

## CEyesFS1 – Fan System 1 (Base Module) Engineering Guide

### • Overview

- The CEyesFS1 module is the base analysis and diagnostics component used on fan systems.
  - Typical applications:
    - AHU
    - FCU
    - RTU
    - Complex fan systems when used in conjunction with CEyesFS2 and/or CEyesFS3.

### • Licensing

- Continual-Eyes™ may be licensed on any NiagaraAX® station.
- The base license includes a capacity of 15 points (or modules)
- Additional points (or modules) may be licensed.

### • Module Execution Properties

- Module execution rate and duration.
  - Continuous execution:
    - The default settings will enable the CEyesFS1 module to execute at all times after initial execution period. (The beginning of the first hour after the placement of the module or after station restart).
  - Execution properties:
    - [ExecutionPeriod] specifies the amount of time that will pass between successive starts of the execution of the logic within this object. If [ExecutionPeriod] is set to 600 seconds (5 minutes), then the logic will be started at 0 minutes past each hour, 5 minutes past and so on until 55 minutes past. If [ExecutionPeriod] is set to 7200 seconds (2 hours), then the logic will be started at midnight, 2AM, 4AM and so on until 10PM.
    - [ExecutionOffset] allows for the modification of the timing of the execution. It specifies the amount of time into the execution period to wait until executing the logic. If [ExecutionPeriod] is set to 600 seconds (5 minutes) and [ExecutionOffset] is set to 60 seconds (1 minute), then the logic will be started at 1 minute past each hour, 6 minutes past, and so on until 56 minutes past. This allows the “staggering” of object execution.
    - [ExecutionDuration] specifies how long a period of time within each execution period the logic will run. If [ExecutionPeriod] and [ExecutionOffset] are set to 5 minutes and 1 minute, respectively and [ExecutionDuration] is set to 2 minutes, then the logic will run continuously from 1 minute past the hour until 3 minutes past the hour, from 6 minutes past until 8 minutes past, etc.
    - [IterationPeriod] is the rate at which the logic inside the object will execute.
    - [Executing] is a read property to view the current status of the module execution.

- **Alarms**

- **[SFanRunNoCmdAlarm]**

- Description
      - Indication that the supply fan is running without a system command to run.
    - Inputs and Parameters
      - Required connections
        - [SupplyFanCommand]
        - [SupplyFanStatus]
      - Parameters
        - [EnableSFanStatusAlarm]
        - [SFanStatusAlarmDelay] in seconds.

- **[SFanNoProofAlarm]**

- Description
      - Indication that the supply fan is not proving run status with a system command to run.
    - Inputs and Parameters
      - Required connections
        - [SupplyFanCommand]
        - [SupplyFanStatus]
      - Parameters
        - [EnableSFanStatusAlarm]
        - [SFanStatusAlarmDelay] in seconds.

- **[FanRunContinuousAlarm]**

- Description
      - Indication that the supply fan is running continuously.
    - Inputs and Parameters
      - Required connections
        - [SupplyFanStatus]
      - Parameters
        - [EnableSFanContinuousAlarm]
        - [MaxSFanRunTime] in hours.

- **[HeatLoopAlarm]**

- Description
      - Indication of an unacceptable modulation or cycling of the control loop.
    - Inputs and Parameters
      - Required connections
        - [HeatSignal]
      - Parameters
        - [HeatLoopAlarmSetpoint]

- [HeatLoopAlarmDelay] in seconds.
- [HeatLoopSampleRate] in seconds. This is the rate at which the input is read. Use higher values on slower control loops.
- [HeatLoopFilterUpdateTime] in seconds. This is the rate at which the [HeatLoopError] is updated. Use higher values on slower control loops.
- [HeatLoopFilterStepSize] This is the maximum amount of change in the [HeatLoopError] at each [HeatLoopFilterUpdateTime].
- Calculated values or other parameters
  - [HeatLoopError] (Read Only)
  
- **[HeatWithHeatingOffAlarm]**
  - Description
    - Indication of heat across the heating component with heating off.
  - Inputs and Parameters
    - Required connections
      - [SupplyFanStatus]
      - [HeatSignal]
      - [HeatDischargeTemp]
      - [HeatInletTemp]
    - Parameters
      - [HeatAlarmEnable]
      - [HeatAlarmDelay] in seconds.
      - [HeatEffectiveOff]
      - [HeatOffMaxDeltaT]
  
- **[UnderheatAlarm]**
  - Description
    - Indication of inadequate heating across the heating component with heat fully on.
  - Inputs and Parameters
    - Required connections
      - [HeatSignal]
      - [HeatDischargeTemp]
      - [HeatInletTemp]
      - [DehumidSig]
    - Parameters
      - [HeatAlarmEnable]
      - [HeatAlarmDelay] in seconds.
      - [HeatEffectiveOn]
      - [HeatOnMinDeltaT]
  
- **[WarmDayHeatingAlarm]**
  - Description
    - Indication that heating is activated on a “warm day” when system is not in dehumid mode.

- Inputs and Parameters
  - Required connections
    - [HeatSignal]
    - [DehumidSig]
    - [OutsideAirTemp]
  - Parameters
    - [HeatAlarmEnable]
    - [HeatAlarmDelay] in seconds.
    - [HeatEffectiveOff]
    - [OaTempHeatingOff]
- **[CoolWithHeatAlarm]**
  - Description
    - Indication of simultaneous heating and cooling when system is not in dehumid mode.
  - Inputs and Parameters
    - Required connections
      - [HeatSignal]
      - [CoolSignal]
      - [DehumidSig]
    - Parameters
      - [HeatEffectiveOff]
      - [CoolEffectiveOff]
      - [CoolWithHeatAlarmDelay] in seconds.
- **[CoolLoopAlarm]**
  - Description
    - Indication of an unacceptable modulation or cycling of the control loop.
  - Inputs and Parameters
    - Required connections
      - [CoolSignal]
    - Parameters
      - [CoolLoopAlarmSetpoint]
      - [CoolLoopAlarmDelay] in seconds.
      - [CoolLoopSampleRate] in seconds. This is the rate at which the input is read. Use higher values on slower control loops.
      - [CoolLoopFilterUpdateTime] in seconds. This is the rate at which the [CoolLoopError] is updated. Use higher values on slower control loops.
      - [CoolLoopFilterStepSize] This is the maximum amount of change in the [CoolLoopError] at each [CoolLoopFilterUpdateTime].
    - Calculated values or other parameters
      - [CoolLoopError] (Read Only)
- **[CoolWithCoolingOffAlarm]**

- Description
  - Indication of cooling across the cooling component with cooling off.
- Inputs and Parameters
  - Required connections
    - [SupplyFanStatus]
    - [CoolSignal]
    - [CoolDischargeTemp]
    - [CoolInletTemp]
  - Parameters
    - [CoolAlarmEnable]
    - [CoolAlarmDelay] in seconds.
    - [CoolEffectiveOff]
    - [CoolOffMaxDeltaT]
- **[UndercoolAlarm]**
  - Description
    - Indication of inadequate cooling across the cooling component with cool fully on.
  - Inputs and Parameters
    - Required connections
      - [CoolSignal]
      - [CoolDischargeTemp]
      - [CoolInletTemp]
      - [DehumidSig]
    - Parameters
      - [CoolAlarmEnable]
      - [CoolAlarmDelay] in seconds.
      - [CoolEffectiveOn]
      - [CoolOnMinDeltaT]
- **[CoolDayCoolingAlarm]**
  - Description
    - Indication that cooling is activated on a “cool day” when system is not in dehumid mode.
  - Inputs and Parameters
    - Required connections
      - [CoolSignal]
      - [DehumidSig]
      - [OutsideAirTemp]
    - Parameters
      - [CoolAlarmEnable]
      - [CoolEffectiveOff]
      - [OaTempCoolingOff]

- **[EconLoopAlarm]**
  - Description
    - Indication of an unacceptable modulation or cycling of the control loop.
  - Inputs and Parameters
    - Required connections
      - [EconSignal]
    - Parameters
      - [EconLoopAlarmSetpoint]
      - [EconLoopAlarmDelay] in seconds.
      - [EconLoopSampleRate] in seconds. This is the rate at which the input is read. Use higher values on slower control loops.
      - [EconLoopFilterUpdateTime] in seconds. This is the rate at which the [EconLoopError] is updated. Use higher values on slower control loops.
      - [EconLoopFilterStepSize] This is the maximum amount of change in the [EconLoopError] at each [EconLoopFilterUpdateTime].
    - Calculated values or other parameters
      - [EconLoopError] (Read Only)
  
- **[EconNotClosingAlarm]**
  - Description
    - Indication that the economizer is not closing fully when commanded closed.
  - Inputs and Parameters
    - Required connections
      - [SupplyFanStatus]
      - [EconSignal]
      - [MixedAirTemp]
      - [ReturnAirTemp]
    - Parameters
      - [EconAlarmEnable]
      - [EcomAlarmDelay] in seconds.
      - [EconEffectiveClosed]
      - [EconClosedMaxDeltaT]
  
- **[EconNotOpeningAlarm]**
  - Description
    - Indication that the economizer is not opening properly when commanded open.
  - Inputs and Parameters
    - Required connections
      - [EconSignal]
      - [MixedAirTemp]
      - [OutsideAirTemp]
    - Parameters
      - [EconAlarmEnable]

- [EcomAlarmDelay] in seconds.
- [EconEffectiveOpen]
- [EconOpenMaxDeltaT]
  
- **[EconOpenInUnoccAlarm]**
  - Description
    - Indication that the economizer is not fully closed in unoccupied cycle. (Disabled in night purge).
  - Inputs and Parameters
    - Required connections
      - [EconSignal]
      - [OccupiedSig]
      - [NightPurgeSig]
    - Parameters
      - [EconEffectiveClosed]
      - [EconAlarmDelay] in seconds.
  
- **[EconWithHeatAlarm]**
  - Description
    - Indication that the economizer is open more than the minimum position with the heating activated.
  - Inputs and Parameters
    - Required connections
      - [HeatSignal]
      - [EconSignal]
      - [EconMinPos]
    - Parameters
      - [EconAlarmEnable]
      - [EconWithHeatAlarmDelay] in seconds.
      - [HeatEffectiveOff]
  
- **[AnyAlarm]**
  - Description
    - Indication of any alarm active with this module. Primarily used for system alarm indication or to share into an associated module's [AssocAlarm] input.
  - Optional Input
    - [AssocAlarm] is used to indicate alarm condition of associated modules.
  - Operation
    - [AnyAlarm] will be initiated:
      - When any of the alarms above are initiated
    - OR
      - [AssocAlarm] = true

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