*LIGO Laboratory / LIGO Scientific Collaboration*

LIGO-E1300767-v2 Advanced LIGO 1/10/2019

TwinCAT Library for ALS Frequency

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LIGO Scientific Collaboration

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| **Library** | |
| Title | ALSFrequency |
| Version | 1 |
| TwinCAT version | V2.11.0 |
| Name space |  |
| Author | Daniel Sigg |
| Description | Tracks the various frequencies |
| Error Code | 16#001 — Illegal diff. VCO frequency  16#002 — Illegal comm. VCO frequency  16#004 — Illegal PSL VCO frequency  16#008 — Illegal fiber AOM frequency  16#010 — Illegal EX VCO frequency  16#020 — Illegal EX beat frequency  16#040 — Illegal EY VCO frequency  16#080 — Illegal EY beat frequency |
| Library Dependencies | ErrorHandler, SaveRestore |

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| **User Interface Type**  TYPE ALSFrequencyStruct :  STRUCT  Error: ErrorStruct;  Aom: LREAL;  DoubleAomVsDoublePsl: LREAL;  BeatX: LREAL;  BeatY: LREAL;  VcoVsDoubleBeatY: LREAL;  GrX: LREAL;  GrXBeat: LREAL;  GrY: LREAL;  GrYBeat: LREAL;  GrXVsDoublePSL: LREAL;  GrXBeatVsDoublePSL: LREAL;  GrYVsDoublePSL: LREAL;  GrYBeatVsDoublePSL: LREAL;  GrXVsGrY: LREAL;  GrXBeatVsGrYBeat: LREAL;  CommX: LREAL:  CommXBeat: LREAL:  CommY: LREAL;  CommYBeat: LREAL;  DiffXY: LREAL;  DiffXYBeat: LREAL;  END\_STRUCT;  END\_TYPE; | |
| Type Name | ALSLaserLockingFiberStruct |
| Description | Structure used in the user interface type monitor the frequencies and beat notes |
| Definition | STRUCT |
| Output Tag | Name: Error  Type: ErrorStruct  Description: Calls the error handler |
| Output Tag | Name: Aom  Type: LREAL  Description: Aom freuquency |
| Output Tag | Name: DoubleAomVsDoublePsl  Type: LREAL  Description: -2\*f\_aom + 2\*f\_psl |
| Output Tag | Name: BeatX  Type: LREAL  Description: Frequency of EX beat note |
| Output Tag | Name: BeatY  Type: LREAL  Description: Frequency of EY beat note |
| Output Tag | Name: VcoVsDoubleBeatX  Type: LREAL  Description: f\_VcoX – 2\*f\_beatX |
| Output Tag | Name: VcoVsDoubleBeatY  Type: LREAL  Description: f\_VcoY – 2\*f\_beatY |
| Output Tag | Name: GrX  Type: LREAL  Description: -4\*f\_Aom + f\_VcoX |
| Output Tag | Name: GrXBeat  Type: LREAL  Description: -4\*f\_Aom + 2\*f\_BeatX |
| Output Tag | Name: GrY  Type: LREAL  Description: -4\*f\_Aom + f\_VcoY |
| Output Tag | Name: GrYBeat  Type: LREAL  Description: -4\*f\_Aom + 2\*f\_BeatY |
| Output Tag | Name: GrXVsDoublePSL  Type: LREAL  Description: -4\*f\_Aom + f\_VcoX + 4\*f\_PSL |
| Output Tag | Name: GrXBeatVsDoublePSL  Type: LREAL  Description: -4\*f\_Aom + 2\*f\_BeatX + 4\*f\_PSL |
| Output Tag | Name: GrYVsDoublePSL  Type: LREAL  Description: -4\*f\_Aom + f\_VcoY + 4\*f\_PSL |
| Output Tag | Name: GrYBeatVsDoublePSL  Type: LREAL  Description: -4\*f\_Aom + 2\*f\_BeatY + 4\*f\_PSL |
| Output Tag | Name: GrXVsGrY  Type: LREAL  Description: f\_VcoX + f\_VcoY |
| Output Tag | Name: GrXBeatVsGrYBeat  Type: LREAL  Description: 2\*(f\_BeatX + f\_BeatY) |
| Output Tag | Name: CommX  Type: LREAL  Description: -4\*f\_Aom + f\_VcoX + 4\*f\_PSL – f\_Comm |
| Output Tag | Name: CommXBeat  Type: LREAL  Description: -4\*f\_Aom + 2\*f\_BeatX + 4\*f\_PSL – f\_Comm |
| Output Tag | Name: CommY  Type: LREAL  Description: -4\*f\_Aom + f\_VcoY + 4\*f\_PSL – f\_Comm |
| Output Tag | Name: CommYBeat  Type: LREAL  Description: -4\*f\_Aom + f\_BeatY + 4\*f\_PSL – f\_Comm |
| Output Tag | Name: DIffXY  Type: LREAL  Description: f\_VcoX + f\_VcoY – 2\*f\_Diff |
| Output Tag | Name: DIffXYBeat  Type: LREAL  Description: 2 \* (f\_BeatX + f\_BeatY –f\_Diff) |

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| **Function Block**  TYPE ALSFrequencyFB:  VAR\_INPUT  Request: SaveRestoreEnum;  DiffVCOFreq: LREAL;  CommVCOFreq: LREAL;  PslVCOFreq: LREAL;  FiberAOMFreq: LREAL;  ExVCOFreq: LREAL;  ExBeatFreq: LREAL;  EyVCOFreq: LREAL;  EyBeatFreq: LREAL;  END\_VAR;  VAR\_IN\_OUT  AlsFreq: AlsFrequencyStruct;  AlsFreqInit; AlsFrequencyStruct;  END\_VAR:  END\_TYPE; | |
| Type Name | ALSFrequencyFB |
| Description | Function block used to monitor the VCO and beat note frequencies |
| Definition | Function Block |
| Input Argument | Name: Request  Type: SaveRestoreEnum  Description: Request save/restore/safemood or noop |
| Input Argument | Name: DiffVCOFreq  Type: LREAL  Description: Monitors the diff. VCO frequency |
| Input Argument | Name: CommVCOFreq  Type: LREAL  Description: Monitors the omm.. VCO frequency |
| Input Argument | Name: PslVCOFreq  Type: LREAL  Description: Monitors the PSL VCO frequency |
| Input Argument | Name: FiberAOMFreq  Type: LREAL  Description: Monitors the fiber AOM frequency |
| Input Argument | Name: ExVCOFreq  Type: LREAL  Description: Monitors the EX VCO frequency |
| Input Argument | Name: ExBeatFreq  Type: LREAL  Description: Monitors the EX beat note frequency |
| Input Argument | Name: EyVCOFreq  Type: LREAL  Description: Monitors the EY VCO frequency |
| Input Argument | Name: EyBeatFreq  Type: LREAL  Description: Monitors the EY beat note frequency |
| In/out Argument | Name: AlsFreq  Type: AlsFrequencyStruct  Description: User interface structure |
| In/out Argument | Name: AlsFreqInit  Type: AlsFrequencyStruct  Description: Save/restore variable in persistent memory |