LIGO Laboratory / LIGO Scientific Collaboration

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TwinCAT Library for Motorized Flipper/TTL IO Controller

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LIGO Scientific Collaboration

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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. 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

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

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)

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

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

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

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

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