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LIGO- E1700244-v2 Advanced LIGO 4/6/2018

TwinCAT Library for
Motorized Flipper/TTL IO Controller

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| **Library** |
| Title | MotorizedFlipper |
| Version | 1 |
| TwinCAT version | 2.11 |
| Name space | – |
| Author | Daniel Sigg |
| Description | Interfaces the motorized flipper/TTL IO controller, [D1700170](https://dcc.ligo.org/LIGO-D1700170).This library provides a function block to support a single channel of the 8‑channel motorized flipper controller/3-channel relay driver. Each motorized flipper channel consists of a TTL digital output for control and a TTL digital input as a readback. Similarly, each channel of the relay driver consist of a coil contact and a readback.The hardware readbacks of the power ok are daisy chained among the 11 channels of a board.A specialized function is used to control the fiber switch. |
| Error codes | Motorized Flipper:0x01 – Power supply voltages out-of-range0x02 – Illegal readback (mismatch between control and readback)0x04 – Readback not nominal (state not as expected)Fiber Switch:0x01 – Power supply voltages out-of-range0x02 – Illegal power switch readback (mismatch control/readback)0x04 – Illegal fiber switch readback (mismatch control/readback)0x08 – Power switch not nominal (state not as expected)0x10 – Fiber switch not nominal (state not as expected) |
| Library dependencies | Error, SaveRestore |

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| **Hardware Input Type**TYPE MotorizedFlipperInStruct:STRUCT Readback: BOOL; PowerOk: BOOL;END\_STRUCTEND\_TYPE |
| Type name | MotorizedFlipperInStruct |
| Description | Structure of the hardware inputs that are wired up for the motorized flipper/TTL IO controller |
| Definition | STRUCT |
| Element | Name: ReadbackType: BOOLDescription: TTL readback |
| Element | Name: PowerOkType: BOOLDescription: Voltage monitor readback |

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| **Hardware Output Type**TYPE MotorizedFlipperOutStruct:STRUCT  Control: BOOL; PowerOk: BOOL;END\_STRUCTEND\_TYPE |
| Type name | MotorizedFlipperOutStruct |
| Description | Structure of the hardware output that are wired up for the motorized flipper/TTL IO controller |
| Definition | STRUCT |
| Element | Name: ControlType: BOOLDescription: TTL output |
| Element | Name: PowerOkType: BOOLDescription: Voltage monitor readback (daisy chained from input) |

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| **User Interface Type**TYPE MotorizedFlipperStruct:STRUCT Error: ErrorStruct; Name: STRING; Control: BOOL;  Negate: BOOL; Readback: BOOL;  Inverted: BOOL;  Check: BOOL; Nominal: BOOL; Mismatch: BOOL; PowerOk: BOOL; END\_TYPE |
| Type name | MotorizedFlipperStruct |
| Description | Structure of the user interface tags that are used to control the motorized flipper/TTL IO controller. |
| Definition | STRUCT |
| Output Tag | Name: ErrorType: ErrorStructDescription: Error handling |
| In/Out Tag | Name: NameType: STRINGDescription: Name of flipper or channel |
| Output Tag | Name: ControlType: BOOLDescription: Control value (TTL output) |
| In/out Tag | Name: NegateType: BOOLDescription: Positive or negative logic for TTL output  |
| Output Tag | Name: ReadbackType: BOOLDescription: Logic readback (TTL input) |
| In/Out Tag | Name: InvertedType: BOOLDescription: Readback is inverted |
| In/Out Tag | Name: CheckType: BOOLDescription: Check readback against nominal |
| In/Out Tag | Name: NominalType: BOOLDescription: Nominal readback value |
| Output Tag | Name: MismatchType: BOOLDescription: Readback is not at nominal |
| Output Tag | Name: PowerOkType: BOOLDescription: Voltages are ok |

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| **User Interface Type**TYPE MFCTypeEnum: (MFCFlipper, MFCRelay);END\_TYPE |
| Type name | MFCTypeEnum |
| Description | Structure of the user interface that are is used to describe the type of switch, e.g., flipper or relay. |
| Definition | ENUM |
| Enum Tag | Name: MFCFlipperDescription: This controls a flipper |
| Enum Tag | Name: MFCRelayDescription: This controls a relay |

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| **User Interface Type**TYPE FiberSwitchStruct:STRUCT Error: ErrorStruct; Name: STRING; PowerSwitch: MotorizedFlipperStruct;  FiberSwitch: MotorizedFlipperStruct;  FiberPathList: ARRAY [1..2] OF STRING; FiberPathNum: DINT; FiberPathName: STRING;END\_TYPE |
| Type name | FiberSwitchStruct |
| Description | Structure of the user interface that is used to control the fiber switch. |
| Definition | STRUCT |
| Output Tag | Name: ErrorType: ErrorStructDescription: Error handling |
| In/Out Tag | Name: NameType: STRINGDescription: Name of fiber switch |
| In/Out Tag | Name: PowerSwitchType: MotorizedFlipperStructDescription: Controls the power to the fiber switch |
| In/Out Tag | Name: FiberSwitchType: MotorizedFlipperStructDescription: Controls the fiber switch |
| Output Tag | Name: FiberPathNumType: DINTDescription: ID (number) of selected fiber path |
| Output Tag | Name: FiberPathNameType: STRINGDescription: Name of selected fiber path |

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| **Function Block**FUNCTION\_BLOCK MotorizedFlipperFBVAR\_INPUT Request: SaveRestoreEnum; Controlling: MFCTypeEnum := MFCFlipper; MotorizedFlipperIn: MotorizedFlipperInStruct;END\_VARVAR\_OUTPUT MotorizedFlipperOut: MotorizedFlipperOutStruct;END\_VARVAR\_IN\_OUT MotorizedFlipperInit: MotorizedFlipperStruct; MotorizedFlipper: MotorizedFlipperStruct;END\_VAR |
| Name | MotorizedFlipperFB |
| Description | Controls a channel of the motorized flipper/TTL IO controller |
| Input argument  | Name: RequestType: SaveRestoreEnumDescription: Save/restore command |
| Input argument  | Name: ControllingType: MFCTypeEnumDescription: Selects the type of IO |
| Input argument | Name: MotorizedFlipperInType: MotorizedFlipperInStructDescription: Input hardware structure |
| Output argument | Name: MotorizedFlipperOutType: MotorizedFlipperOutStructDescription: Output hardware structure |
| In/out argument | Name: MotorizedFlipperInitType: MotorizedFlipperStructDescription: Interface structure for save/restore |
| In/out argument | Name: MotorizedFlipperType: MotorizedFlipperStructDescription: User Interface structure |

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| **Function Block**FUNCTION\_BLOCK FiberSwitchFBVAR\_INPUT Request: SaveRestoreEnum; InvertedLogic: BOOL := FALSE; FiberSwitchIn: MotorizedFlipperInStruct; PowerSwitchIn: MotorizedFlipperInStruct; END\_VARVAR\_OUTPUT FiberSwitchOut: MotorizedFlipperOutStruct; PowerSwitchOut: MotorizedFlipperOutStruct; END\_VARVAR\_IN\_OUT FiberSwitchInit: FiberSwitchStruct; FiberSwitch: FiberSwitchStruct;END\_VAR |
| Name | FiberSwitchFB |
| Description | Controls a fiber switch, ie., E1700252, using the motorized flipper/TTL IO controller |
| Input argument  | Name: RequestType: SaveRestoreEnumDescription: Save/restore command |
| Input argument  | Name: InvertedLogicType: BOOLDescription: Invert the logic of the fiber switch |
| Input argument  | Name: FiberSwitchInType: MotorizedFlipperInStructDescription: Input hardware structure for fiber switch |
| Input argument  | Name: PowerSwitchInType: MotorizedFlipperInStructDescription: Input hardware structure for power on/off to fiber switch |
| Output argument | Name: FiberSwitchOutType: MotorizedFlipperOutStructDescription: Output hardware structure for fiber switch |
| Output argument | Name: PowerSwitchOutType: MotorizedFlipperOutStructDescription: Output hardware structure for power on/off to fiber switch |
| In/out argument | Name: FiberSwitchInitType: FiberSwitchStructDescription: Interface structure for save/restore |
| In/out argument | Name: FiberSwitchType: FiberSwitchStructDescription: User Interface structure |