

## CEyesFS3 – Fan System 3 (Option Module) Engineering Guide

### • Overview

- The CEyesFS3 module is an option analysis and diagnostics component used on fan systems.
  - Fan system analysis options included in this module:
    - Heat Wheel applications
    - Preheat coil applications
    - Hot Deck / Cold Deck applications

### • 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 CEyesFS3 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**

- **[HtWheelLoopAlarm]**

- Description
  - Indication of an unacceptable modulation or cycling of the control loop.
- Inputs and Parameters
  - Required connections
    - [HtWheelSpeed]
  - Parameters
    - [HeatWheelAlarmSetpoint]
    - [HeatWheelAlarmDelay] in seconds.
    - [HeatWheelSampleRate] in seconds. This is the rate at which the input is read. Use higher values on slower control loops.
    - [HeatWheelFilterUpdateTime] in seconds. This is the rate at which the [HeatWheelError] is updated. Use higher values on slower control loops.
    - [HeatWheelFilterStepSize] This is the maximum amount of change in the [HeatWheelError] at each [HeatWheelFilterUpdateTime].
  - Calculated values or other parameters
    - [HeatWheelError] (Read Only)

- **[HtWhIEfficiencyAlarm]**

- Description
  - Indication that the heat wheel is not delivering the expected minimum efficiency.
- Inputs and Parameters
  - Required connections
    - [SupplyFanStatus]
    - [HtWheelRaTemp]
    - [HtWheelOaTemp]
    - [HtWheelDaTemp]
  - Parameters
    - [HtWheelEfficiencyMult] (minimum efficiency)
    - [HtWheelDeadBand] (alarm dead band in degrees for moderate weather)
    - [HtWhIAlarmEnable]
    - [HtWhIEfficiencyAlarmDelay] in seconds.

- **[PreheatLoopAlarm]**

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

- [PreheatLoopAlarmSetpoint]
- [PreheatLoopAlarmDelay] in seconds.
- [PreheatLoopSampleRate] in seconds. This is the rate at which the input is read. Use higher values on slower control loops.
- [PreheatLoopFilterUpdateTime] in seconds. This is the rate at which the [PreheatLoopError] is updated. Use higher values on slower control loops.
- [PreheatLoopFilterStepSize] This is the maximum amount of change in the [PreheatLoopError] at each [PreheatLoopFilterUpdateTime].
- Calculated values or other parameters
  - [PreheatLoopError] (Read Only)
  
- **[PreheatOverHeatAlarm]**
  - Description
    - Indication that the preheat air temp is higher than the preheat air temp setpoint.
  - Inputs and Parameters
    - Required connections
      - [SupplyFanStatus]
      - [PreheatInletTemp]
      - [PreheatOutletTemp]
      - [PreheatTempStpt]
    - Parameters
      - [PreheatOverHeatMult]
      - [PreheatTempAlarmEnable]
      - [PreheatAlarmDelay]
  
- **[PreheatUnderHeatAlarm]**
  - Description
    - Indication that the preheat air temp is lower than the preheat air temp setpoint.
  - Inputs and Parameters
    - Required connections
      - [SupplyFanStatus]
      - [PreheatOutletTemp]
      - [PreheatTempStpt]
    - Parameters
      - [PreheatUnderHeatMult]
      - [PreheatTempAlarmEnable]
      - [PreheatAlarmDelay]
  
- **[PreheatHeatWhenOffAlarm]**
  - Description
    - Indication that of heat across the preheating component with preheating off.
  - Inputs and Parameters

- Required connections
  - [SupplyFanStatus]
  - [PreheatSig]
  - [PreheatInletTemp]
  - [PreheatOutletTemp]
- Parameters
  - [PreheatTempAlarmEnable]
  - [PreheatAlarmDelay]
  - [PreheatEffectiveOff]
  - [PreheatOffMaxDeltaT]
- **[HotDeckLoopAlarm]**
  - Description
    - Indication of an unacceptable modulation or cycling of the control loop.
  - Inputs and Parameters
    - Required connections
      - [HotDeckSig]
    - Parameters
      - [HotDeckLoopAlarmSetpoint]
      - [HotDeckLoopAlarmDelay] in seconds.
      - [HotDeckLoopSampleRate] in seconds. This is the rate at which the input is read. Use higher values on slower control loops.
      - [HotDeckLoopFilterUpdateTime] in seconds. This is the rate at which the [HotDeckLoopError] is updated. Use higher values on slower control loops.
      - [HotDeckLoopFilterStepSize] This is the maximum amount of change in the [HotDeckLoopError] at each [HotDeckLoopFilterUpdateTime].
    - Calculated values or other parameters
      - [HotDeckLoopError] (Read Only)
- **[HotDeckOverHeatAlarm]**
  - Description
    - Indication that the hot deck air temp is higher than the hot deck air temp setpoint.
  - Inputs and Parameters
    - Required connections
      - [SupplyFanStatus]
      - [HotDeckOutletTemp]
      - [HotDeckTempStpt]
    - Parameters
      - [HotDeckOverHeatMult]
      - [HotDeckTempAlarmEnable]
      - [HotDeckAlarmDelay]

- **[HotDeckUnderHeatAlarm]**
  - Description
    - Indication that the hot deck air temp is lower than the hot deck air temp setpoint.
  - Inputs and Parameters
    - Required connections
      - [SupplyFanStatus]
      - [HotDeckOutletTemp]
      - [HotDeckTempStpt]
    - Parameters
      - [HotDeckUnderHeatMult]
      - [HotDeckTempAlarmEnable]
      - [HotDeckAlarmDelay]
  
- **[HotDeckHeatWhenOffAlarm]**
  - Description
    - Indication of heat across the hot deck heating component with hot deck heat off.
  - Inputs and Parameters
    - Required connections
      - [SupplyFanStatus]
      - [HotDeckSig]
      - [HotDeckInletTemp]
      - [HotDeckOutletTemp]
    - Parameters
      - [HotDeckTempAlarmEnable]
      - [HotDeckAlarmDelay]
      - [HotDeckEffectiveOff]
      - [HotDeckOffMaxDeltaT]
  
- **[ColdDeckLoopAlarm]**
  - Description
    - Indication of an unacceptable modulation or cycling of the control loop.
  - Inputs and Parameters
    - Required connections
      - [ColdDeckSig]
    - Parameters
      - [ColdDeckLoopAlarmSetpoint]
      - [ColdDeckLoopAlarmDelay] in seconds.
      - [ColdDeckLoopSampleRate] in seconds. This is the rate at which the input is read. Use higher values on slower control loops.
      - [ColdDeckLoopFilterUpdateTime] in seconds. This is the rate at which the [ColdDeckLoopError] is updated. Use higher values on slower control loops.

- [ColdDeckLoopFilterStepSize] This is the maximum amount of change in the [ColdDeckLoopError] at each [ColdDeckLoopFilterUpdateTime].
- Calculated values or other parameters
  - [ColdDeckLoopError] (Read Only)
  
- **[ColdDeckOverCoolAlarm]**
  - Description
    - Indication that the cold deck air temp is lower than the cold deck air temp setpoint.
  - Inputs and Parameters
    - Required connections
      - [SupplyFanStatus]
      - [ColdDeckOutletTemp]
      - [ColdDeckTempStpt]
    - Parameters
      - [ColdDeckOverCoolMult]
      - [ColdDeckTempAlarmEnable]
      - [ColdDeckAlarmDelay]
  
- **[ColdDeckUnderCoolAlarm]**
  - Description
    - Indication that the cold deck air temp is higher than the cold deck air temp setpoint.
  - Inputs and Parameters
    - Required connections
      - [SupplyFanStatus]
      - [ColdDeckOutletTemp]
      - [ColdDeckTempStpt]
    - Parameters
      - [ColdDeckUnderCoolMult]
      - [ColdDeckTempAlarmEnable]
      - [ColdDeckAlarmDelay]
  
- **[ColdDeckCoolWhenOffAlarm]**
  - Description
    - Indication of cooling across the cold deck cooling component with cold deck cooling off.
  - Inputs and Parameters
    - Required connections
      - [SupplyFanStatus]
      - [ColdDeckSig]
      - [ColdDeckInletTemp]
      - [ColdDeckOutletTemp]
    - Parameters
      - [ColdDeckTempAlarmEnable]

- [ColdDeckAlarmDelay]
- [ColdDeckEffectiveOff]
- [ColdDeckOffMaxDeltaT]
  
- **[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