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TwinCAT Library for   
4th Generation TTFSS

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| **Library** | |
| Title | TtFssV4 |
| Version | 1 |
| TwinCAT version | 2.11 |
| Name space | – |
| Author | Daniel Sigg |
| Description | Controls the 4th generation TTFFS, .  The RF detector measures the power off a -20 dB directional coupler. It is a logarithmic device and has the following equation:  LO:  RF: |
| Error code | TtFssV4:  1 – Demodulator  Demod:  1 – Power supply voltages out-of-range  2 – LO power level out-of-range  3 – RF power level overload  4 – Sign is wrong |
| Library dependencies | ReadADC, WriteADC, Error, SaveRestore, Demodulator |

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| **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 |

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| **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 |

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| **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 |

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| **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 4th 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 |