*LIGO Laboratory / LIGO Scientific Collaboration*

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TwinCAT Library for AOM Driver

Daniel Sigg

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LIGO Scientific Collaboration

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

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| **Library** |
| Title | AomDriver |
| Version | 1 |
| TwinCAT version | 2.11 |
| Name space | – |
| Author | Daniel Sigg |
| Description | Controls the AM-modulated AOM driver, [E1900038](https://dcc.ligo.org/LIGO-E1900038).The frequency difference mixer is using the same RF mixer circuit but without a divider and a VCO. It implements none of the extra frequency controls of the VCO neither. The fixed ratio frequency source locks an OCXO to an RF signal using an internal PLL, in order to generate a clean higher order harmonics.The RF power monitor has the calibration$$P=22 dBm-10 dBm/V×(U-4 V)$$The corresponding temperature readout has the calibration$$T=20°C+50°C/V×(U\*1.10-6 V)$$The factor 1.10 is due to the voltage divider at the temperature readout.The RF power levels can be alarmed when outside ±1dBm of nominal. |
| Error codes | 0x01 – Power supply voltages out-of-range0x02 – Output RF power level out-of-range0x04 – Excitation switch |
| Library dependencies: | Error, SaveRestore, ReadADC. WriteDAC |

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| **Hardware Input Type**TYPE AomDriverInStruct :STRUCT OutputMon: INT; OutputTemp: INT; ModulationMon: INT; Spare: INT; ExcitationSwitch: BOOL; PowerOk: BOOL;END\_STRUCTEND\_TYPE |
| Type name | AomDriverInStruct |
| Description | Structure of the hardware inputs that are wired up for the AOM driver |
| Definition | STRUCT |
| Element | Name: OutputMonType: INTDescription: Monitors the RF power after the output amplifier |
| Element | Name: OutputTempType: INTDescription: Monitors the temperature of the output RF detector |
| Element | Name: ModulationMonType: INTDescription: Monitor for the modulation signal |
| Element | Name: SpareType: INTDescription: not used |
| Element | Name: ExcitationSwitchType: BOOLDescription: Monitors the excitation input enable |
| Element | Name: PowerOkType: BOOLDescription: Voltage monitor readback |

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| **Hardware Output Type**TYPE AomDriverOutStruct :STRUCT ModulationBias: INT; ExcitationEn: BOOL; DewhiteSwitchAB: BOOL; DewhiteSwitchA: BOOL;END\_STRUCTEND\_TYPE |
| Type name | AomDriverOutStruct |
| Description | Structure of the hardware outputs that are wired up for the AOM Driver |
| Definition | STRUCT |
| Element | Name: ModulationBiasType: INTDescription: Set point for the modulation bias |
| Element | Name: ExcitationEnType: BOOLDescription: Enables the excitation input |
| Element | Name: DewhiteSwitchABType: BOOLDescription: Enables the dewhitening switches A and B |
| Element | Name: DewhiteSwitchAType: BOOLDescription: Enables the dewhitening switch A |

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| **User Interface Type**TYPE AomDriverDewehiteEnum :  AomDriverDewhiteNone, AomDriverDewhiteOne, AomDriverDewhiteTwo);END\_TYPE |
| Type name | AomDriverPowerEnum |
| Description | Enumerated type to describe the dewhitening switch state of the AOM driver |
| Definition | ENUM |
| Enum Tag | Name: AomDriverDewhiteNoneShort: NONEDescription: None of the dewhitening filters is on |
| Enum Tag | Name: AomDriverDewhiteOneShort: ADescription: First dewhitening filter is on |
| Enum Tag | Name: AomDriverDewhiteTwoShort A+BDescription: Both dewhitening filters are on |

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| **User Interface Type**TYPE AomDriverStruct :STRUCT Error: ErrorStruct; OutputMon: LREAL;  OuptutNom: LREAL; OutputTemp: LREAL; ModulationBias: LREAL; ModulationMon: LREAL; ExcitationSwitch: BOOL; ExcitationEn: BOOL; PowerOk: BOOL; DewhiteSwitch: AomDriverDewhiteEnum;END\_STRUCTEND\_TYPE |
| Type name | AomDriverStruct |
| Description | Structure of the user interface tags that are used to control the low noise VCO |
| Definition | STRUCT |
| Output Tag | Name: ErrorType: ErrorStructDescription: For error handler |
| Output Tag | Name: OutputMonType: LREALDescription: Monitors the RF power after the output amplifier dBm |
| Input Tag | Name: OutputNomType: LREALDescription: Nominal value for the RF power at the output amplifier in dBm |
| Output Tag | Name: OutputTempType: LREALDescription: Monitors the temperature of the output RF detector in C |
| Input Tag | Name: ModulationBiasType: LREALDescription: Set point for the modulation bias in V |
| Output Tag | Name: ModulationMonType: LREALDescription: Monitor for the modulation signal in V |
| Input Tag | Name: ExcitationEnType: BOOLDescription: Enables the excitation input |
| Output Tag | Name: ExcitationSwitchType: BOOLDescription: Monitors the excitation input enable |
| Output Tag | Name: PowerOkType: BOOLDescription: Voltage monitor readback |
| Input Tag | Name: DewhiteSwitchType: AomDriverDewhiteEnumDescription: State of dewhitening filter stages |

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| **Function Block**FUNCTION\_BLOCK AomDriverFBVAR\_INPUT Request: SaveRestoreEnum; AomDriverIn: AomDriverInStruct;END\_VARVAR\_OUTPUT AomDriverOut: AomDriverOutStruct;END\_VARVAR\_IN\_OUT AomDriverInit: AomDriverStruct; AomDriver: AomDriverStruct;END\_VAR |
| Name | AomDriverFB |
| Description | Controls the AOM driver. One function block for each AOM driver chassis needs to be instantiated. |
| Input argument  | Name: RequestType: SaveRestoreEnumDescription: Save restore command |
| Input argument | Name: AomDriverInType: AomDriverInStructDescription: Input hardware structure |
| Output argument | Name: AomDriverOutType: AomDriverOutStructDescription: Output hardware structure |
| In/out argument | Name: AomDriverInitType: AomDriverStructDescription: Save/restore variables in persistent memory |
| In/out argument | Name: AomDriverType: AomDriverStructDescription: User Interface structure |