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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-range  0x02 – Illegal readback (mismatch between control and readback)  0x04 – Readback not nominal (state not as expected)  Fiber Switch:  0x01 – Power supply voltages out-of-range  0x02 – 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\_STRUCT  END\_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: Readback  Type: BOOL  Description: TTL readback |
| Element | Name: PowerOk  Type: BOOL  Description: Voltage monitor readback |

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| **Hardware Output Type**  TYPE MotorizedFlipperOutStruct:  STRUCT  Control: BOOL;  PowerOk: BOOL;  END\_STRUCT  END\_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: Control  Type: BOOL  Description: TTL output |
| Element | Name: PowerOk  Type: BOOL  Description: 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: Error  Type: ErrorStruct  Description: Error handling |
| In/Out Tag | Name: Name  Type: STRING  Description: Name of flipper or channel |
| Output Tag | Name: Control  Type: BOOL  Description: Control value (TTL output) |
| In/out Tag | Name: Negate  Type: BOOL  Description: Positive or negative logic for TTL output |
| Output Tag | Name: Readback  Type: BOOL  Description: Logic readback (TTL input) |
| In/Out Tag | Name: Inverted  Type: BOOL  Description: Readback is inverted |
| In/Out Tag | Name: Check  Type: BOOL  Description: Check readback against nominal |
| In/Out Tag | Name: Nominal  Type: BOOL  Description: Nominal readback value |
| Output Tag | Name: Mismatch  Type: BOOL  Description: Readback is not at nominal |
| Output Tag | Name: PowerOk  Type: BOOL  Description: 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: MFCFlipper  Description: This controls a flipper |
| Enum Tag | Name: MFCRelay  Description: 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: Error  Type: ErrorStruct  Description: Error handling |
| In/Out Tag | Name: Name  Type: STRING  Description: Name of fiber switch |
| In/Out Tag | Name: PowerSwitch  Type: MotorizedFlipperStruct  Description: Controls the power to the fiber switch |
| In/Out Tag | Name: FiberSwitch  Type: MotorizedFlipperStruct  Description: Controls the fiber switch |
| Output Tag | Name: FiberPathNum  Type: DINT  Description: ID (number) of selected fiber path |
| Output Tag | Name: FiberPathName  Type: STRING  Description: Name of selected fiber path |

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| **Function Block**  FUNCTION\_BLOCK MotorizedFlipperFB  VAR\_INPUT  Request: SaveRestoreEnum;  Controlling: MFCTypeEnum := MFCFlipper;  MotorizedFlipperIn: MotorizedFlipperInStruct;  END\_VAR  VAR\_OUTPUT  MotorizedFlipperOut: MotorizedFlipperOutStruct;  END\_VAR  VAR\_IN\_OUT  MotorizedFlipperInit: MotorizedFlipperStruct;  MotorizedFlipper: MotorizedFlipperStruct;  END\_VAR | |
| Name | MotorizedFlipperFB |
| Description | Controls a channel of the motorized flipper/TTL IO controller |
| Input argument | Name: Request  Type: SaveRestoreEnum  Description: Save/restore command |
| Input argument | Name: Controlling  Type: MFCTypeEnum  Description: Selects the type of IO |
| Input argument | Name: MotorizedFlipperIn  Type: MotorizedFlipperInStruct  Description: Input hardware structure |
| Output argument | Name: MotorizedFlipperOut  Type: MotorizedFlipperOutStruct  Description: Output hardware structure |
| In/out argument | Name: MotorizedFlipperInit  Type: MotorizedFlipperStruct  Description: Interface structure for save/restore |
| In/out argument | Name: MotorizedFlipper  Type: MotorizedFlipperStruct  Description: User Interface structure |

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| **Function Block**  FUNCTION\_BLOCK FiberSwitchFB  VAR\_INPUT  Request: SaveRestoreEnum;  InvertedLogic: BOOL := FALSE;  FiberSwitchIn: MotorizedFlipperInStruct;  PowerSwitchIn: MotorizedFlipperInStruct;  END\_VAR  VAR\_OUTPUT  FiberSwitchOut: MotorizedFlipperOutStruct;  PowerSwitchOut: MotorizedFlipperOutStruct;  END\_VAR  VAR\_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: Request  Type: SaveRestoreEnum  Description: Save/restore command |
| Input argument | Name: InvertedLogic  Type: BOOL  Description: Invert the logic of the fiber switch |
| Input argument | Name: FiberSwitchIn  Type: MotorizedFlipperInStruct  Description: Input hardware structure for fiber switch |
| Input argument | Name: PowerSwitchIn  Type: MotorizedFlipperInStruct  Description: Input hardware structure for power on/off to fiber switch |
| Output argument | Name: FiberSwitchOut  Type: MotorizedFlipperOutStruct  Description: Output hardware structure for fiber switch |
| Output argument | Name: PowerSwitchOut  Type: MotorizedFlipperOutStruct  Description: Output hardware structure for power on/off to fiber switch |
| In/out argument | Name: FiberSwitchInit  Type: FiberSwitchStruct  Description: Interface structure for save/restore |
| In/out argument | Name: FiberSwitch  Type: FiberSwitchStruct  Description: User Interface structure |