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TwinCAT Library for ALS PDH Locking

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Library	
Title	ALSPDHLocking
Version	1
TwinCAT version	V2.11.0
Name space	
Author	Sheila Dwyer, Alexa Staley
Description	Autolocker for ALS PDH at end station. To begin, the autolocker checks whether the locking conditions have been meet. These conditions are specified in the library; for example, the PLL must be locked. The user is allowed to override these locking conditions by forcing the autolocker to run. When the autolocker runs, the settings on the common mode board for the REFL servo are manipulated until lock is reached (or the acquisition fails). Lock is determined from either the REFL PD or the Trans PD input. The user specifies which to use and the threshold of each.
Error Code	16#2000—Acquisition Failed
Library dependencies	ALSCommunication, ALSLaser, ALSLaserLocking, ALSStateMachine, WriteADC, DCPower, DelayLinePhaseShifter, CommonModeServo, Demodulator, Error, FiberDistribution, IscWhitening, LowNoiseVCO, Photodetectors, ReadADC, RFAmplifier, RTCommunication, SaveRestore

ALS PDH Locking Type	
TYPE ALSPDHLockingEnum : (PDHDisengaged, PDHAcquire, PDHLocked, PDHFailed); END_TYPE;	
Type name	ALSPDHLockingEnum
Description	Specifies the state of the autolocker and arm cavity
Definition	ENUM
Element	Name: PDHDisengaged Description: The autolocker is disengaged
Element	Name: PDHAcquire Description: The autolocker is attempting to acquire lock
Element	Name: PDHLocked Description: The arm cavity is locked to the 532nm beam
Element	Name: PDHFailed Description: The autolocker failed to lock the cavity

User Interface Type	
TYPE ALSPDHLockingLogicStruct : STRUCT Conditions: BOOL; LockingCriteria: BOOL; Enable: BOOL; Force: BOOL; On: BOOL; SlowOn: BOOL; END_STRUCT END_TYPE;	
Type name	ALSPDHLockingLogicStruct
Description	Structure used in the user interface type to control the autolocker
Definition	STRUCT
Input Tag	Name: Conditions Type: BOOL Description: Pre-conditions for locking
Input Tag	Name: LockingCriteria

	Type: BOOL Description: Locking conditions used to determine arm lock
Input Tag	Name: Enable Type: BOOL Description: Enable autolocker
Input Tag	Name: Force Type: BOOL Description: Force autolocker to engage even if conditions are not met
Output Tag	Name: On Type: BOOL Description: Autolocker is on
Input Tag	Name: SlowOn Type: BOOL Description: Slow Servo is on

<p>User Interface Type TYPE ALSPDHLockingStruct : STRUCT Error: ErrorStruct; State: ALSPDHLockingEnum; RefIPwrUnlockedNom: LREAL; RefIPwrLockedPercent: LREAL := 70; TransPDNormThresh: LREAL; Logic: AKSODHLockingLogicStruct; Status: BOOL; LockLosses: INT; ResetLockLosses: BOOL; AcquireGain: INT; LockedGain: INT; END_STRUCT END_TYPE;</p>	
Type name	ALSPDHLockingStruct
Description	Structure used in the user interface type for the autolocker
Definition	STRUCT
Input/Output Tag	Name: Error Type: ErrorStruct Description: Calls error handler
Output Tag	Name: State Type: ALSPDHLockingEnum Description: Autolocker state

Input Tag	Name: ReflPwrUnlockedNom Type: LREAL Description: Nominal power on REFL PD (cavity unlocked)
Input Tag	Name: ReflPwrLockedPercent Type: LREAL Description: Upper limit on REFL PD (cavity locked); default is 70%
Input Tag	Name: TransPDNormThresh Type: LREAL Description: Locking threshold set for Trans PD Norm
Output Tag	Name: Logic Type: ALSPDHLockingLogicStruct Description: Autolocker logic
Output Tag	Name: Status Type: BOOL Description: Status of 532nm locking
Output Tag	Name: LockLosses Type: INT Description: Lock loss count
Input Tag	Name: ResetLockLosses Type: BOOL Description: Reset lock loss count
Input Tag	Name: AcquireGain Type: INT Description: Gain to use when acquiring lock (in dB)
Input Tag	Name: LockGain Type: INT Description: Gain to use when locked (in dB)

Function Block TYPE ALSPDHLockingFB : VAR_INPUT Request: SaveRestoreEnum; PLLLocking: ALSLaserLockingStruct; GreenLaserPD: DCPowerStruct; RFAmp: RFAmplifierStruct; RelfPDA: DCPowerStruct; ReflPDB: DCPowerStruct; PhasShifter: DelayLogicStruct; Demod: DemodulatorLscStruct; FromCornerPLC2: CornerPLC2toEndStruct; RealTime: RTCommunicationStruct; DummyREalTimeSend: DWORD; END_VAR VAR_IN_OUT ALSPDHLockingInit: ALSPDHLockingStruct; ALSPDHLocking: ALSPDHLockingStruct; Servo: CommonModeStruct; VCO: LowNoiseVCOStruct; END_VAR END_TYPE;	
Type name	ALSPDHLockingStruct
Description	This function block attempts to lock the arm cavity to the green beam depending on the user interface commands and locking conditions. This function block also indicates whether lock has been acquired.
Definition	
Input argument	Name: Request Type: SaveRestoreEnum Description: Request save/restore/safemood or noop
Input argument	Name: PLLocking Type: ALSLaserLockingStruct Description: Checks if PLL is locked for locking conditions
Input argument	Name: GreenLaserPD Type: DCPowerStruct Description: Checks status of green laser PD

Input argument	Name: RFamp Type: RFamplifierStruct Description: Checks status of RF amplifier for locking conditions
Input argument	Name: ReflPDA Type: DCPowerStruct; Description: Checks reflected PD A DC power
Input argument	Name: ReflPDB Type: DCPowerStruct Description: Check reflected PD B DC power
Input argument	Name: PhaseShifter Type: DelayLogicStruct Description: Checks status of phase shifter for locking conditions
Input argument	Name: Demod Type: DemodulatorLscStruct Description: Checks status of demodulator for locking conditions
Input argument	Name: FromCornerPLC2 Type: CornerPLC2toEndStruct; Description: Checks communication from corner station PLC2 to end station
Input argument	Name: RealTime Type: RTCommunicationStruct; Description: Checks the real time communication system
Input argument	Name: DummyRealTimeSend Type: DWORD Description: Dummy variable for real time
In/out argument	Name: ALSPDHLockingInit Type: ALSPDHLockingStruct Description: Save/restore variable in persistent memory
In/out argument	Name: ALSPDHLocking Type: ALSPDHLockingStruct Description: User interface structure
In/out argument	Name: Servo Type: CommdModeStruct Description: User interface structure
In/out argument	Name: VCO Type: LowNoiseVCOStruct Description: User interface structure