // remove the
      2 bytes for CRC and the DIF trailer
00102 }
```

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

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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",
      std::make_shared<spdlog::sinks::stdout_color_sink_mt>());
00020     m_InternalLogger->set_level(spdlog::level::trace);
00021   }
00022   void                              start();
00023   void                              processDIF(const DIFPtr&);
00024   void                              processFrame(const DIFPtr&, uint32_t frameIndex);
00025   void                              processPadInFrame(const DIFPtr&, uint32_t frameIndex, uint32_t
      channelIndex);
00026   void                              processSlowControl(Buffer);
00027   void                              end();
00028   std::shared_ptr<spdlog::logger>& print() { return m_InternalLogger; }
00029   void                              setLevel(const spdlog::level::level_enum& level) {
      m_InternalLogger->set_level(level); }
00030
00031 private:
00032   // This class is a dumb class to print on terminal so we need the logger + the standard one given by
      the interface.
00033   std::shared_ptr<spdlog::logger> m_InternalLogger{nullptr};
00034 };
```

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

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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

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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

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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 <cstdint>
#include <cstring>
#include <stdexcept>
#include <zlib.h>
```

5.51.1 Detailed Description

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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 <cstdint>
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 <cstdint>
#include <vector>
```

Classes

- class DIF

5.53.1 Detailed Description

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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 <cstdint>
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

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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 getFrameBCID();
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

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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

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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

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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

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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(),
      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 }
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() {}
```