*LIGO Laboratory / LIGO Scientific Collaboration*

LIGO-E1300790-v1 *advanced LIGO* 10/16/2013

TwinCAT Library for Photodetectors

Daniel Sigg, Alexa Staley

Distribution of this document:

LIGO Scientific Collaboration

This is an internal working note  
of the LIGO Laboratory.

|  |  |
| --- | --- |
| **California Institute of Technology**  **LIGO Project – MS 18-34**  **1200 E. California Blvd.**  **Pasadena, CA 91125**  Phone (626) 395-2129  Fax (626) 304-9834  E-mail: info@ligo.caltech.edu | **Massachusetts Institute of Technology**  **LIGO Project – NW22-295**  **185 Albany St**  **Cambridge, MA 02139**  Phone (617) 253-4824  Fax (617) 253-7014  E-mail: info@ligo.mit.edu |
| **LIGO Hanford Observatory**  **P.O. Box 159**  **Richland WA 99352**  Phone 509-372-8106  Fax 509-372-8137 | **LIGO Livingston Observatory**  **P.O. Box 940**  **Livingston, LA 70754**  Phone 225-686-3100  Fax 225-686-7189 |

http://www.ligo.caltech.edu/

|  |  |
| --- | --- |
| **Library** | |
| Title | Photodetectors |
| Version | 1 |
| TwinCAT version | V2.11.0 |
| Name space |  |
| Author | Daniel Sigg |
| Description | Information about the photodetectors |
| Error Code | (Qpd) 1 — Whiten  (Wfs) 1 — Dc  (Wfs) 2 — Demod  (Wfs) 3 — Whiten  (WfsSimple) 1 — Demod  (WfsSimple) 2 — Whiten  (LsDc) 1 — Dc  (LsDcWhiten) 1 — Dc  (LsDcWhiten) 4 — Whiten  (LsDemod) 2 — Demod  (LsDemodPhase) 2 — Demod  (LsDemodPhase) 8 — Phase  (LsDemodPhaseWhiten) 2 — Demod  (LsDemodPhaseWhiten) 4 — Whiten  (LsDemodPhaseWhiten) 8 — Phase  (LsDemodWhiten) 2 — Demod  (LsDemodWhiten) 4 — Whiten  (LsError) 1 — Dc  (LsError) 2 — Demod  (LsError) 8 — Phase  (LsSimpleError) 1 — Dc  (LsSimpleError) 2 — Demod  (LsSimpleWhiten) 1 —Dc  (LsSimpleWhiten) 2 — Demod  (LsSimpleWhiten) 4 —Whiten  (LsWhiten) 1 — Dc  (LsWhiten) 2 — Demod  (LsWhiten) 4 — Whiten  (LsWhiten) 8 — Phase |
| Library Dependencies | Error, ReadADC, WriteADC, SaveRestore, DCPower, DelayLogic, IscWhitening |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE QpdStruct :  STRUCT  Error: ErrorStruct;  Whiten: IscWhiteningSimpeQpdStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | QpdStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Whiten  Type: IscWhiteningSimpleQpdStruct  Description: Whitening |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE WfsStruct :  STRUCT  Error: ErrorStruct;  Dc: QuadDCPowerStruct;  Demod: werStructorAscStruct;  Whiten: IscWhiteningSimpeDemodWfsStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | WfsStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output tag | Name: Dc  Type: QuadDCPowerStruct  Description: |
| Output tag | Name: Demod  Type: werStructorAscStruct  Description: |
| Output Tag | Name: Whiten  Type: IscWhiteningSimpleDemodWfsStruct  Description: Whitening |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE WfsSimpleStruct :  STRUCT  Error: ErrorStruct;  Demod: DemodulatorAscStruct;  Whiten: IscWhiteningSimpeWfsSimpleStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | WfsSimpleStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Demod  Type: DemodulatorAscStruct  Description: |
| Output Tag | Name: Whiten  Type: IscWhiteningSimpleWfsSimpleStruct  Description: Whitening |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsDcStruct :  STRUCT  Error: ErrorStruct;  Dc: DCPowerStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsDcStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Dc  Type: DCPowerStruct  Description: DC Power |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsDcWhitenStruct :  STRUCT  Error: ErrorStruct;  Dc: DCPowerStruct;  Whiten: IscWhiteningChannelStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsDcWhitenStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Dc  Type: DCPowerStruct  Description: DC Power |
| Output Tag | Name: Whiten  Type: IscWhiteningChannelStruct  Description: Whitening |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsDemodPhaseStruct :  STRUCT  Error: ErrorStruct;  Demod: icStructtorLscStruct;  Phase: DelayLogicStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsDemodPhaseStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Phase  Type: DelayLogicStruct  Description: |
| Output Tag | Name: Demod  Type: icStructtorLscStruc  Description: |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsDemodPhaseWhitenStruct :  STRUCT  Error: ErrorStruct;  Demod: DemodulatorLscStruct;  Phase: DelayLogicStruct;  Whiten: IscWhiteningSimpleDemodIQStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsDemodPhaseWhitenStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Phase  Type: DelayLogicStruct  Description: |
| Output Tag | Name: Demod  Type: DemodulatorLscStruct  Description: |
| Output Tag | Name: Whiten  Type: IscWhiteningSimpleDemodIQStruct  Description: |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsDemodStruct :  STRUCT  Error: ErrorStruct;  Demod: DemodulatorLscStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsDemodStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Demod  Type: DemodulatorLscStruct  Description: |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsDemodWhitenStruct :  STRUCT  Error: ErrorStruct;  Demod: DemodulatorLscStruct;  Whiten: IscWhiteningSimpleDemodIQStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsDemodWhitenStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Demod  Type: DemodulatorLscStruct  Description: |
| Output Tag | Name: Whiten  Type: IscWhiteningSimpleDemodIQStruct  Description: |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsSimpleStruct :  STRUCT  Error: ErrorStruct;  Dc: DCPowerStruct;  Demod: DemodulatorLscStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsSimpleStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Dc  Type: DCPowerStruct  Description: |
| Output Tag | Name: Demod  Type: DemodulatorLscStruct  Description: |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsSimpleWhitenStruct :  STRUCT  Error: ErrorStruct;  Dc: DCPowerStruct;  Demod: DemodulatorLscStruct;  Whiten: IscWhiteningSimpleDemodIQStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsSimpleWhitenStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Dc  Type: DCPowerStruct  Description: |
| Output Tag | Name: Demod  Type: DemodulatorLscStruct  Description: |
| Output Tag | Name: Whiten  Type: IscWhiteningSimpleDemodIQStruct  Description: |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsStruct :  STRUCT  Error: ErrorStruct;  Dc: DCPowerStruct;  Demod: DemodulatorLscStruct;  Phase: DelayLogicStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Dc  Type: DCPowerStruct  Description: |
| Output Tag | Name: Demod  Type: DemodulatorLscStruct  Description: |
| Output Tag | Name: Phase  Type: DelayLogicStruct  Description: |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsWhitenStruct :  STRUCT  Error: ErrorStruct;  Dc: DCPowerStruct;  Demod: DemodulatorLscStruct;  Phase: DelayLogicStruct;  Whiten: IscWhiteningSimpleDemodIQStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsWhitenStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Dc  Type: DCPowerStruct  Description: |
| Output Tag | Name: Demod  Type: DemodulatorLscStruct  Description: |
| Output Tag | Name: Phase  Type: DelayLogicStruct  Description: |
| Output Tag | Name: Whiten  Type: IscWhiteningSimpleDemodIQStruct  Description: |

|  |  |
| --- | --- |
| **User Interface Type**  TYPE LsDcWhitenOnlyStruct :  STRUCT  Error: ErrorStruct;  Whiten: IscWhiteningChannelStruct;  END\_STRUCT;  END\_TYPE; | |
| Type Name | LsDcWhitenOnlyStruct |
| Description | User interface structure |
| Definition | STRUCT |
| In/out Tag | Name: Error  Type: ErrorStruct  Description: Calls error handler |
| Output Tag | Name: Whiten  Type: IscWhiteningChannelStruct  Description: Whitening |

|  |  |
| --- | --- |
| **Function Block**  TYPE QpdErrorHandlerFB:  VAR\_IN\_OUT  Qpd: QpdStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | QpdErrorHandlerFB |
| Description | Function block used to monitor Qpds |
| Definition | Function Block |
| In/out Argument | Name: Qpd  Type: QpdStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE WfsErrorHandlerFB:  VAR\_IN\_OUT  Wfs WfsStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | WfsErrorHandlerFB |
| Description | Function block used to monitor Wfs |
| Definition | Function Block |
| In/out Argument | Name: Wfs  Type: WfsStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE WfsSimpleErrorHandlerFB:  VAR\_IN\_OUT  WfsSimple WfsSimpleStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | WfsSimpleErrorHandlerFB |
| Description | Function block used to monitor Wfs simple |
| Definition | Function Block |
| In/out Argument | Name: WfsSimple  Type: WfsSimpleStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE LsDcErrorHandlerFB:  VAR\_IN\_OUT  LsDc LsDcStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsDcErrorHandlerFB |
| Description | Function block used to monitor LsDc |
| Definition | Function Block |
| In/out Argument | Name: LsDc  Type: LsDcStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE WfsErrorHandlerFB:  VAR\_IN\_OUT  Wfs WfsStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsDcWhitenErrorHandlerFB |
| Description | Function block used to monitor LsDcWhiten |
| Definition | Function Block |
| In/out Argument | Name: LsDcWhiten  Type: LsDcWhitenStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE LsDcWhitenOnlyErrorHandlerFB:  VAR\_IN\_OUT  LsDcWhitenOnly LsDcWhitenOnlyStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsDcWhitenOnlyErrorHandlerFB |
| Description | Function block used to monitor LsDcWhitenOnly |
| Definition | Function Block |
| In/out Argument | Name: LsDcWhitenOnly  Type: LsDcWhitenOnlyStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE LsDemodErrorHandlerFB:  VAR\_IN\_OUT  LsDemod LsDemodStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsDemodErrorHandlerFB |
| Description | Function block used to monitor LsDemod |
| Definition | Function Block |
| In/out Argument | Name: LsDemod  Type: LsDemodStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE LsDemodPhaseErrorHandlerFB:  VAR\_IN\_OUT  LsDemodPhase LsDemodPhaseStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsDemodPhaseErrorHandlerFB |
| Description | Function block used to monitor LsDemodPhase |
| Definition | Function Block |
| In/out Argument | Name: LsDemodPhase  Type: LsDemodPhaseStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE LsDemodPhaseWhitenErrorHandlerFB:  VAR\_IN\_OUT  LsDemodPhaseWhiten LsDemodPhaseWhitenStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsDemodPhaseWhitenErrorHandlerFB |
| Description | Function block used to monitor LsDemodPhaseWhiten |
| Definition | Function Block |
| In/out Argument | Name: LsDemodPhaseWhiten  Type: LsDemodPhaseWhitenStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE LsDemodWhitenErrorHandlerFB:  VAR\_IN\_OUT  LsDemodWhiten LsDemodWhitenStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsDemodWhitenErrorHandlerFB |
| Description | Function block used to monitor LsDemodWhiten |
| Definition | Function Block |
| In/out Argument | Name: LsDemodWhiten  Type: LsDemodWhitenStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE LsErrorHandlerFB:  VAR\_IN\_OUT  Ls LsStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsErrorHandlerFB |
| Description | Function block used to monitor Ls |
| Definition | Function Block |
| In/out Argument | Name: Ls  Type: LsStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE LsSimpleErrorHandlerFB:  VAR\_IN\_OUT  LsSimple LsSimpleStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsSimpleErrorHandlerFB |
| Description | Function block used to monitor LsSimple |
| Definition | Function Block |
| In/out Argument | Name: LsSimple  Type: LsSimpleStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE LsSimpleWhitenErrorHandlerFB:  VAR\_IN\_OUT  LsSimpleWhiten LsSimpleWhitenStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsSimpleWhitenErrorHandlerFB |
| Description | Function block used to monitor LsSimpleWhiten |
| Definition | Function Block |
| In/out Argument | Name: LsSimpleWhiten  Type: LsSimpleWhitenStruct  Description: User interface structure |

|  |  |
| --- | --- |
| **Function Block**  TYPE LsWhitenErrorHandlerFB:  VAR\_IN\_OUT  LsWhiten LsWhitenStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | LsWhitenErrorHandlerFB |
| Description | Function block used to monitor LsWhiten |
| Definition | Function Block |
| In/out Argument | Name: LsWhiten  Type: LsWhitenStruct  Description: User interface structure |