*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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of the LIGO Laboratory.

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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 frequency16#004 — Illegal PSL VCO frequency16#008 — Illegal fiber AOM frequency16#010 — Illegal EX VCO frequency16#020 — Illegal EX beat frequency16#040 — Illegal EY VCO frequency16#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: ErrorType: ErrorStructDescription: Calls the error handler |
| Output Tag | Name: AomType: LREALDescription: Aom freuquency  |
| Output Tag | Name: DoubleAomVsDoublePslType: LREALDescription: -2\*f\_aom + 2\*f\_psl |
| Output Tag | Name: BeatXType: LREALDescription: Frequency of EX beat note |
| Output Tag | Name: BeatYType: LREALDescription: Frequency of EY beat note |
| Output Tag | Name: VcoVsDoubleBeatXType: LREALDescription: f\_VcoX – 2\*f\_beatX |
| Output Tag | Name: VcoVsDoubleBeatYType: LREALDescription: f\_VcoY – 2\*f\_beatY |
| Output Tag | Name: GrXType: LREALDescription: -4\*f\_Aom + f\_VcoX |
| Output Tag | Name: GrXBeatType: LREALDescription: -4\*f\_Aom + 2\*f\_BeatX |
| Output Tag | Name: GrYType: LREALDescription: -4\*f\_Aom + f\_VcoY |
| Output Tag | Name: GrYBeatType: LREALDescription: -4\*f\_Aom + 2\*f\_BeatY |
| Output Tag | Name: GrXVsDoublePSLType: LREALDescription: -4\*f\_Aom + f\_VcoX + 4\*f\_PSL |
| Output Tag | Name: GrXBeatVsDoublePSLType: LREALDescription: -4\*f\_Aom + 2\*f\_BeatX + 4\*f\_PSL |
| Output Tag | Name: GrYVsDoublePSLType: LREALDescription: -4\*f\_Aom + f\_VcoY + 4\*f\_PSL |
| Output Tag | Name: GrYBeatVsDoublePSLType: LREALDescription: -4\*f\_Aom + 2\*f\_BeatY + 4\*f\_PSL |
| Output Tag | Name: GrXVsGrYType: LREALDescription: f\_VcoX + f\_VcoY |
| Output Tag | Name: GrXBeatVsGrYBeatType: LREALDescription: 2\*(f\_BeatX + f\_BeatY) |
| Output Tag | Name: CommXType: LREALDescription: -4\*f\_Aom + f\_VcoX + 4\*f\_PSL – f\_Comm |
| Output Tag | Name: CommXBeatType: LREALDescription: -4\*f\_Aom + 2\*f\_BeatX + 4\*f\_PSL – f\_Comm |
| Output Tag | Name: CommYType: LREALDescription: -4\*f\_Aom + f\_VcoY + 4\*f\_PSL – f\_Comm |
| Output Tag | Name: CommYBeatType: LREALDescription: -4\*f\_Aom + f\_BeatY + 4\*f\_PSL – f\_Comm |
| Output Tag | Name: DIffXYType: LREALDescription: f\_VcoX + f\_VcoY – 2\*f\_Diff |
| Output Tag | Name: DIffXYBeatType: LREALDescription: 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: RequestType: SaveRestoreEnumDescription: Request save/restore/safemood or noop |
| Input Argument | Name: DiffVCOFreqType: LREALDescription: Monitors the diff. VCO frequency |
| Input Argument | Name: CommVCOFreqType: LREALDescription: Monitors the omm.. VCO frequency |
| Input Argument | Name: PslVCOFreqType: LREALDescription: Monitors the PSL VCO frequency |
| Input Argument | Name: FiberAOMFreqType: LREALDescription: Monitors the fiber AOM frequency |
| Input Argument | Name: ExVCOFreqType: LREALDescription: Monitors the EX VCO frequency |
| Input Argument | Name: ExBeatFreqType: LREALDescription: Monitors the EX beat note frequency |
| Input Argument | Name: EyVCOFreqType: LREALDescription: Monitors the EY VCO frequency |
| Input Argument | Name: EyBeatFreqType: LREALDescription: Monitors the EY beat note frequency |
| In/out Argument | Name: AlsFreqType: AlsFrequencyStructDescription: User interface structure |
| In/out Argument | Name: AlsFreqInitType: AlsFrequencyStructDescription: Save/restore variable in persistent memory |