

LIGO Laboratory / LIGO Scientific Collaboration

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**TwinCAT Library for
4th Generation TTFSS**

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LIGO Scientific Collaboration

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Library	
Title	TtFssV4
Version	1
TwinCAT version	2.11
Name space	–
Author	Daniel Sigg
Description	<p>Controls the 4th generation TFFS, .</p> <p>The RF detector measures the power off a -20 dB directional coupler. It is a logarithmic device and has the following equation:</p> <p>LO: $P = -75 \text{ dBm} + 16.667 \text{ dBm/V} \times U$</p> <p>RF: $P = -72 \text{ dBm} + 16.667 \text{ dBm/V} \times U$</p>
Error code	<p>TtFssV4:</p> <p>1 – Demodulator</p> <p>Demod:</p> <p>1 – Power supply voltages out-of-range</p> <p>2 – LO power level out-of-range</p> <p>3 – RF power level overload</p> <p>4 – Sign is wrong</p>
Library dependencies	ReadADC, WriteADC, Error, SaveRestore, Demodulator

Hardware Input Type	
TYPE TtFssV4InStruct :	
STRUCT	
LoMon:	INT;
RfMon:	INT;
MixerMon:	INT
EomRmsMon:	INT;
FastMon:	INT;
ComExcSw:	BOOL;
FastExcSw:	BOOL;
PfdSignSw:	BOOL;
PowerOk:	BOOL;
END_STRUCT	
END_TYPE	
Type name	TtFssV4InStruct
Description	Structure of the hardware inputs that are wired to the TTFFS V4
Definition	STRUCT
Element	Name: RFMon Type: INT Description: Monitors the RF power at the RF input
Element	Name: LOMon Type: INT Description: Monitors the RF power at the LO input
Element	Name: MixerMon Type: INT Description: Mixer output monitor
Element	Name: EomRmsMon Type: INT Description: Eom RMS monitor
Element	Name: FastMon Type: INT Description: Fast output monitor
Element	Name: ComExcSw Type: BOOL Description: Common excitation switch
Element	Name: FastExcSw Type: BOOL Description: Fast excitation switch

Element	Name: PfdSignSw Type: BOOL Description: Sign of phase-frequency discriminator
Element	Name: PowerOk Type: BOOL Description: Voltage monitor readback

Hardware Output Type	
TYPE TtFssV4OutStruct :	
STRUCT	
	ComGain: INT;
	ComOfs: INT;
	FastGain: INT;
	FastOfs: INT;
	SlowOfs: INT;
	AoEn: BOOL;
	Boost1: BOOL;
	ComExcEn: BOOL;
	FastExcEn: BOOL;
	RampEn: BOOL;
	EomEn: BOOL;
	PfdSign: BOOL;
	FastSign: BOOL;
	Boost2: BOOL;
	Boost3: BOOL;
	Spare1: BOOL;
	Spare2: BOOL;
END_STRUCT	
END_TYPE	
Type name	TtFssV4OutStruct
Description	Structure of the hardware output that are wired to the TTFSS V4
Definition	STRUCT
Element	Name: ComGain Type: INT Description: Common path gain
Element	Name: ComOfs Type: INT Description: Common path offset adjust
Element	Name: FastGain Type: INT Description: Fast path gain
Element	Name: FastOfs Type: INT Description: Fast path offset adjust
Element	Name: SlowOfs Type: INT Description: Slow path output

Element	Name: AoEn Type: BOOL Description: AO enable
Element	Name: Boost1 Type: BOOL Description: Boost1 enable
Element	Name: ComExcEn Type: BOOL Description: Common excitation enable
Element	Name: FastExcEn Type: BOOL Description: Fast excitation enable
Element	Name: RampEn Type: BOOL Description: Ramp input enable
Element	Name: EomEn Type: BOOL Description: EOM path enable
Element	Name: PfdSign Type: BOOL Description: Sign of PFD
Element	Name: FastSgn Type: BOOL Description: Sign of fast path
Element	Name: Boost2 Type: BOOL Description: Boost2 enable
Element	Name: Boost3 Type: BOOL Description: Boost3 enable
Element	Name: Spare1 Type: BOOL Description: Spare1 enable
Element	Name: Spare2 Type: BOOL Description: Spare2 enable

User Interface Type	
TYPE TtFssV4Struct :	
STRUCT	
Error: ErrorStruct; Demod: DemodulatorLscStruct; MixerMon: LREAL; FastMon: LREAL; EomRmsMon: LREAL; ComExcSw: BOOL; FastExcSw: BOOL; PowerOk: BOOL; ComGain: LREAL; ComOfs: LREAL; FastGain: LREAL; FastOfs: LREAL; SlowOfs: LREAL; AoEn: BOOL; Pol: BOOL; Boost1En: BOOL; Boost2En: BOOL; Boost3En: BOOL; ComExcEn: BOOL; FastExcEn: BOOL; FastPol: BOOL; RampEn: BOOL; EomEn: BOOL; Spare1: BOOL; Spare2: BOOL;	
END_STRUCT	
END_TYPE	
Type name	TtFssV4Struct
Description	Structure of the user interface tags that are used to control the TTFSS V4
Definition	STRUCT
Output Tag	Name: Error Type: ErrorStruct Description: For error handling
In/Outt Tag	Name: Demod Type: DemodulatorLscStruct Description: Represents the demodulator section
Output Tag	Name: MixerMon Type: LREAL Description: Monitors the mixer output in V

Output Tag	Name: FastMon Type: LREAL Description: Monitors the fast output in V
Output Tag	Name: EomRmsMon Type: LREAL Description: Monitors the EOM output in Vrms
Output Tag	Name: ComExcSw Type: BOOL Description: Common excitation switch
Output Tag	Name: FastExcSw Type: BOOL Description: Fast excitation switch
Output Tag	Name: PowerOk Type: BOOL Description: Voltage monitor readback
Input Tag	Name: ComGain Type: LREAL Description: Common gain in dB (-10 to +30)
Input Tag	Name: ComOfs Type: LREAL Description: Common path offset adjust
Input Tag	Name: FastGain Type: LREAL Description: Fast gain in dB (-10 to +30)
Input Tag	Name: FastOfs Type: LREAL Description: Fast path offset adjust
Input Tag	Name: SlowOfs Type: LREAL Description: Slow path offset
Input Tag	Name: AoEn Type: BOOL Description: Additive offset enable
Input Tag	Name: Pol Type: BOOL Description: Common sign
Input Tag	Name: Boost1En Type: BOOL Description: Boost 1 enable

Input Tag	Name: Boost2En Type: BOOL Description: Boost 2 enable
Input Tag	Name: Boost3En Type: BOOL Description: Boost 3 enable
Input Tag	Name: ComExcEn Type: BOOL Description: Common excitation enable
Input Tag	Name: FastExcEn Type: BOOL Description: Fast excitation enable
Input Tag	Name: FastPol Type: BOOL Description: Fast sign
Input Tag	Name: RampEn Type: BOOL Description: Ramp input enable
Input Tag	Name: EomEn Type: BOOL Description: EOM path option enable
Input Tag	Name: Spare1 Type: BOOL Description: Spare1 enable
Input Tag	Name: Spare2 Type: BOOL Description: Spare2 enable

Function Block FUNCTION_BLOCK TtFssV4FB VAR_INPUT DemodulatorType: DemodulatorTypeEnum := PhaseFrequency; Request: SaveRestoreEnum; TtFssIn: TtFssV4InStruct; END_VAR VAR_OUTPUT TtFssOut: TtFssV4OutStruct; END_VAR VAR_IN_OUT TtFssInit: TtFssV4Struct; TtFss: TtFssV4Struct; END_VAR	
Name	TtFssV4FB
Description	Controls the 4 th generation TTFSS.
Input argument	Name: DemodulatorType Type: DemodulatorTypeEnum Description: Describes the demodulator (PhaseFrequency or SingleFast)
Input argument	Name: Request Type: SaveRestoreEnum Description: Request for save/restore/safemode or noop
Input argument	Name: TtFssIn Type: TtFssV4InStruct Description: Input hardware structure
Output argument	Name: TtFssOut Type: TtFssV4OutStruct Description: Output hardware structure
In/out argument	Name: TtFssInit Type: TtFssV4Struct Description: Save/restor variable in persistent memory
In/out argument	Name: TtFss Type: TtFssV4Struct Description: User Interface structure