Metasys® System UL 864 9th Edition UUKL/ ORD-C100-13 UUKLC Standard Smoke Control Applications

Application Note

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Metasys® System UL 864 9th Edition UUKL/ ORD-C100-13 UUKLC Standard Smoke Control Applications

Application Note

Document Introduction

IMPORTANT: Smoke control applications require extra care during installation, commissioning, and servicing. Make sure to read smoke control documentation and follow all procedures carefully to ensure compliance with the UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Standard for Smoke Control.

Smoke control applications issue commands to controlled devices that pressurize or depressurize an area of a building to minimize the spread of smoke. The smoke control strategy is achieved with the Network Engine (NxE) application described in this document and with manual override of the smoke control logic provided by the Firefighter's Smoke Control Station (FSCS). The NxE application includes both Network Automation Engines (NAEs) and Network Control Engines (NCEs). This document describes the devices and logic used to implement a smoke control system. It also includes smoke control applications for three specific building types—single-story shopping mall, warehouse, and multi-story building.

Note: These application notes only present an example of three possible smoke control strategies. The details of applying the strategy vary, because every building is unique. These application notes can help you develop an appropriate application for your project.

Related Documentation

Table 1 lists related smoke control documentation.

Table 1: Related Documentation

For Information On	See Document	LIT No.
UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control Information, Requirements, and Wiring Details	*Metasys® System UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System Technical Bulletin*	*LIT-12011252*

FCSC Overview

FSCS and MS/TP Field Device Connections

Figure 1 shows the FSCS and MS/TP field device connections. The field controller in this example is an MS/TP controller. You can use any combination of controllers.

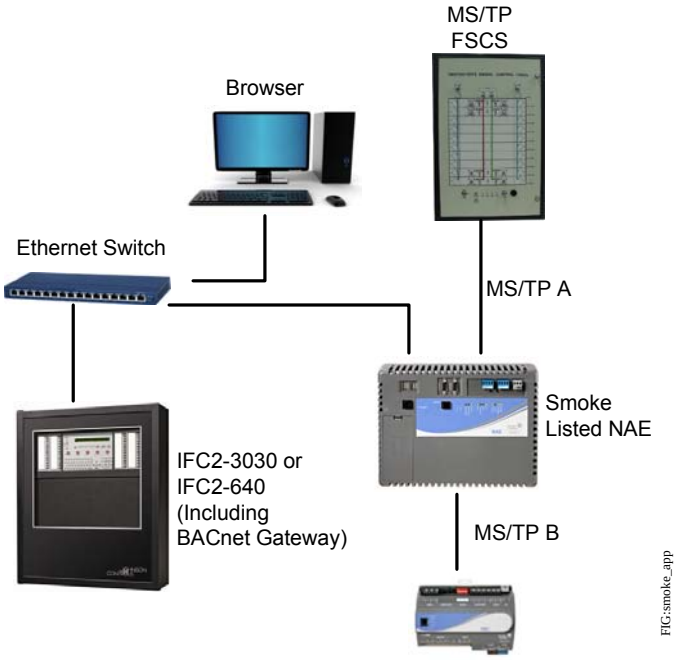

Figure 1: FSCS to MS/TP Field Device Connections

Smoke Control Priority Levels

All automatic smoke control commands are commanded at Priority 2. Firefighter manual overrides commanded from the Firefighter's Smoke Control Station (FSCS) panel to pressurize or depressurize zones are commanded at Priority 2. Firefighter manual overrides commanded from the FSCS panel to control individual fans and dampers are commanded at Priority 1. Weekly testing is commanded at Priority 7.

Automatic Smoke Control

Automatic Smoke Control depressurizes areas (zones) where smoke is detected. Pressurize and depressurize commands in automatic smoke control are commanded at Priority 2. Priority 2 commands are released when the smoke alarm is reset.

If a zone is under smoke control, the FSCS panel turns on status (LED) to indicate the current status of the fans, dampers and zone. Status LEDs for a fan show whether the fan is either On, Auto mode, Off, or in Trouble. Status LEDs for a damper or VAV indicate whether the damper is either Open, Auto mode, Closed, or in Trouble. Status LEDs for a zone indicate whether the zone is in Pressurize mode, Auto mode, Depressurize mode, or Purge mode. The Auto LED remains on while the point is in automatic smoke control.

The logic to check the status of fans and dampers for trouble is initiated when the zone goes into smoke control. If a fan does not reach its setpoint within 60 seconds, its Trouble LED is turned on. If a damper does not reach its setpoint within 75 seconds, its Trouble LED is turned on. After a commanded point goes into Trouble, the Automatic Command Retry logic repeats the command that failed every 60 seconds until the command is successful.

Manual Smoke Control

Manual smoke control logic is initiated when a firefighter turns the FSCS Panel Enable key from the Auto position to the Firefighter Control position and initiates a manual override of a fan, damper, VAV controller, or zone point from the Auto setting on the FSCS panel. This override turns off the Panel Enable switch Auto LED and turns on the Panel Enable switch Firefighter Control LED.

There are two levels of manual smoke control: Priority 2 and Priority 1. Priority 2 is the first level and is initiated when a firefighter, using the FSCS, puts a zone into manual smoke control by turning the zone knob to Pressurize, Depressurize, or Purge. All zone smoke control commands are commanded at Priority 2. Priority 2 commands are released when the firefighter returns the Zone knob back to Auto, or returns the Panel Enable key back to Auto.

Priority 1 is the second level and is initiated when a firefighter, using the FSCS, puts a point in manual smoke control by flipping either a fan toggle switch to On or Off, or a damper or VAV toggle switch to Open or Close. Individual points are commanded at Priority 1. Priority 1 commands are released when the firefighter either flips the fan, damper or VAV toggle switch back to Auto, or returns the Panel Enable key back to Auto.

Any point that is under manual smoke control activates the trouble-checking logic and turns on the Trouble LED for that point. If a fan does not reach its setpoint within 60 seconds after the NxE issues the command, its Trouble LED is turned on. If a damper does not reach its setpoint within 75 seconds after the NxE issues the command, its Trouble LED is turned on. If the Zone switch is set to either Pressurize, Depressurize, or Purge, and a fan does not reach its setpoint within 60 seconds after the NxE issues the command, or a damper does not reach its setpoint within 75 seconds after the NxE issues the command, the Trouble LED for the fan or damper that failed is turned on. After a commanded point goes into Trouble, the Automatic Command Retry logic repeats the command that failed every 60 seconds until the command is successful.

Auto Command Retry Logic

The Auto Command Retry logic is used for fans, dampers, and Variable Air Volume Modular Assembly (VMA) and VAV controllers. It does a comparison check between the commanded state and the actual device state, to verify that the command was successful. In the event a command to a fan, damper, or VAV fails, the reason may be that the MCO for the commanded device is on a remote smoke control NxE panel. The additional time required to communicate with the remote smoke control NxE might exceed the command response limit. Therefore, the command is resent every 60 seconds until the command is successful.

The Auto Command Retry logic is used when either a device MCO does not match command; a fan, damper, or VAV/VMA (Vxx) status does not match its commanded value; or a fan, damper, or VAV trouble input is active.

Fan Relay Supervision

If the project must meet Life Safety Code NFPA 101 requirements (where the fire system uses the HVAC system to sequence control or shutdown an HVAC fan), then fan relay supervision is required. Locate the auxiliary relay used to control the motor starter on the HVAC system fan within 3 feet of the motor starter. You must monitor (supervise) the wiring between the fan shutdown controller and the shutdown relay for integrity. To monitor, you can use electronic supervision or continuously powered shutdown relays that turn the fan off if power is lost to the relay circuit. In addition, proof of fan operation such as an airflow switch is required.

Response Times

Response times for individual components to achieve their intended state from the point of command should not exceed the following time periods: 60 seconds for fan operation at the intended state plus 90 seconds to annunciate, or 75 seconds for completion of damper travel plus 90 seconds to annunciate. See Figure 11 through Figure 88 for examples of response times and timing order.

Security Administration System

The Security Administration system authenticates and authorizes users of Metasys® system applications. The Security Administrator is a browser-based interface that manages all accounts. The Security Administrator creates User Accounts and Roles, and assigns access permissions to each user of the Metasys system.

Roles and User Accounts Overview

Security is based on User Accounts and Roles. Roles are groups of users with a specific function within the Metasys system. To access the system, an individual provides a user account and the correct password. Use letters, numbers, or symbols to create user account passwords.

Use the Login button from the logon prompt to send the user's credentials. A unique Session generates when the user's credentials match the logon requirements.

UUKL Smoke Control Security Administration Details

UUKL smoke control requires that only operators designated as fire operators be able to control the smoke control system. This designation required the creation of five new roles:

- **Administrator** - This is the highest level of control and allows site control of all HVAC and Fire features.
- **Fire Administrator** - This role is a fire manager level setting. It allows for full system control, including system modification or configuration.

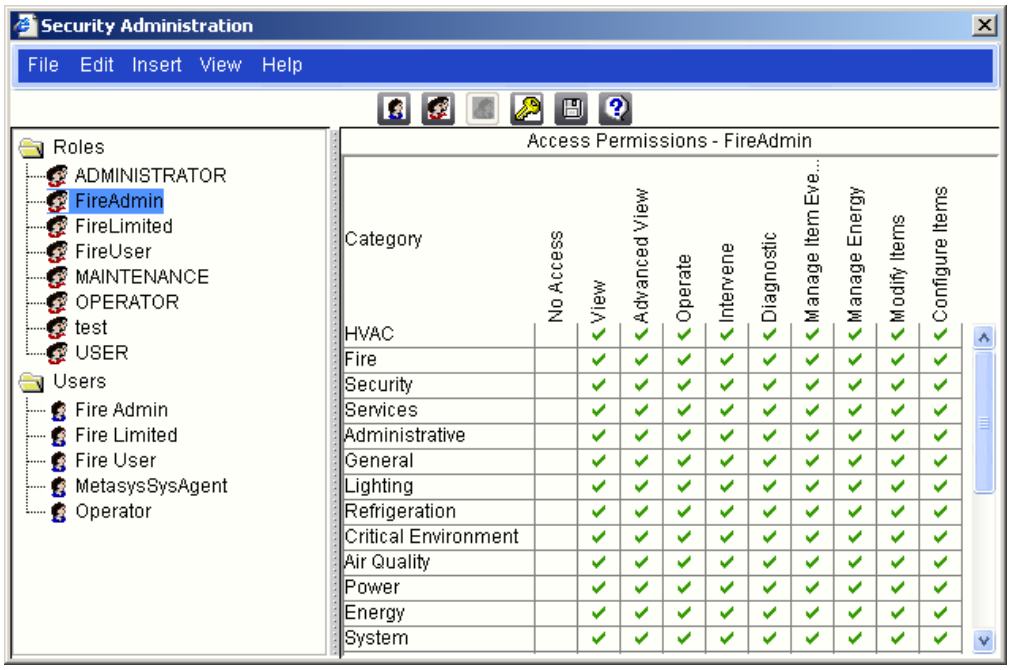

Figure 2: Fire Administrator Access Permissions

- **Fire User** - This role is for most fire field technicians and allows system control and alarm acknowledgement, but not system modification or configuration.

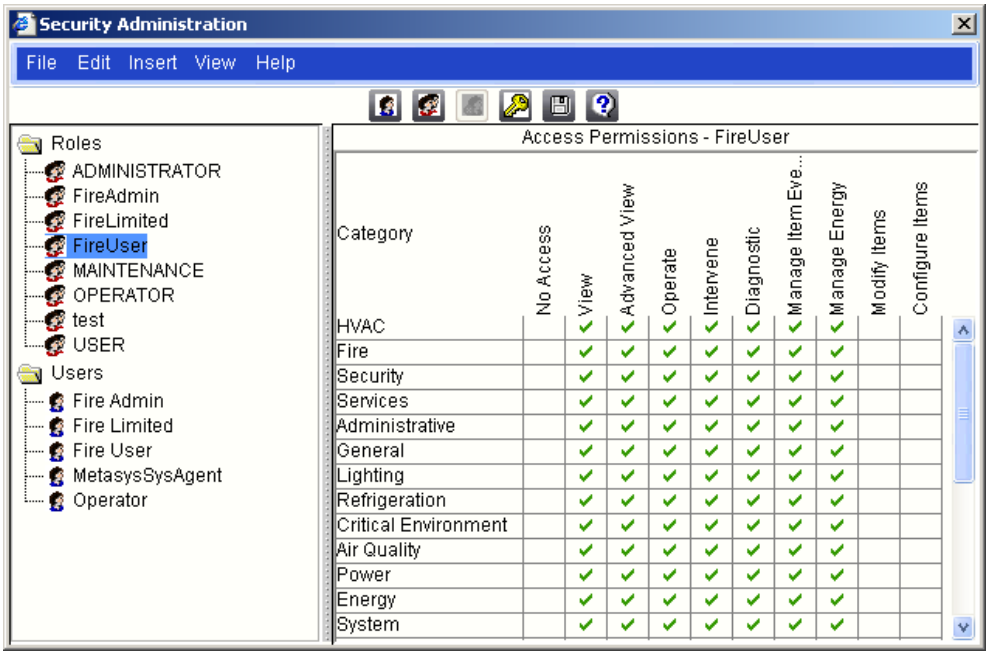

Figure 3: Fire User Access Permissions

- **Fire Limited** - This is the lowest of the permissions and only allows the operator to view fire/smoke control devices and alarms.

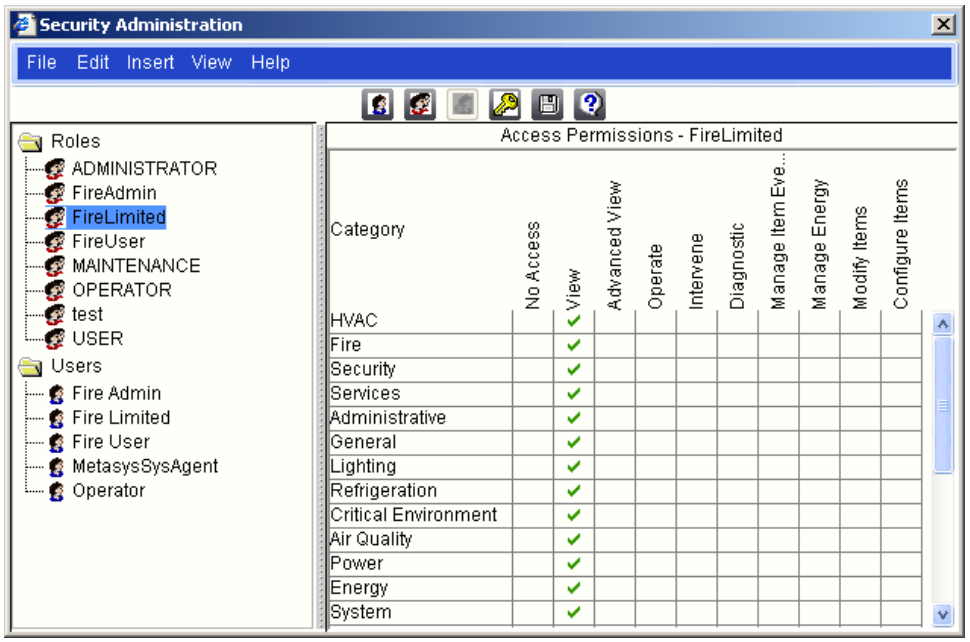

Figure 4: Fire Limited Access Permissions

Security Administration Detailed Procedures

Creating a New Role

To create a new role:

1. From the Security Administration menu bar, select Insert > New Role. The New Role dialog box appears.
2. Enter the information.
3. Click OK. The New Role appears in the tree.

Creating a New User Account

To create a new user account:

1. From the Security Administration menu bar, select Insert > New User. The User Properties tab appears.
2. Fill in the information.
3. Click OK. The New User appears in the tree.

Configuring a User Profile

To configure a user profile:

1. Select the user whom you wish to configure.
2. From the menu bar, select Edit > Properties. The User Properties tab appears.
3. Modify the desired user information.
4. Click OK.

Configuring Role Properties

To configure role properties:

1. Select the user whom you wish to configure.
2. From the menu bar, select Edit > Properties. The User Properties tab appears.
3. Select the Roles tab, then select an Available Role.
4. Click Add. The selected role appears in the Assigned Role list box.
5. Click OK.

Assigning System Access Permissions

To assign system access permissions:

1. Select the user whom you wish to assign system access permissions.
2. From the main menu, select Edit > System Access Permissions. The System Access Permission dialog box appears.
3. Select an available privilege.
4. Click Add, then click OK to assign the user's System Access Permissions.

Required Smoke Control Site Object and Smoke Control NxE Settings

Smoke Control Site Object - Default ADS Repository Setting

If a smoke control site has an Application and Data Server (ADS)/Extended Application and Data Server (ADX) on its network, then the smoke control site's **Default ADS Repository** setting **must** be set to 0.0.0.0.

Note: This setting prevents the smoke control NxE from forwarding alarms to the ADX once the smoke control NxE's alarm buffer is full. You must also make the same change in each smoke control NxE. See *Smoke Control NxE - ADS Repository Setting* for more information.

To configure the **Default ADS Repository** for the smoke control site object:

1. From the SCT, double-click the smoke control site object.
2. Select the Site View tab and click the Advanced option to display additional information (Figure 5).
3. Select Edit and scroll down to the Engineering Values section.
4. Set the Default ADS Repository value to 0.0.0.0, then click Save.

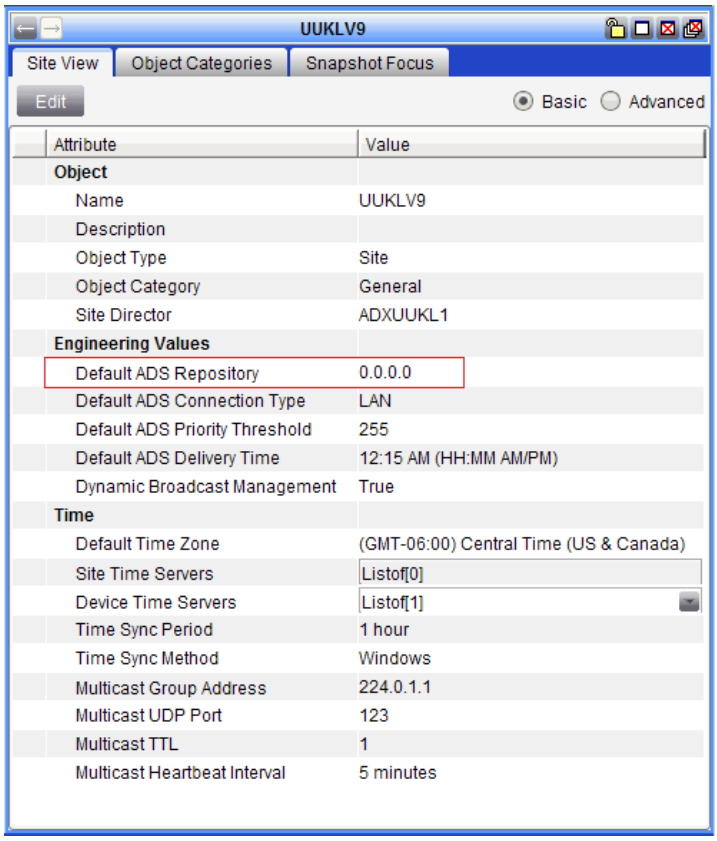

Figure 5: Smoke Control Site's Required Setting

Smoke Control NxE - ADS Repository Setting

If a smoke control site has an ADX/ADS on its network, the following communication setting **must** be made to **every** smoke control NxE in the smoke control site (Figure 6).

Note: This setting prevents the smoke control NxE from forwarding alarms to the ADX once the smoke control NxE's alarm buffer is full. You must also make the same change to the smoke control site object. See *Smoke Control Site Object - Default ADS Repository Setting* for more information.

To configure the ADS Repository for a smoke control NxE:

1. From the SCT, view the smoke control NxE device.
2. Select the Focus tab and click the Advanced option to display additional information.
3. Select Edit and scroll down to the Site section.
4. Set the ADS Repository value to 0.0.0.0, and click Save.

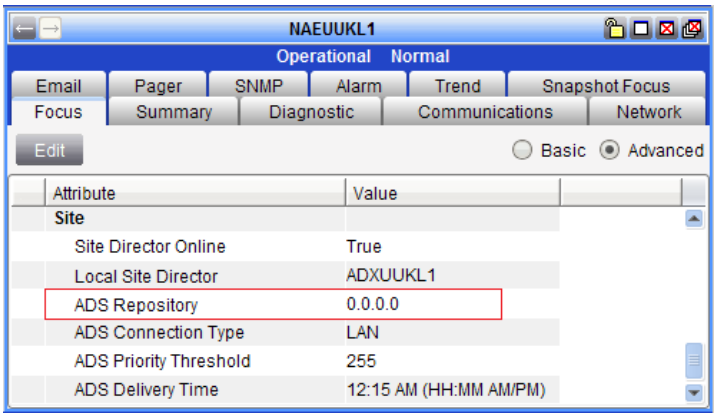

Figure 6: Smoke Control NxE's Required ADS Repository Setting

Smoke Control NxE - Alarm Event Action When Full Setting

Each smoke control NxE has an alarm repository buffer that stores alarms as they occur. When the NxE's alarm repository buffer gets full, the **Event Action When Full** setting determines what action to take. The **Event Action When Full** setting **must** be set to **STOP**, not Rollover, to prevent the NxE from overwriting the stored alarms that reported the initial initiating event. Figure 7 shows the NxE's Configuration Tab where the Event Action When Full setting is located.

Note: This is a required setting for all UL 864 9th Edition UUKL/ORD-C100-13 UUKLC smoke control NxEs.

To configure the Event Action When Full setting:

1. From the SCT, double-click the smoke control NxE device object.
2. Select the Configuration tab and click the Advanced option to display additional information.
3. Select Edit and scroll down to the Alarms section.
4. Set the Event Action When Full setting to Stop, then click Save.

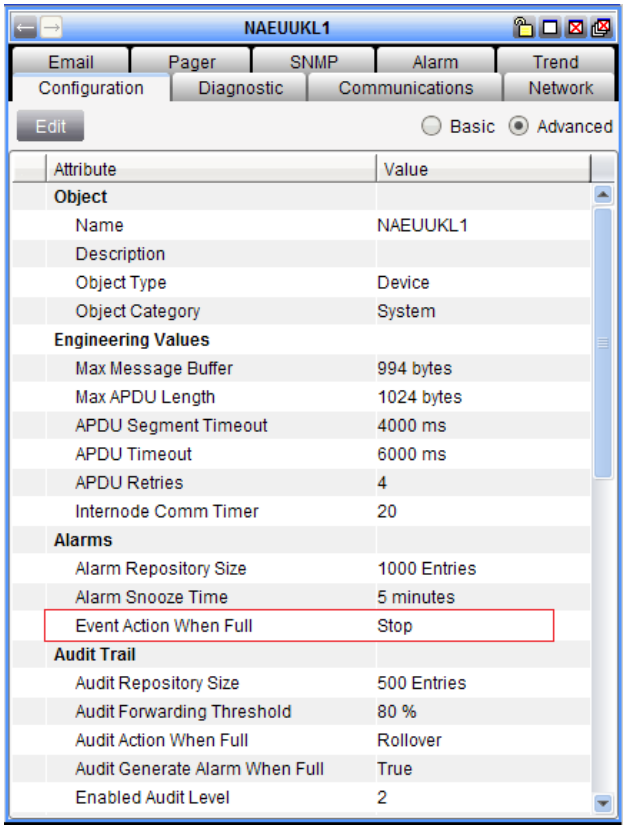

Figure 7: Smoke Control NxE Alarms - Event Action When Full Setting

Smoke Control NxE Alarm Buffer Operation

Alarm Buffering Within a Smoke Control NxE

The operation of the alarm buffer on any model smoke control NxE in this system responds as follows:

1. The NxE records alarms as normal until it reaches its high warning level limit (NAE55: 900 out of 1,000 alarms, NAE45/35 and NCE: 400 out of 500). An alarm pop-up then warns that the buffer is almost full and to reduce the number of buffered alarms.
2. When the alarm buffer of the NxE reaches its full limit, the NxE then overwrites the lowest priority alarm in its alarm buffer with the next new alarm having a higher priority. Alarms having equal priority values are not overwritten.

   Note: Since smoke control alarms always have the highest priority, they are never overwritten.

3. Once all of the lowest priority alarms are overwritten in the NxE's alarm buffer, the NxE then stops recording alarms until the recorded alarms are acknowledged, evaluated, and discarded.

Event Priority

Event Priorities indicate the importance of the event message and determine when the event message is displayed. Displaying the priority of the event messages in the Event Viewer allows you to acknowledge event messages of higher importance before event messages of lower importance. The priority number associated with the event message falls within a range of 0–255. Event messages with a lower priority number are of a higher importance or are more critical than event messages with a higher priority number.

Table 2: Life Safety Group (Priority 0–39)

Priority	Recommended Use
0-4	Not used
5	Automatic Fire Alarm
8	Life Safety Process Alarm
11	Manual Fire Alarm
14	Other Higher Priority Life Safety
19	Medical Alarm
22	Hold Up and Duress Alarm
25	Panic Alarm
28	Life Safety Pre-Alarm Alert
31	Other Lower Priority Life Safety

Table 3: Property Safety Group (Priority 40–79)

Priority	Recommended Use
45	Burglar Alarm and Forced Door Alarm
48	Security Alarm
51	Other Higher Priority Property Safety
60	Watchman Tour Alarm
63	Property Process Alarm
66	Door Held Open Alarm
69	Other Lower Priority Property Safety

Table 4: Supervisory and Trouble Group (Priority 80–139)

Priority	Recommended Use
85	Fire Supervision (tamper)
88	Security Supervision (tamper)
91	Other Supervisory
100	Fire Trouble (equipment failure)
103	Security and Burglar Trouble (equipment failure)
106	Communication Equipment Failure Trouble
109	Process Trouble
112	Energy Alarm
115	Other Failure
124	Communication Equipment Warning Trouble
127	Early Warning Alert
130	Energy Warning
133	Other Warning

Table 5: Other Group (Priority 80–139)

Priority	Recommended Use
145	Equipment and Industrial Supervision
148	Comfort Alarm
151	Miscellaneous Higher Priority Alerts
160	System Events
163	Miscellaneous Higher Priority Events
172	Life Safety Return to Normal
179	Property Safety Return to Normal
186	Supervisory and Trouble Return to Normal
189	Miscellaneous Return to Normal
198	System Status Active
201	Comfort Warning
204	Miscellaneous Lower Priority Events
213	System Status Normal
216	Comfort Normal
219	Test and Diagnostic Events
222	Miscellaneous

Assigning the Fire Object Category to Smoke Control Objects

You must assign every object used specifically for smoke control as a Fire object. This assignment limits the control of smoke control devices and points to authorized Fire operators.

WARNING: Risk of Serious Injury or Death.

Properly configure the software objects and define the fire objects (BACnet® Life Safety objects) as well as the appropriate user account roles and permissions. Failure to do so may allow these objects to be changed by unauthorized persons, which may compromise the safety of the system in the event of a fire or smoke control event.

Use the drop-down menu to assign the Fire object category (Figure 8).

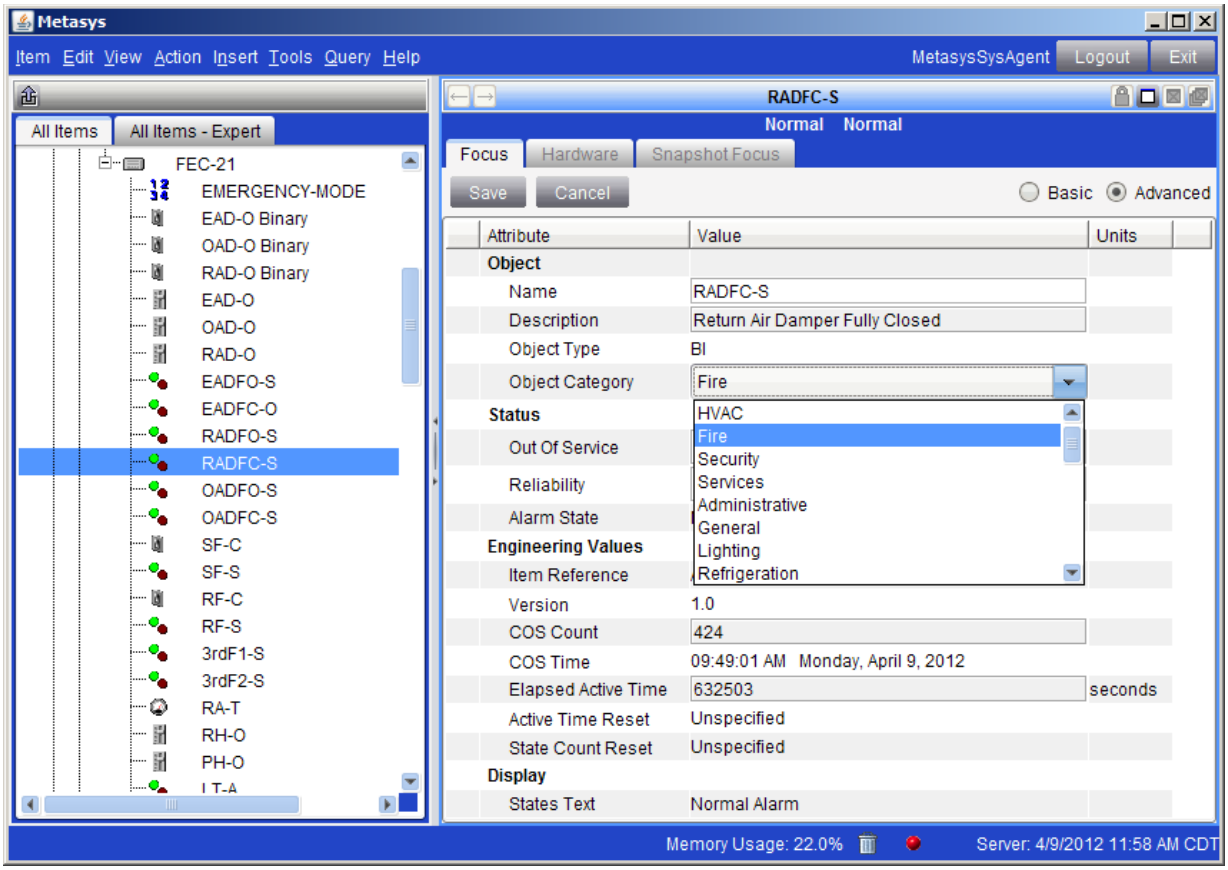

Figure 8: Assigning the Fire Object to Smoke Control Objects

Smoke Control Design Considerations

These Smoke Control NxE applications, as they exist in the Metasys System Smoke Control Library, comply with the UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Listing. However, you are responsible for ensuring that the application complies with state and local regulations, and is approved by the Authority Having Jurisdiction (AHJ). You are also responsible for configuring all of the smoke control components, as well as the programming of those components, in order to comply with the UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control Listing as documented herein.

Smoke Control NxE Design Considerations

Keep the following design considerations in mind when designing a smoke control system:

- The smoke control NxE reports critical alarms based on the alarm condition. The alarm can only be cleared by resetting from the Intelligent Fire Controller (IFC) panel or the Manual Latched Alarm Reset point of the NxE.
- A **Programming In Progress** BACnet® Binary Value object (BV) point is required. You must set this point to true any time you are making changes to the Smoke Control system. Setting the point to true turns on the Programming In Progress LED on the FSCS to let a firefighter know that changes are being made and the system may not be fully functional. Turn off the point when changes are complete.
- A master reset interlock is required. The interlock is true if the reset on the IFC panel is pressed or the Manual Latched Alarm Reset point is set to True.
- You must define the hardware location for each object.
- You must name each object with a descriptive name that is unique in the system.

Smoke Control NxE Application

Metasys System Objects

This smoke control NxE application resides on the smoke control NxE and was created with the System Configuration Tool (SCT) to define the required Control System, Interlock, and Multiple Command objects. The Logic Connector Tool (LCT) is used to create the logic within the Control System object.

The LCT logic and configuration screens are organized into two sections: building type and FSCS. The building type section shows logic and configuration screens for pressurization and exhaust logic, lock alarms, latched alarms, and alarm lockout interlock settings for the building. The FSCS section shows the logic and configuration screens for each of the smoke control devices for which the FSCS controls and/or displays status. These devices include Exhaust Fan, Supply Fan, Zone Switch, VAV, Zone Smoke LED, and Firefighter Control.

Standard Smoke Control Application Examples

To help you in designing your smoke control system, this section shows several approved smoke control examples, which comply with UL/ULC Listings. Keep in mind that these are only examples. The mixture of components in your system can differ. Be sure that your smoke control system complies with all device and communication requirements and any local restrictions.

Smoke Control Application Overview

The smoke control Network Automation Engine (NxE) application provides smoke control for a building. The NxE FC Bus controllers provide field connections. The LCT application provides basic HVAC and automatic smoke control for the building. A smoke control NxE provides a connection to the FSCS, and the smoke control NxE application provides automatic smoke control and firefighter manual override for the smoke control system.

Smoke Control Application File Location

These Metasys system smoke control applications are located on the Metasys Branch Purchase Package (BPP) disk in the Metasys System Standard Smoke Control Applications directory.

Smoke Control Application Types

There are three different smoke control applications, with each application being designed for a specific building type.

Multi-Story Building

This smoke control application example uses a six-story building with dedicated stairwell and elevator fans. It incorporates floor above-floor below pressurization to achieve its smoke control. See Figure 120.

Warehouse

This smoke control application example uses a single-story warehouse and treats the warehouse as a single zone. You can configure multiple zones, but when a smoke control event occurs, even if it is only in one zone, all zones react as one and depressurize the warehouse. See Figure 9.

Single-Story Shopping Mall

This smoke control application example uses a single-story shopping mall with a two-zone (North and South) Mall Common area and three stores (zones) on each side of the common areas, for a total of six stores. When a smoke control event occurs, it depressurizes the smoke alarm zone and pressurizes all surrounding areas. See Figure 150.

FSCS Global Device Functions

Each fan switch, damper switch, Variable Air Volume (VAV) switch, and zone switch on the FSCS performs its same function, regardless of the smoke control application in which it is used. Command timing for each device type is also application independent.

FSCS Panel and Point Auto Discovery

The FSCS panel comes mounted in an enclosure along with an MS-FEU1610-0U MS/TP controller. The MS-FEU1610-0U is used as a communication interface between the FSCS and a smoke control NxE. The MS-FEU1610-0U connects to the FSCS using its SA bus and connects to the smoke control NxE using its FC bus.

The FSCS is pre-programmed with the point list provided when the panel is ordered. Once the FSCS is connected to the system, the panel and points can be Auto Discovered using the Insert drop-down menu of the NxE.

FSCS Panel Controls and Indicators

The example FSCS panel in Figure 9 shows Floors 4 through Floor 6 of a multi-story building. FSCS panels for a warehouse or a single-story shopping mall are different and are shown in their respective smoke control application sections. The FSCS is used in all three smoke control applications that are described in this document and is responsible for all Sonalert® logic.

Firefighters use the FSCS's toggle switches to manually control fans, dampers, and VAVs for each zone (one floor per zone, in this example). Each zone has a Zone Switch that, depending on its setting, controls dampers and fans to pressurize, depressurize, or purge a zone. A Trouble LED for each device illuminates when a fan, damper, or VAV fails to achieve its commanded state or an automatic smoke detector triggers smoke LEDs to illuminate. The LED value is set to 4 as described in Table 6, and the Sonalert sounds. Pressing the Silence button on the FSCS panel acknowledges the condition, silences the Sonalert, and changes the LED to a slow blink. The LED remains on slow blink until it is commanded off. The panel starts a timer and resounds the Sonalert within 24 hours if the LED is not turned off.

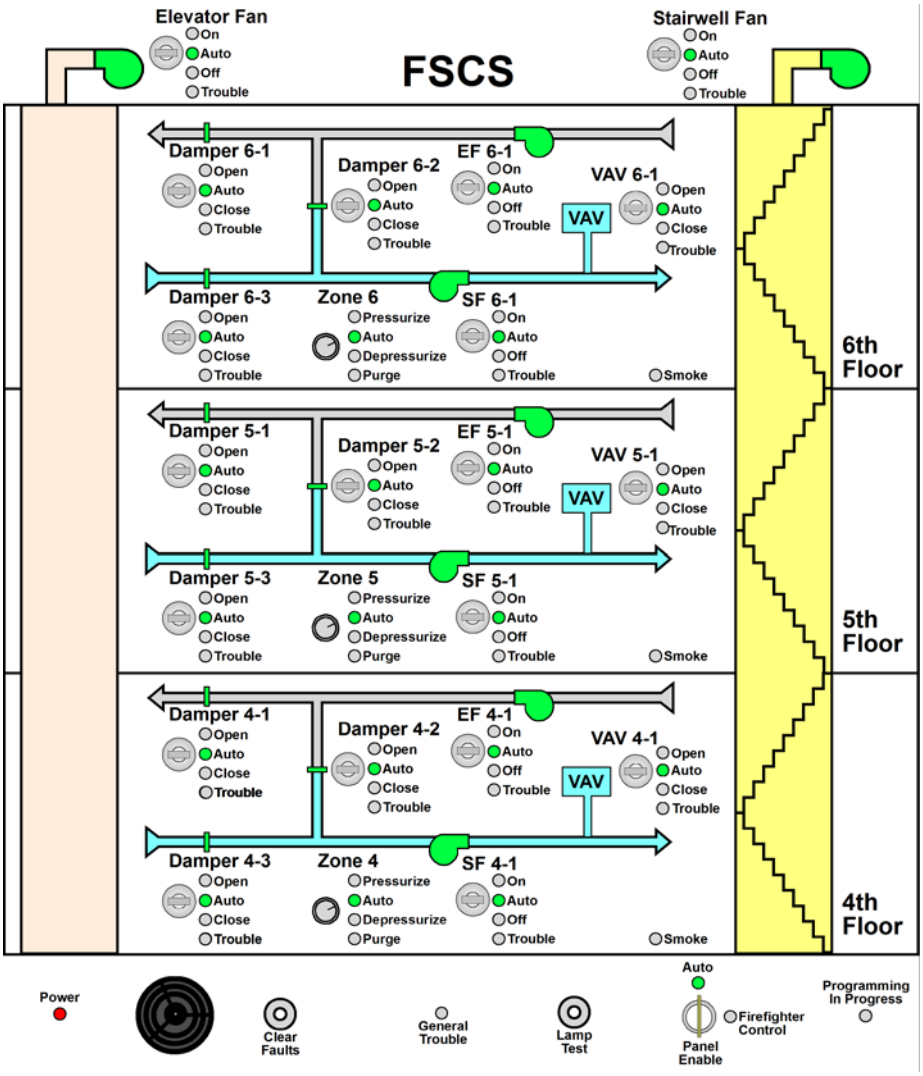

Figure 9: Example FSCS Panel (Warehouse)

The Sonalert sounds if the FSCS Panel Enable key is turned from the Firefighter Control position to the Auto position and all zone knobs and point toggle switches are not set to Auto. The FSCS still goes into Auto mode, but the Sonalert reminds the firefighter to set the manual smoke control switches to the Auto position.

The General Trouble LED illuminates to a fast blink if the FSCS panel loses communications with the NxE to which it is physically connected.

The Smoke LED for the zone illuminates when a smoke alarm is initiated by an automatic smoke detector in the zone.

You can set the Trouble LEDs on the FSCS panel to the following values shown in Table 6.

Table 6: FSCS Trouble LED Blink Conditions

FSCS Trouble LED Value	LED Blink Condition	Description
1	LED is off	Device or condition is inactive
2	LED is on continuously	Device or condition is active
3	LED slow blink	Acknowledged Condition
4	LED fast blink and Sonalert turned on	Unacknowledged Condition

FSCS General Trouble LED

The General Trouble LED (Figure 10) flashes at a fast blink whenever the FSCS panel loses communications with the NxE physically connected to the FSCS for more than 200 seconds. Figure 11 shows the communication timing for the General Trouble LED. The General Trouble LED also flashes at a fast blink if the FSCS Panel Enable key is turned from the Firefighter Control position to the Auto position and all zone knobs and point toggle switches are not set to Auto. The FSCS still goes into Auto mode, but the General Trouble LED reminds the firefighter to set the manual smoke control switches to the Auto position.

Figure 10: FSCS General Trouble LED

FSCS Sonalert

The FSCS panel is responsible for all Sonalert logic. A Trouble LED illuminates when a fan or damper fails to achieve its commanded state, and an automatic fire detection device triggers an alarm. The LED value is set to 3 (fast blink), as described in Table 6, and the Sonalert sounds. Pressing the Silence button on the FSCS panel silences the Sonalert and changes the Trouble LED to a value of 4 (slow blink). The Trouble LED remains on slow blink until it is commanded off. The panel starts a timer and resounds the Sonalert within 24 hours if the Trouble LED is not turned off.

The Sonalert sounds if the FSCS Panel Enable key is turned from the Firefighter Control position to the Auto position and all zone knobs and point toggle switches are not set to Auto. The FSCS still goes into Auto mode, but the Sonalert reminds the firefighter to set the manual smoke control switches to the Auto position.

Communication Timing

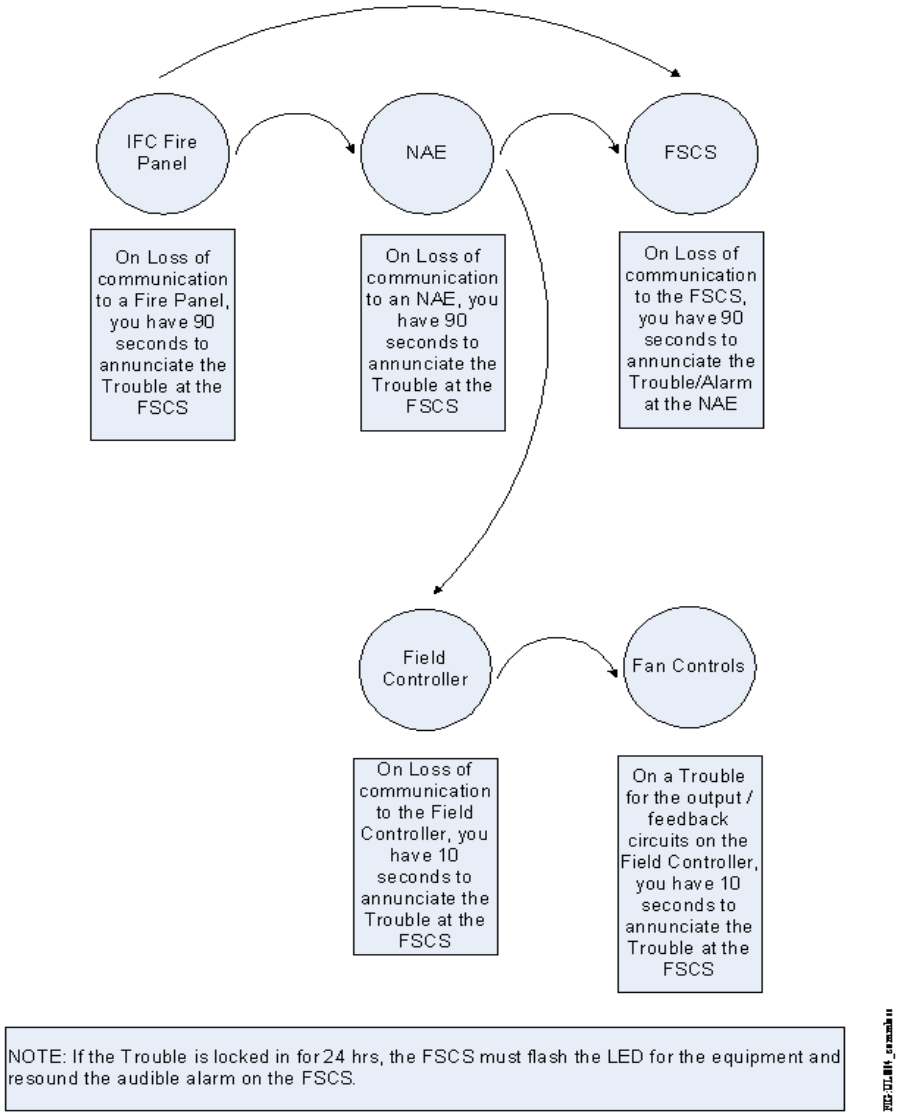

Figure 11: Communication Timing

Fire System Point Types

IFC Multistate Point from a Multistate Gateway

This point can be either a Zone, Detector, Module, or a Panel Information point.

Table 7: IFC Multistate Point State Table

BACnet Point State
State 1 - Normal
State 2 - Alarm
State 3 - Fault
State 4 - Disable

IFC Point from a Life Safety BACnet Gateway

Life Safety points can be either a Detector, Module, or a Panel Information point.

Life Safety zones can only be a Zone.

Table 8: IFC Life Safety Point State Table

BACnet Point State
State 1 - Quiet
State 2 - PreAlarm
State 3 - Alarm
State 4 - Fault
State 5 - Fault PreAlarm
State 6 - False Alarm
State 7 - Not Ready
State 8 - Active
State 9 - Tamper
State 10 - Test Alarm
State 11 - Test Active
State 12 - Test Fault
State 13 - Test Fault Alarm
State 14 - Holdup
State 15 - Duress
State 16 - Tamper Alarm
State 17 - Abnormal
State 18 - Emergency Power
State 19 - Delayed
State 20 - Blocked
State 21 - Local Alarm
State 22 - General Alarm
State 23 - Supervisory
State 24 - Test Supervisory

Smoke Control Logic Programming Folders

Common Smoke Control Programming

The following folders contain programming that is common to all building types. Use this programming to construct a smoke control system that is consistent with the physical devices installed in the building. Automatic smoke control for each of the three building types is explained in its respective section.

Main Smoke Control Folder

Each smoke control application has a main folder that contains all subfolders required to program a smoke control system.

FSCS Folder

FSCS Folder, Tree and Objects

Figure 12 shows the FSCS Tree folder and its objects.

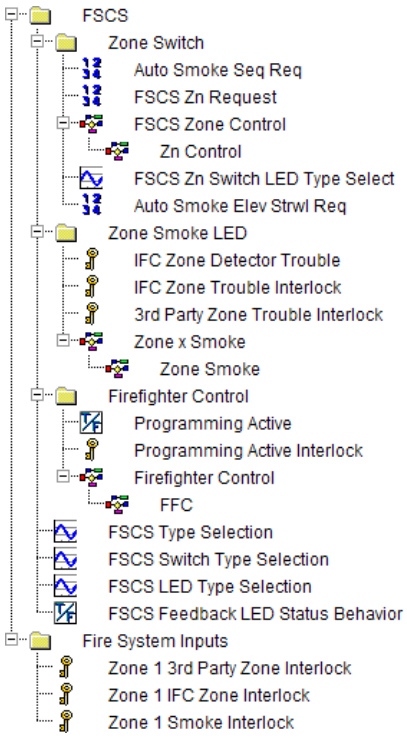

Figure 12: FSCS Objects

Zone Switch Folder

The Zone switch (Figure 13) is a four-position rotary switch with four LEDs. The four switch positions are Pressurize, Auto, Depressurize, and Purge, each with its associated LED.

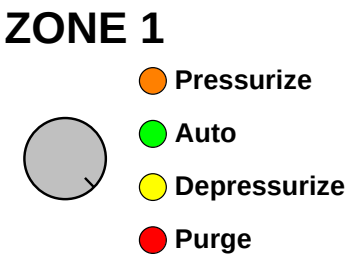

Figure 13: FSCS Zone Switch

Table 9: Zone Switch - 3-Position Rotary, 4 LEDs

Switch Position	Switch Setting	Associated With	LED	Description
1	Manual Pressurize	MS/TP banked LEDs	Pressurize	Illuminates the Pressurize LED when the switch is in position 1 and the associated feedback point is correct. Turns the Pressurize LED off when in any other position.
2	Auto		Auto	Illuminates the Auto LED when the switch is in position 2 and the associated feedback point is correct. Turns the Auto LED off when in any other position.
3	Manual Depressurize		Depressurize	Illuminates the Depressurize LED when switch is in position 3 and the associated feedback point is correct. Turns the Depressurize LED off when in any other position.
4	Manual Purge		Purge	Illuminates the Purge LED when switch is in position 4 and the associated feedback point is correct. Turns the Purge LED off when in any other position.

FSCS Logic

The FSCS Logic section contains logic and configuration screens for the FSCS Zone Switch and FSCS Zone Smoke LED.

The FSCS Zone Control Switch main logic controls smoke for its individual zone. See Figure 14.

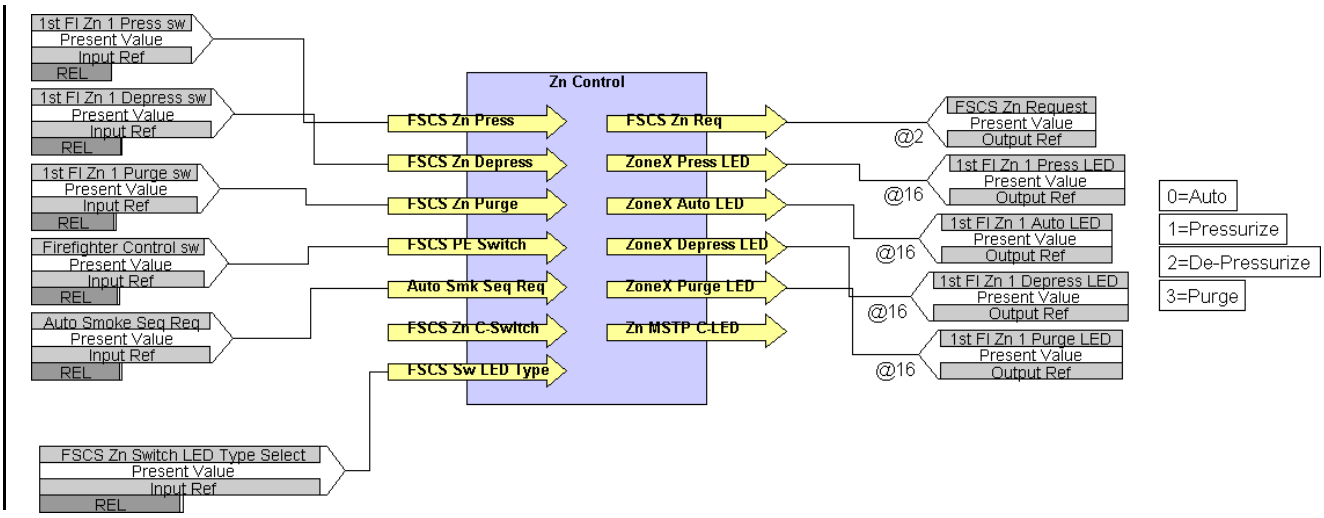

Figure 14: Zone 1 Control Switch Main Logic

- The Zone Control system block logic controls the FSCS Zone LEDs for the zone, depending on the Firefighter Control Key setting (Figure 15).
- The Zone Purge LED is illuminated if the pressurize and depressurize points in the field controller are true.
- The Zone Pressurize LED is illuminated if the field controller pressurize point is true and the depressurize point is false. The Zone Depressurize LED on the FSCS is illuminated if the field controller depressurize point is true and the pressurize point is false.
- The Zone Auto LED is illuminated only if the Zone Switch on the FSCS panel is not set to Pressurize, Depressurize, or Purge.
- The Zone Pressurize, Zone Depressurize, and Zone Purge settings on the FSCS panel are not functional unless the Firefighter Control Key has been turned to Firefighter Control.
- If the Firefighter Control Key is set to Auto, the FSCS Request is set to 0. If the Firefighter Control Key is set to Firefighter Control, the FSCS Request is set to the values shown in Table 10, depending on the position of the Zone switch.

Table 10: FSCS Zone1 Switch FSCS Request State Value

FSCS Zone 1 Switch Position	FSCS Request State Value	Smoke Control Action
Pressurize	1	Zone 1 Supply Fan On
Auto	0	Auto Smoke Control
Depressurize	2	Zone 1 Exhaust Fan On
Purge	3	Zone 1 Supply Fan On and Zone 1 Exhaust Fan On

Zone Switch Logic

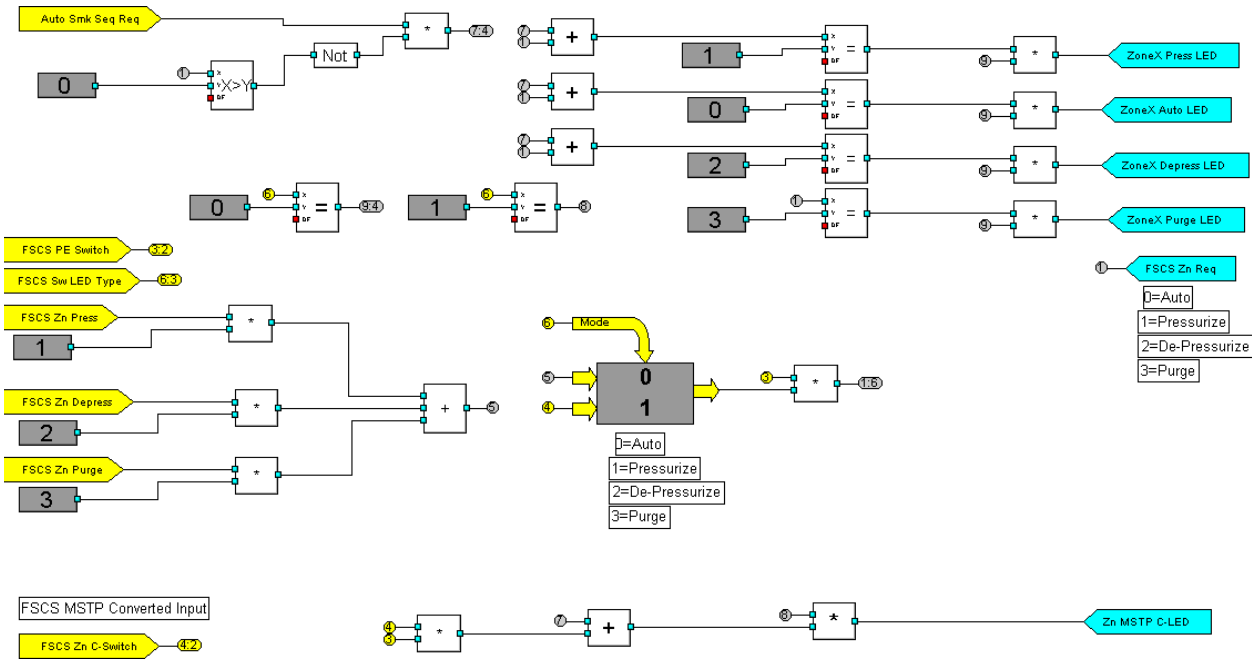

Figure 15: Zone Control Block Logic

The Auto Smoke Seq Req is an auto smoke control request to pressurize or depressurize a zone (Figure 16).

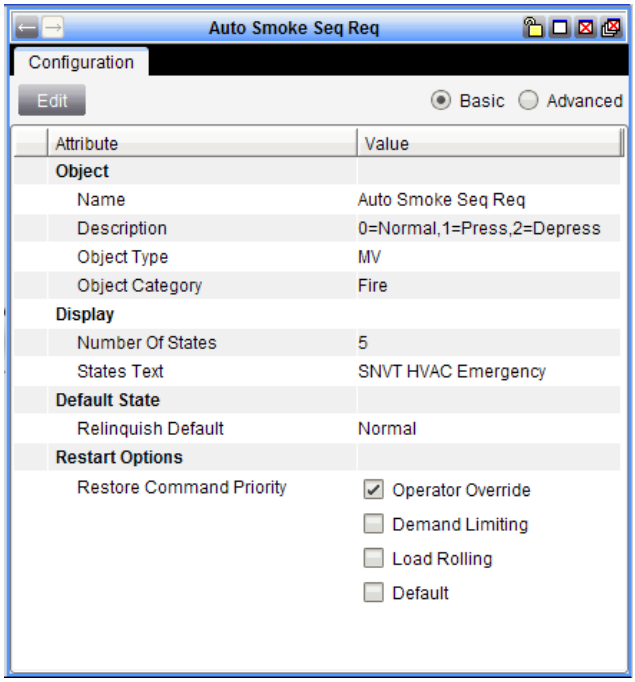

Figure 16: Auto Smoke Seq Req

The FSCS Zn Request is a manual FSCS Zone Switch request to pressurize, depressurize, or purge a zone (Figure 17).

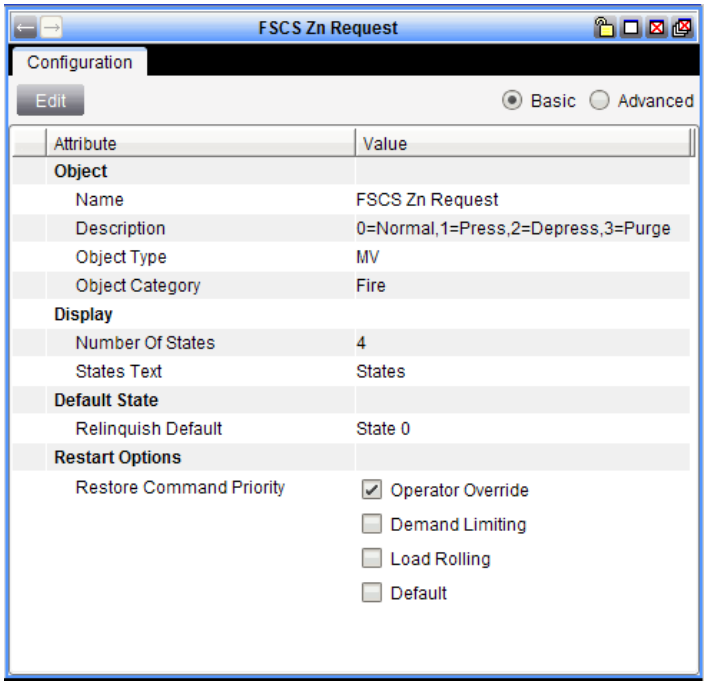

Figure 17: FSCS Zn Request

The Auto Smoke Elev Strwl Req is an auto smoke control request to pressurize the elevator shaft and stairwells (Figure 18).

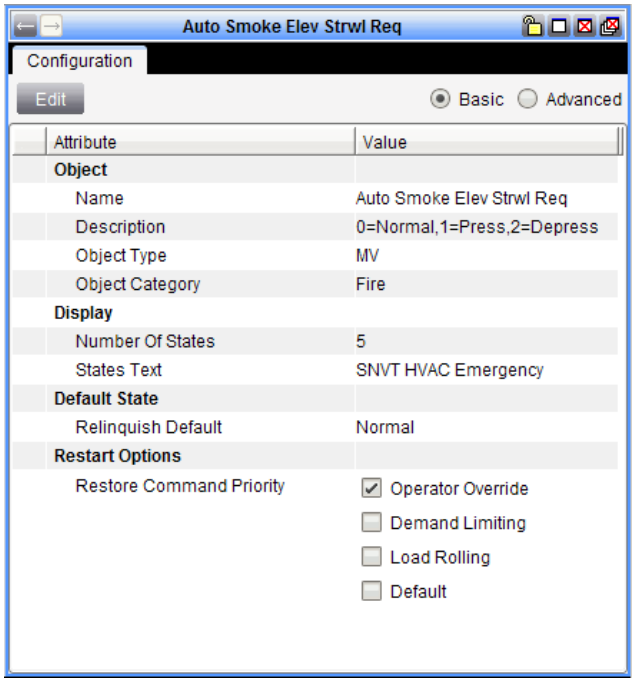

Figure 18: Auto Smoke Elev Strwl Req

FSCS Type Selection

This setting **must** be set to MSTP Converted.

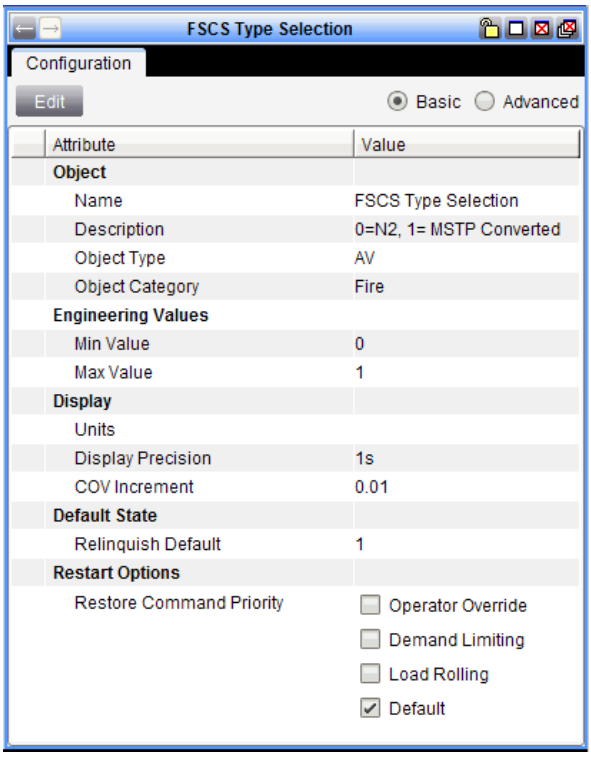

Figure 19: FSCS Type Selection

Zone Smoke LED Folder

The FSCS's Zone Smoke LED is a single LED that illuminates when a trouble condition exists within its Zone (Figure 26). Each zone has a Smoke LED.

Figure 20: FSCS Smoke LED

Table 11: Smoke LED Alarm Sources

Alarm Source	LED Status
Smoke	Solid on when smoke is detected. Off when smoke alarm is reset.
Zone Disabled from IFC Panel	Flashes at fast rate when trouble exists. When acknowledged, flashes at slower rate. Off when trouble is cleared.
Detector Disabled from IFC Panel	
Panel Fault from IFC Panel	
Zone Trouble from IFC Panel	
Detector Trouble from IFC Panel	
Network Communication Trouble from IFC Panel	

The Zone Smoke block controls the Zone's Smoke LED on the FSCS (Figure 21).

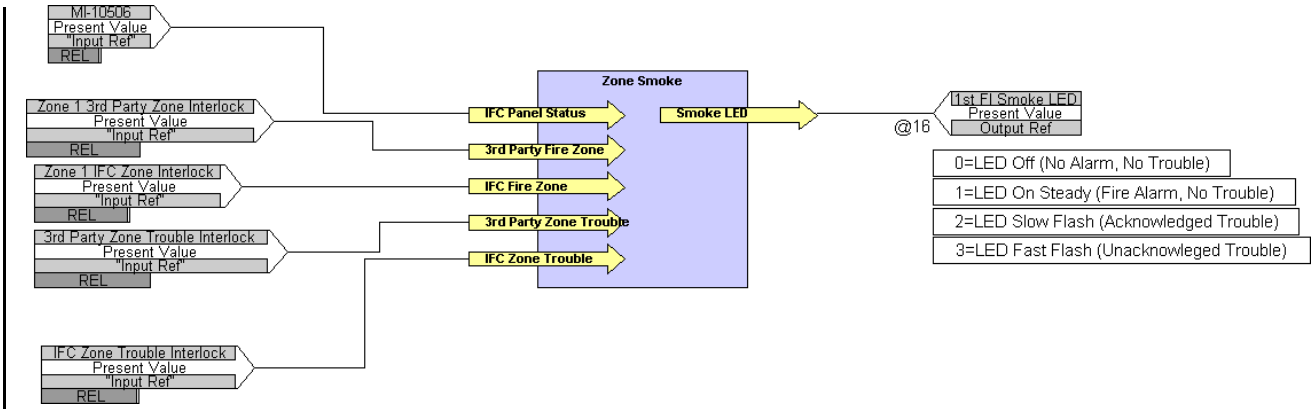

Figure 21: Zone Smoke LED Main Logic

Zone Smoke LED Inputs

Table 12: Zone Smoke LED Inputs

Zone Smoke LED Inputs	Zone Smoke Block Inputs	Zone Smoke Block Output	Output Value
3rd Party Zone Interlock	3rd Party Fire Zone	Smoke LED	0 = LED Off (No Alarm, No Trouble) 1 = LED On Steady (Fire Alarm, No trouble) 2 = LED Slow Flash (Acknowledged Trouble) 3 = LED Fast Flash (Unacknowledged Trouble)
IFC Zone Interlock	IFC Fire Zone		
Zone Trouble Interlock	3rd Party Zone Trouble		
Zone Trouble Interlock	IFC Zone Trouble		
IFC Panel Status	IFC Panel Status		

The Zone Smoke block logic (Figure 22) has the following settings:

- If the zone is in smoke control, turn the Smoke LED on continuously.
- If the panel status is bad, flash the Smoke LED.
- If the zone is not in smoke control, turn the Smoke LED off.

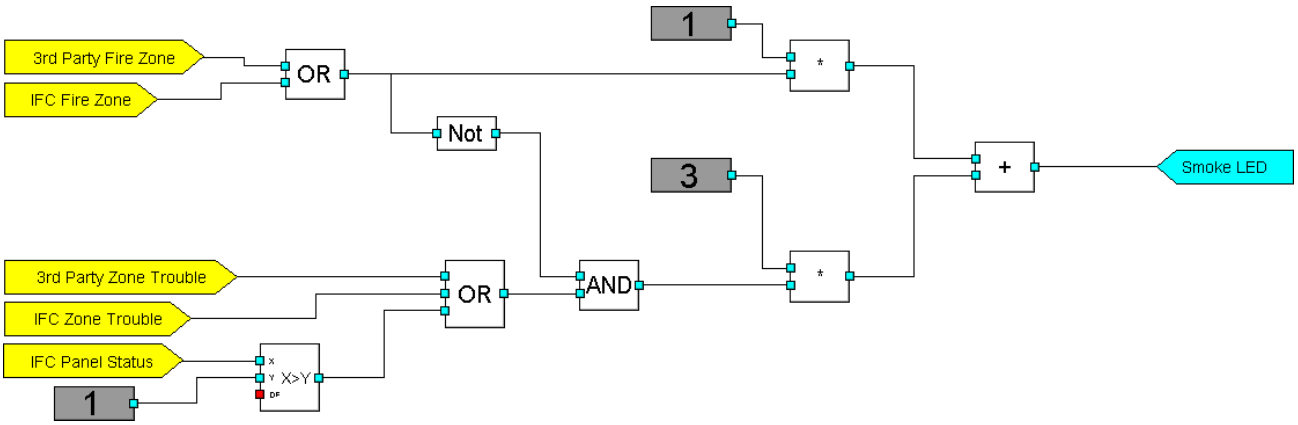

Figure 22: Zone Smoke Logic

Fire System Trouble

You must define either the **IFC Zone Detector Interlock, IFC Zone Trouble Interlock, 3rd Party Zone Interlock,** or any combination of the three interlocks, as required by the fire system of the smoke control site.

IFC Zone Detector Trouble Interlock Definition

The IFC Zone Detector Trouble Interlock Definition contains a point for each detector in the zone (Figure 23). When a detector goes into alarm the FSCS Trouble LED for that zone illuminates.

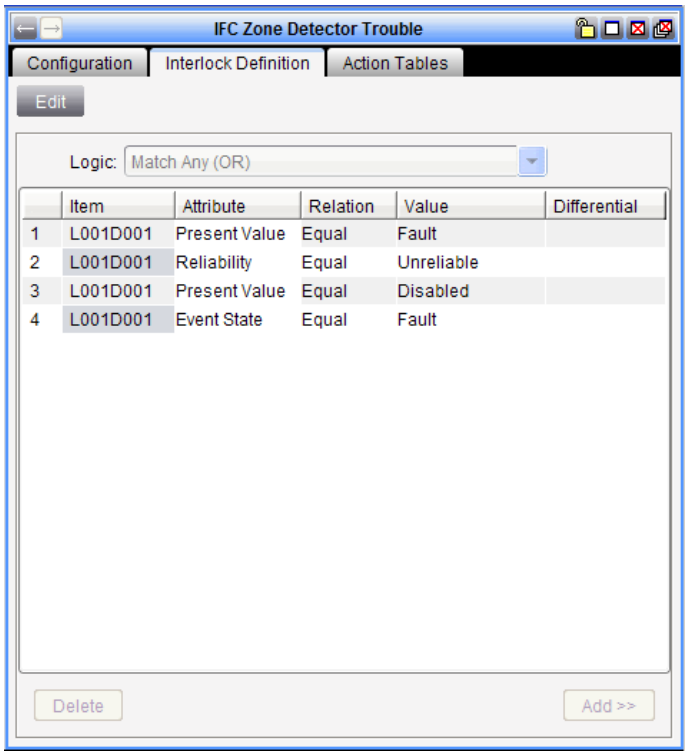

Figure 23: IFC Zone Detector Interlock Definition

IFC Zone Trouble Interlock Definition

The IFC Zone Trouble Interlock Definition contains a Present Value, Event State, Out of Service, and Reliability point for each zone in the building and a point for the IFC Zone Detector Trouble value. See Figure 24.

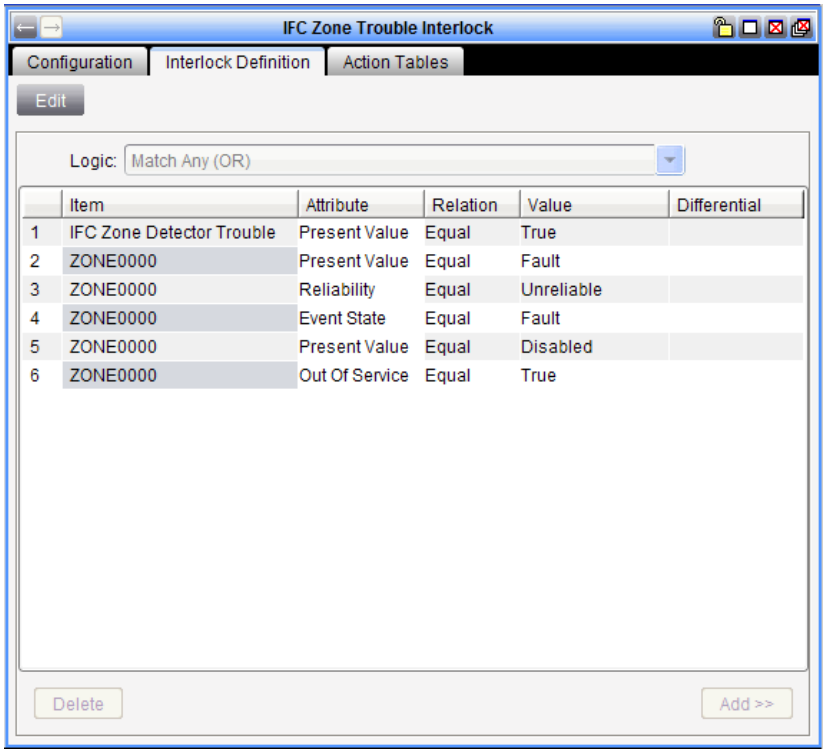

Figure 24: IFC Zone Trouble Interlock Definition

3rd Party Zone Trouble Interlock Definition

The 3rd Party Zone Trouble Interlock Definition contains an optional, third-party, normally open (N.O.) contact input connection, and a point to monitor the field controller offline status (Figure 25). If the third-party point goes unreliable or the field controller monitoring the third-party point goes offline, the Zone LED illuminates.

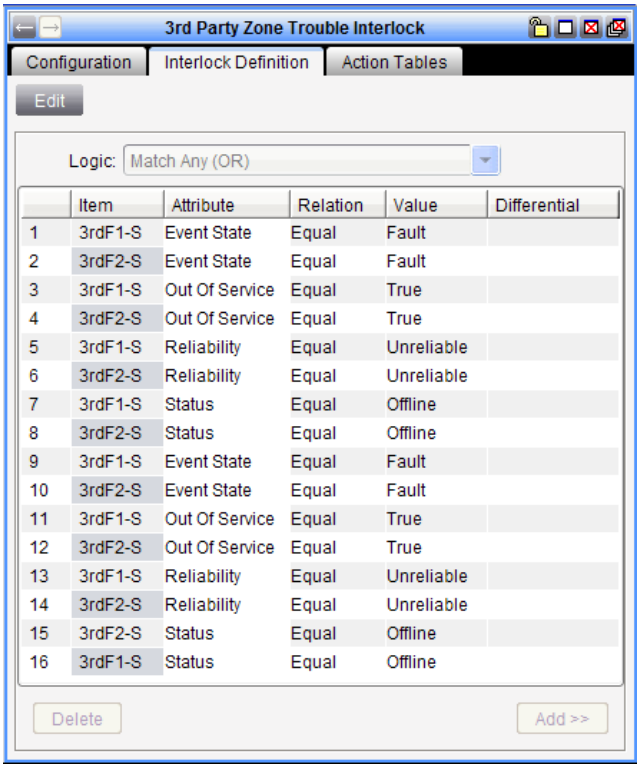

Figure 25: 3rd Party Zone Trouble Interlock Definition

Firefighter Control Folder

IMPORTANT: This folder is **only** found in the smoke control NxE that is directly connected to the FSCS.

The Firefighter Control switch is a two-position key switch on the FSCS. The two switch positions are Auto and Firefighter Control, each with its associated LED (Figure 26).

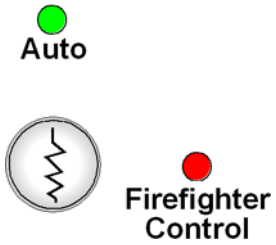

Figure 26: FSCS Firefighter Control Switch

Table 13: Firefighter Control Switch - 2-Position Key Switch, 2 LEDs

Switch Position	Switch Setting	Associated With	LED	Description
1	Auto	MS/TP banked switch	Auto	Illuminates the Auto LED when the switch is in position 1. Turns the Auto LED off when in any other position.
2	Firefighter Control		Firefighter Control	Illuminates the Firefighter Control LED when the switch is in position 2. Turns the Firefighter Control LED off when in any other position.

Note: The Sonalert alarm sounds if the FSCS Firefighter Control key is turned from the Firefighter Control position to the Auto position and all zone knobs and point toggle switches are not set to Auto. The FSCS still goes into Auto mode, but the Sonalert alarm reminds the firefighter to set the manual smoke control switches to the Auto position. The General Trouble LED also flashes at a fast blink if the FSCS Panel Enable key is turned from the Firefighter Control position to the Auto position and all zone knobs and point toggle switches are not set to Auto. The FSCS still goes into Auto mode, but the General Trouble LED reminds the firefighter to set the manual smoke control switches to the Auto position.

Firefighter Control Logic

The FSCS Fighter Control main logic turns the Firefighter Control Auto LED on if the Firefighter Control key is off. It turns the Firefighter Control LED on if the Firefighter Control Key is on. The Programming in Progress LED automatically flashes when you upload or download to any field controller or supervisory controller. If you edit the LCT while the system is live, manually command the Programming in Progress LED to Fast Flash. See Figure 27.

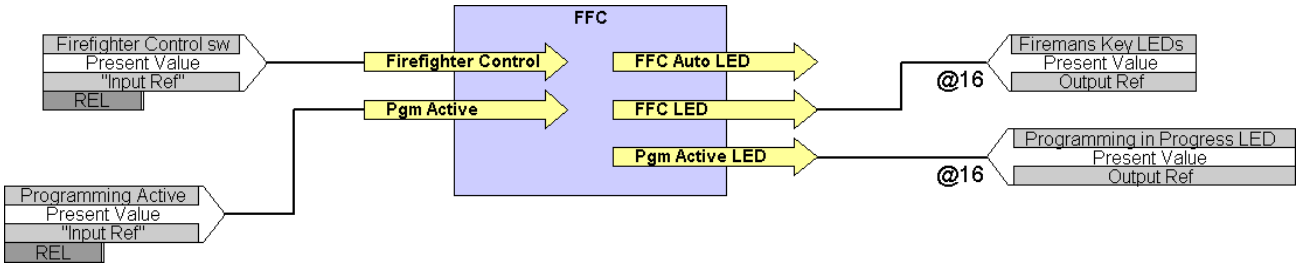

Figure 27: Firefighter Control Main Logic

FFC Block Input and Outputs

Table 14: FFC Block Inputs

Inputs	FFC Block Inputs	Description
Firemans Key	Firefighter Control	Current switch setting on the FSCS Panel Enable switch
Programming Active	Pgm Active	Status of current system programming activities False = Programming Not Active True = Programming Active LED illuminates

Table 15: FFC Block Outputs

FFC Block Outputs	Outputs	Description
FFC Auto LED	Firemans Key Auto Ind	Controls the FSCS Panel Enable Auto LED False = FSCS Panel Enable Auto LED off True = FSCS Panel Enable Auto LED illuminates
FFC LED	Firemans Key FFE Ind	Controls the FSCS Panel Enable Firefighter Control LED False = FSCS Panel Enable Firefighter Control LED off True = FSCS Panel Enable Firefighter Control LED illuminates
Pgm Active LED	Programming Panels Ind	Controls the FSCS **Programming in Progress** LED False = Programming in Progress LED off True = Programming in Progress LED illuminates

FFC Block Logic

The FFC block logic is shown in Figure 28.

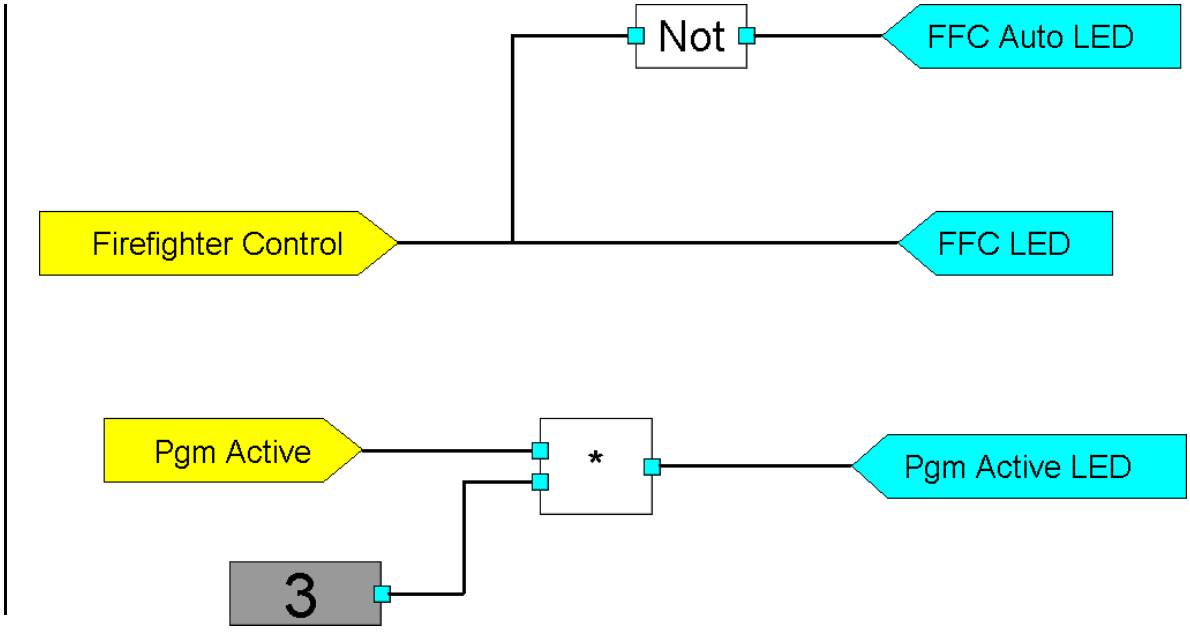

Figure 28: FFC Block Logic

Programming Active

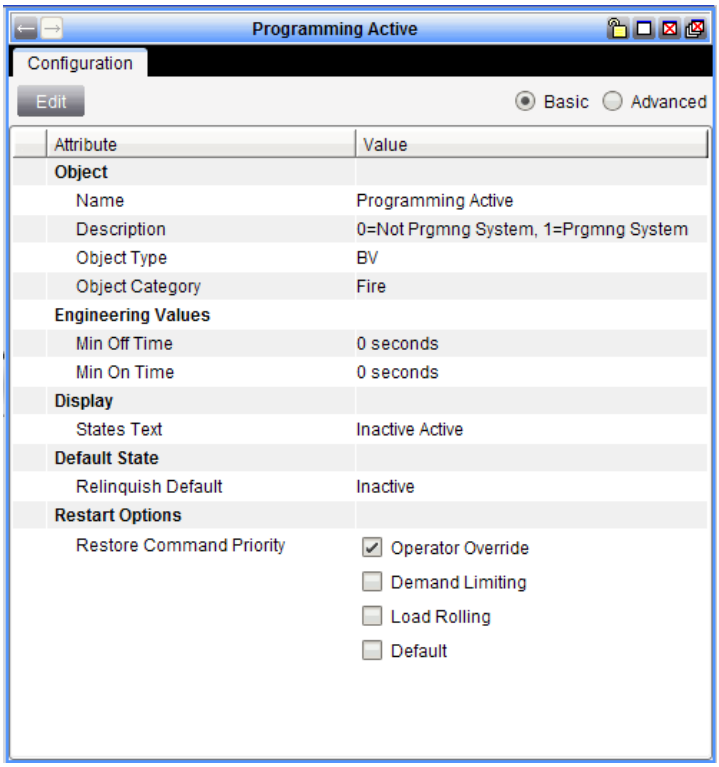

Figure 29: Programming Active

Programming Active Interlock

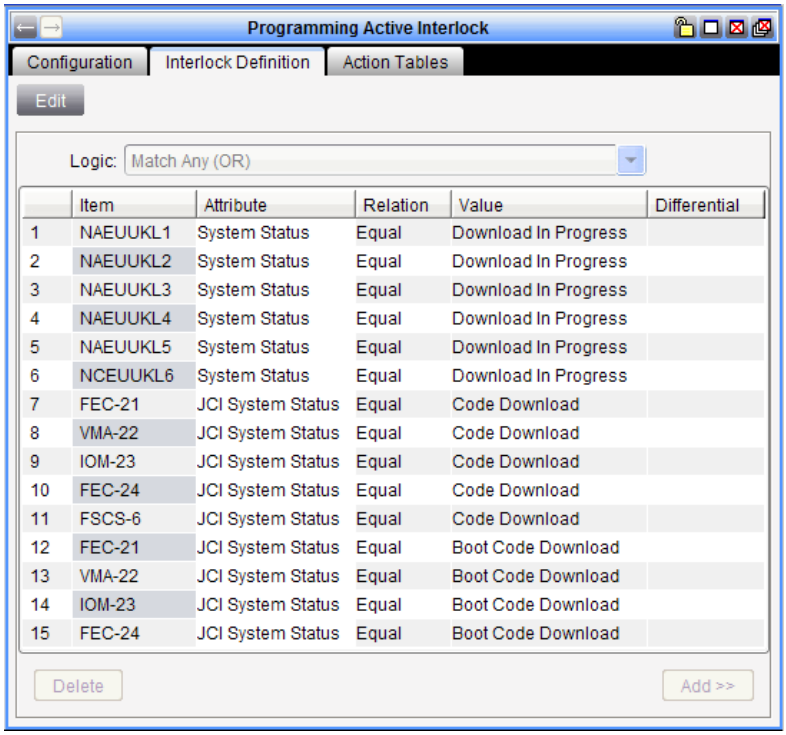

Figure 30: Programming Active Interlock

Fire System Inputs Folder

You must define either the **Zone x IFC Interlock** or the **Zone x 3rd Party Zone Interlock** or both as required by the fire system of the smoke control site.

Zone x IFC Zone Interlock Definition

The IFC Zone Interlock Definition includes all zones, detectors, or a combination of both, for the smoke control area (Figure 31).

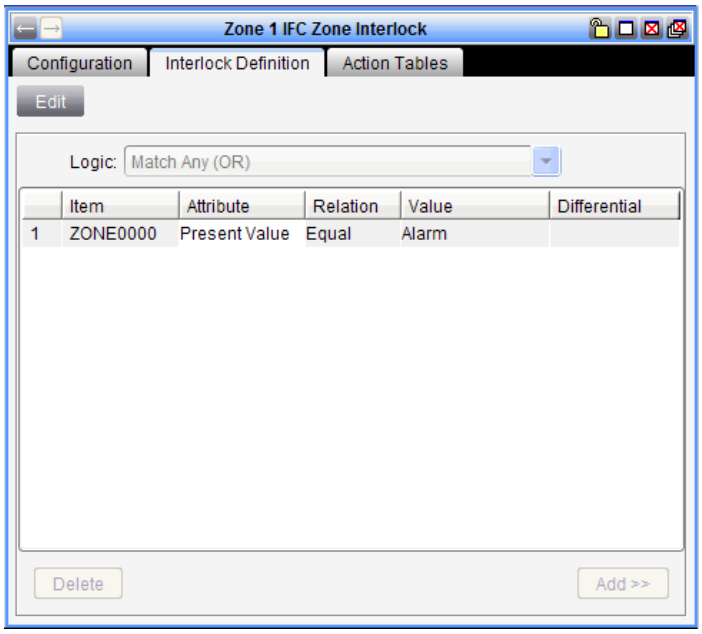

Figure 31: IFC Zone Interlock Definition

Zone x 3rd Party Zone Interlock Definition

The Zone 1 3rd Party Zone Interlock Definition includes points for an optional third-party fire system and normally open (N.O.) dry-contact input connections (Figure 32). Multiple third-party fire points are allowed per zone and multiple zones are allowed per smoke control area.

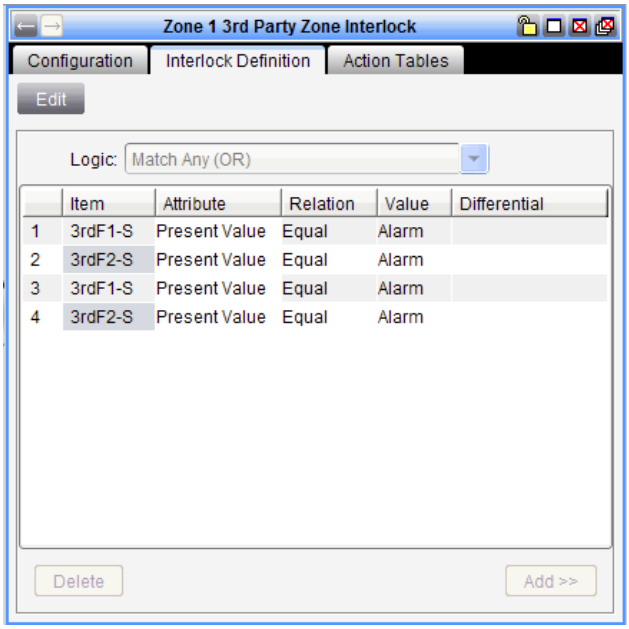

Figure 32: 3rd Party Zone Interlock Definition

Zone x Smoke Interlock Definition

The Zone Smoke Interlock Definition includes the Zone 3rd Party Zone Interlock and the IFC Zone Interlock (Figure 33).

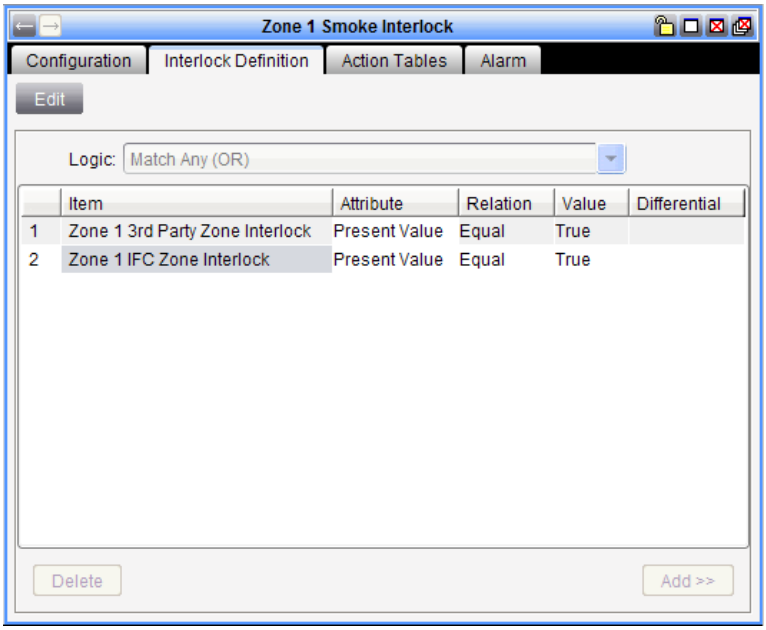

Figure 33: Zone Smoke Interlock Definition

Floor Com Monitor Folder

IMPORTANT: This folder is **only** found in the smoke control NxE that is directly connected to the FSCS.

Figure 34 shows all of the objects associated with the Floor Com Monitor.

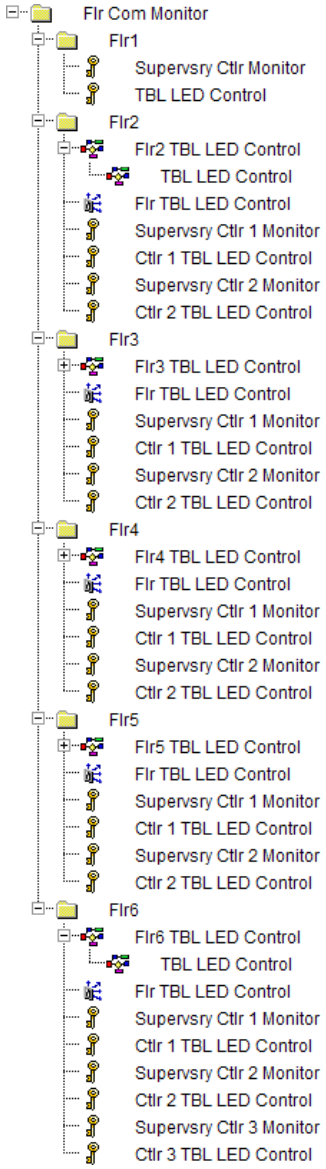

Figure 34: Floor Com Monitor Folder

These interlocks monitor the status of each supervisory controller. Should a controller become unreliable, the interlocks illuminate all FSCS Trouble LEDs that are associated with the failed controller.

Supervisory Ctlr Monitor Interlock Definition

The Supervisory Ctlr Monitor Interlock Definition monitors the status of the supervisory controller (Figure 35).

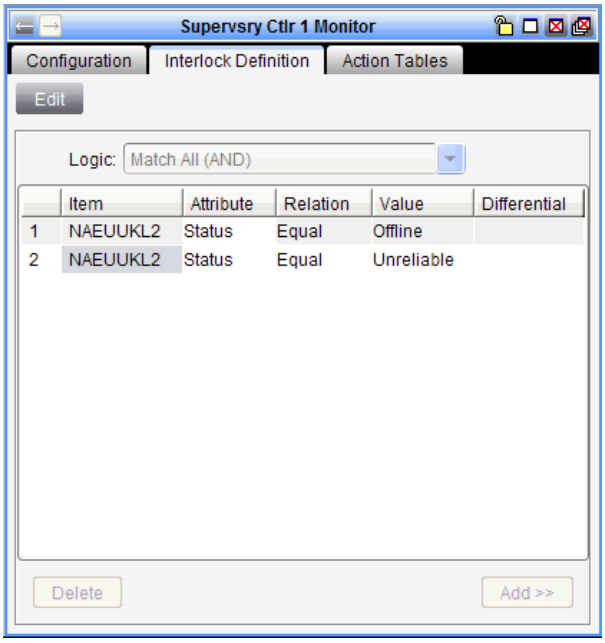

Figure 35: Zone Smoke Interlock Definition

Controller 1 Trouble LED Control

The Controller 1 Trouble LED Control is the input to the TBL LED Control LCT Logic which indicates when the Supervisory Ctrl Monitor Interlock is unreliable.

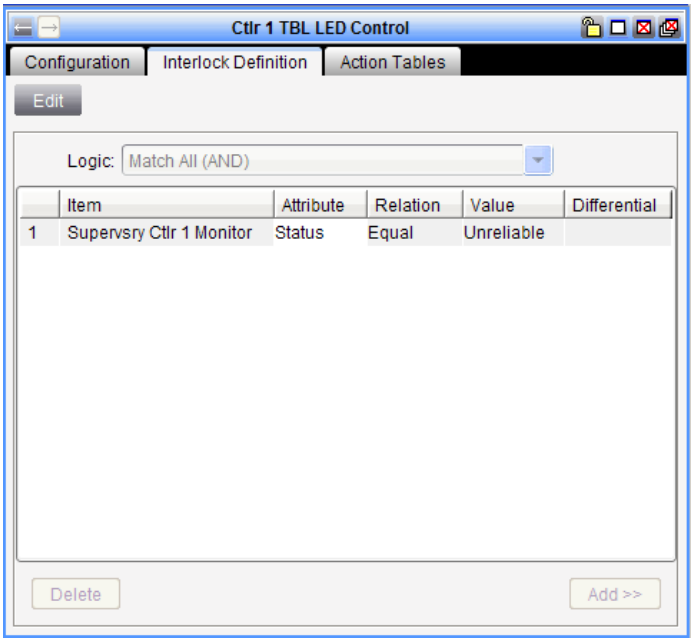

Figure 36: Ctlr 1 Trouble LED Control

Floor Trouble LED Control Action Table

The Floor Trouble LED Control Action Table defines which trouble LEDs are associated with the failed NxEs (Figure 37).

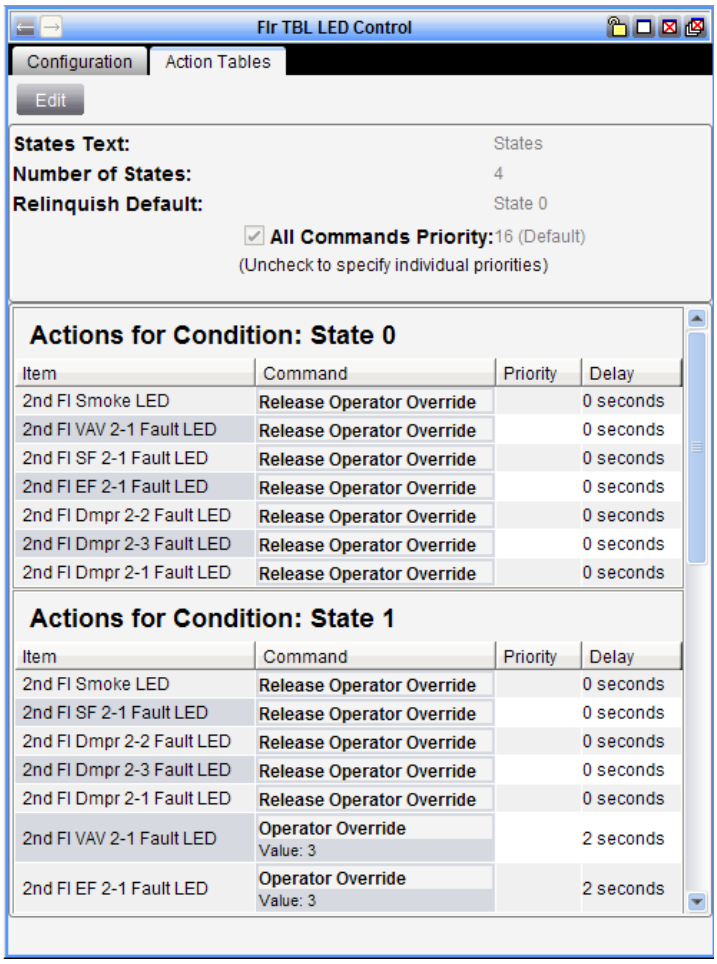

Figure 37: Floor TBL LED Control Action Table

Trouble LED Control Logic

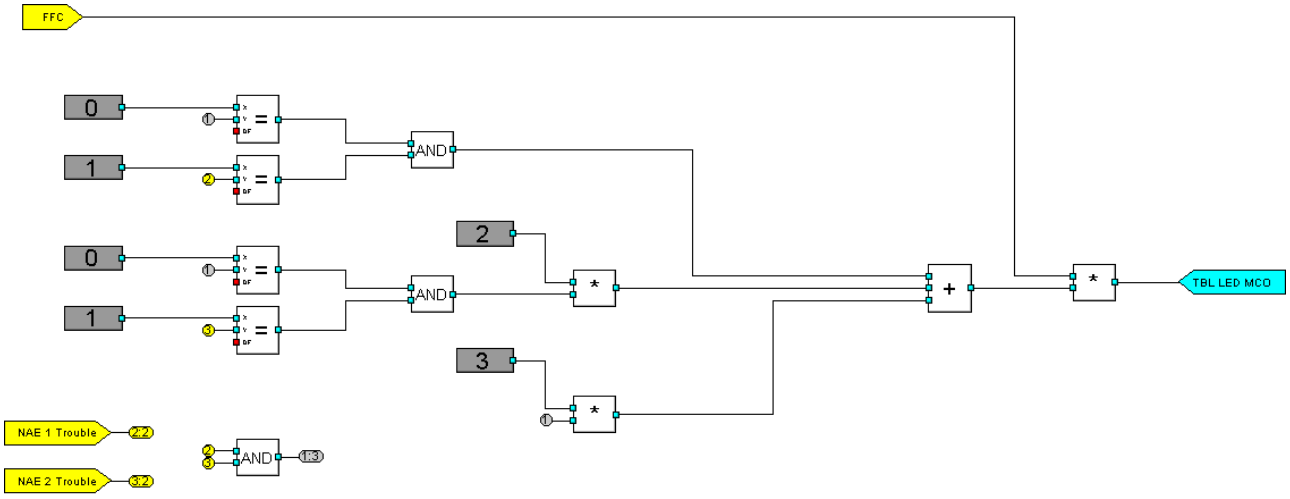

Figure 38: Trouble LED Control Logic

Trouble LED Control Block

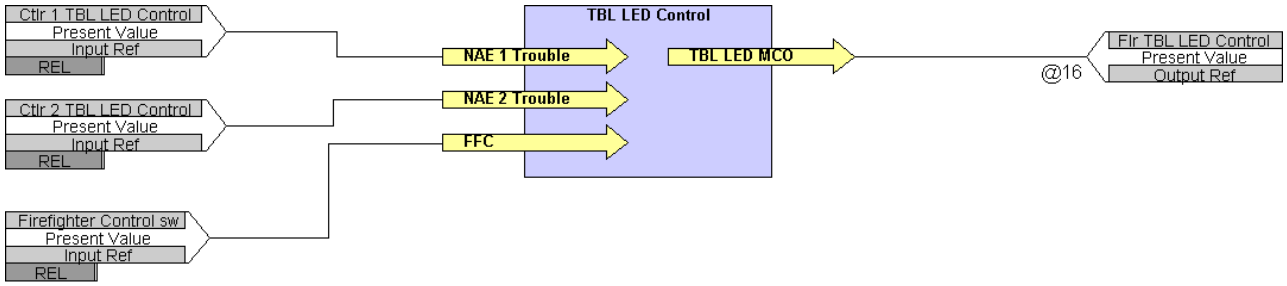

Figure 39: Trouble LED Control Block

WDT Schedule Folder

The WDT Schedule folder contains the weekly test schedule for all dedicated smoke control equipment for this NxE.

To assign schedule day and times for the weekly dedicated test to run:

1. From the WDT Schedule, set the desired day and time for the test to run from the Weekly Schedule Display Mode.

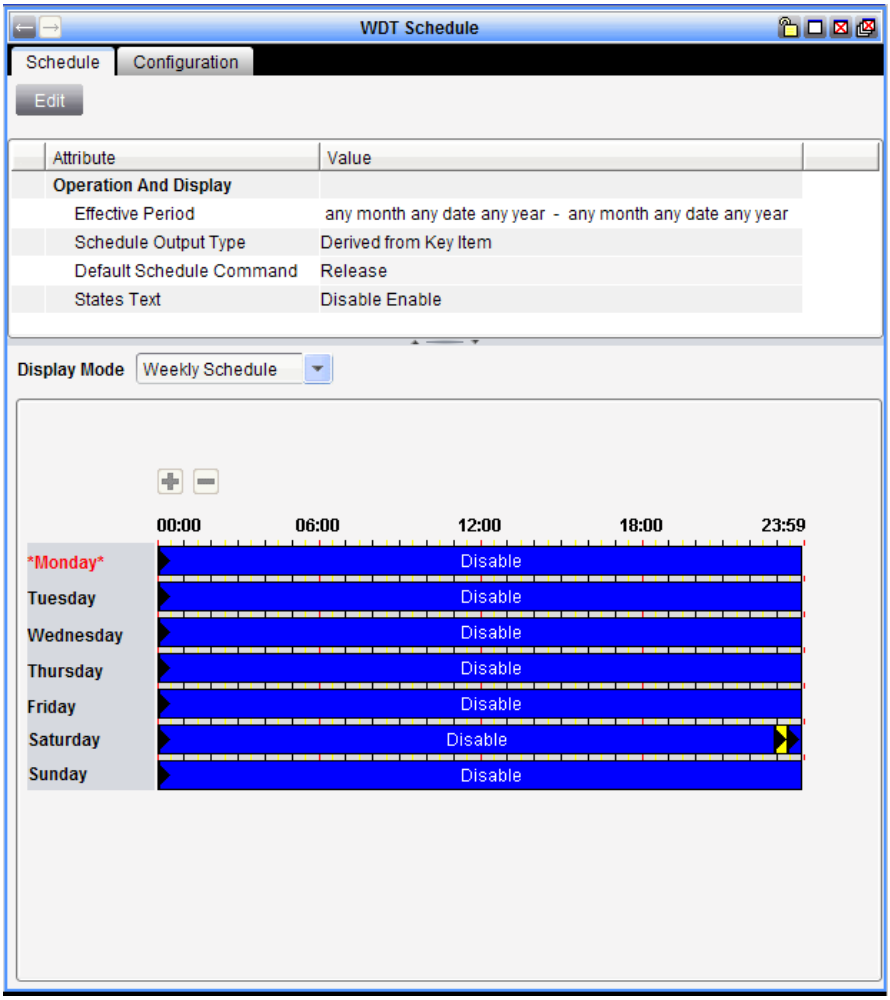

Figure 40: WDT Weekly Schedule

2. From the Scheduled Items Display Mode, add the desired WDT Enable point for all dedicated smoke control equipment controlled by this NxE.

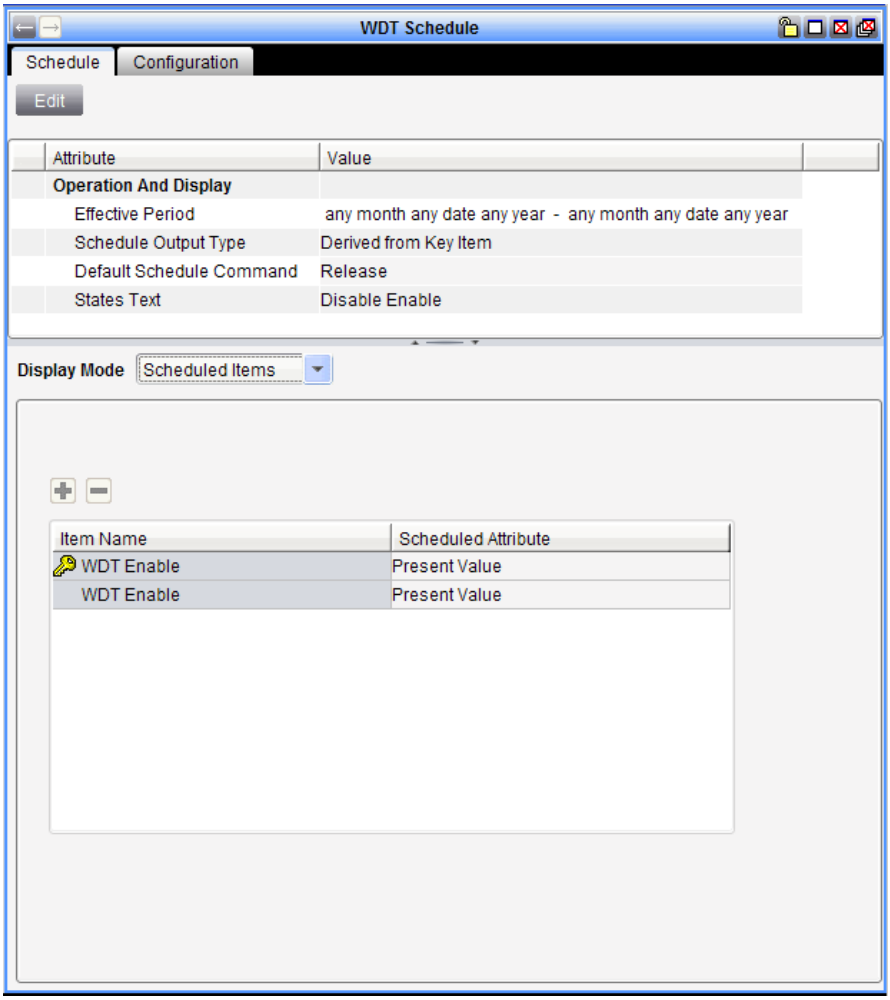

Figure 41: WDT Scheduled Items

AHU Folder

The AHU folder contains subfolders for the devices that physically define the AHU type.

AHUs configurations vary as required by the type of unit physically installed in the smoke control area. Use the fan, damper, and VMA logic folders to match the physical AHU configuration of the smoke area.

Figure 42: AHU Folder Tree

Emergency Shutdown Control

The Emergency Shutdown Control folder is one of the AHU subfolders.

The Emergency Shutdown status point is used by the fan, damper, and Vxx control logic to shutdown the AHU (Figure 43).

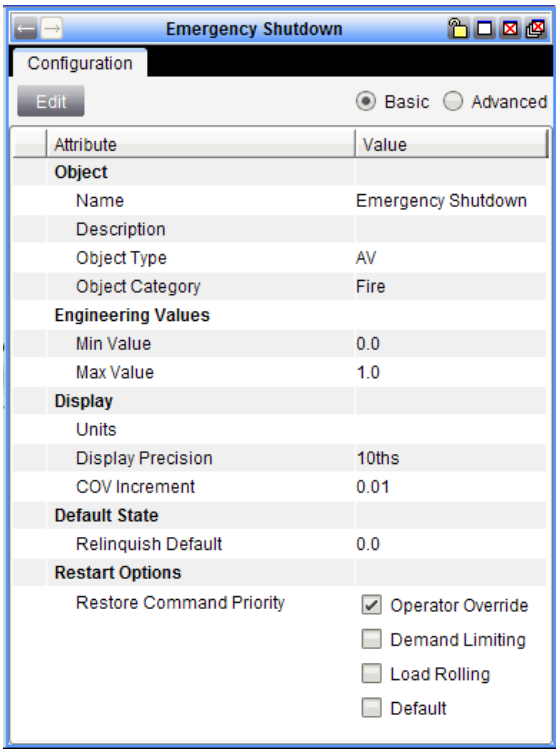

Figure 43: Emergency Shutdown Status Point

The Emergency Shutdown Interlock Definition contains any condition that causes an emergency shutdown of the AHU to prevent physical damage to the AHU and associated ductwork (Figure 44). This interlock sets the value of the Emergency Shutdown status point.

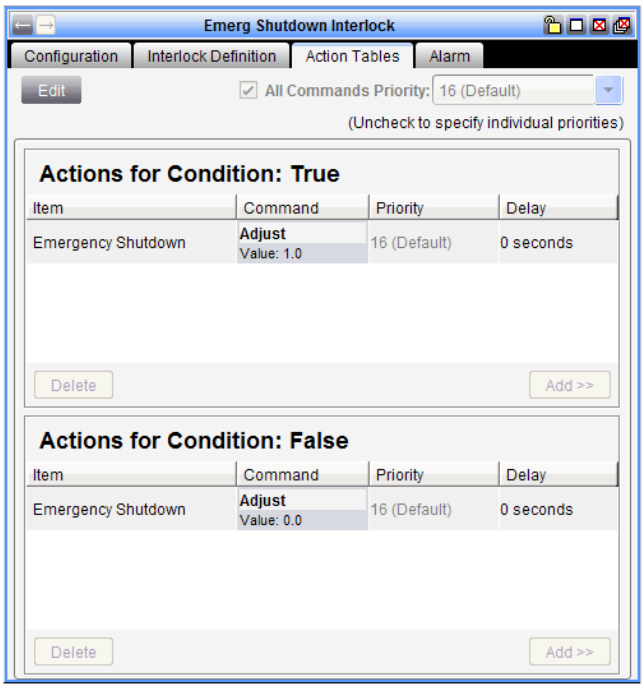

Figure 44: Emergency Shutdown Interlock Definition

Fan Folder

Fan Objects

Figure 45 shows all objects associated with any fan type. The FSCS folder is shown since some of the fan's logic references these points.

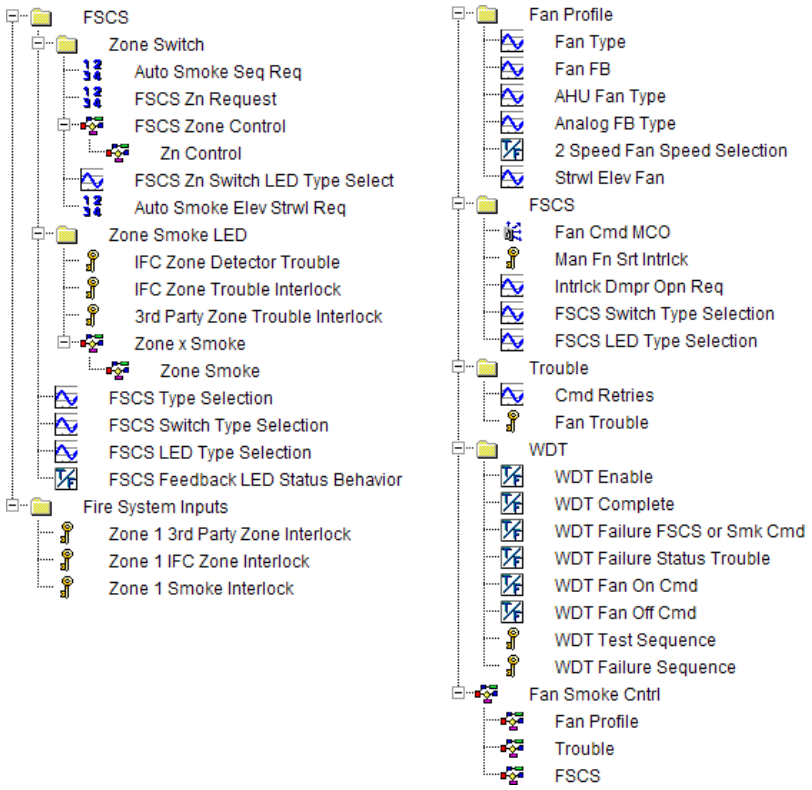

Figure 45: Fan and Related Fan Objects

Fan Response Timing

Manual Fan Command Timing

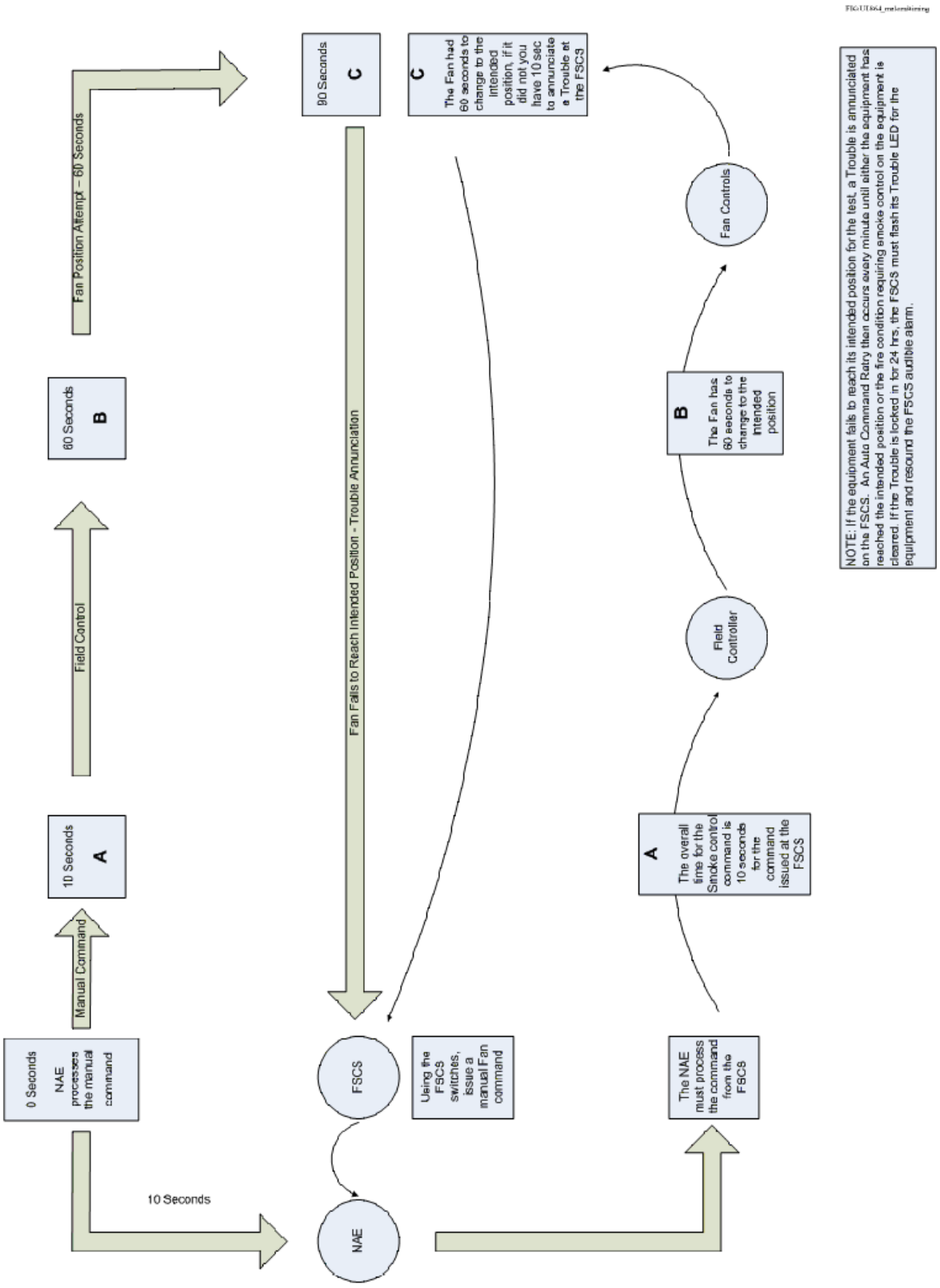

Figure 46: Manual Fan Command Timing

Automatic Fan Command Timing

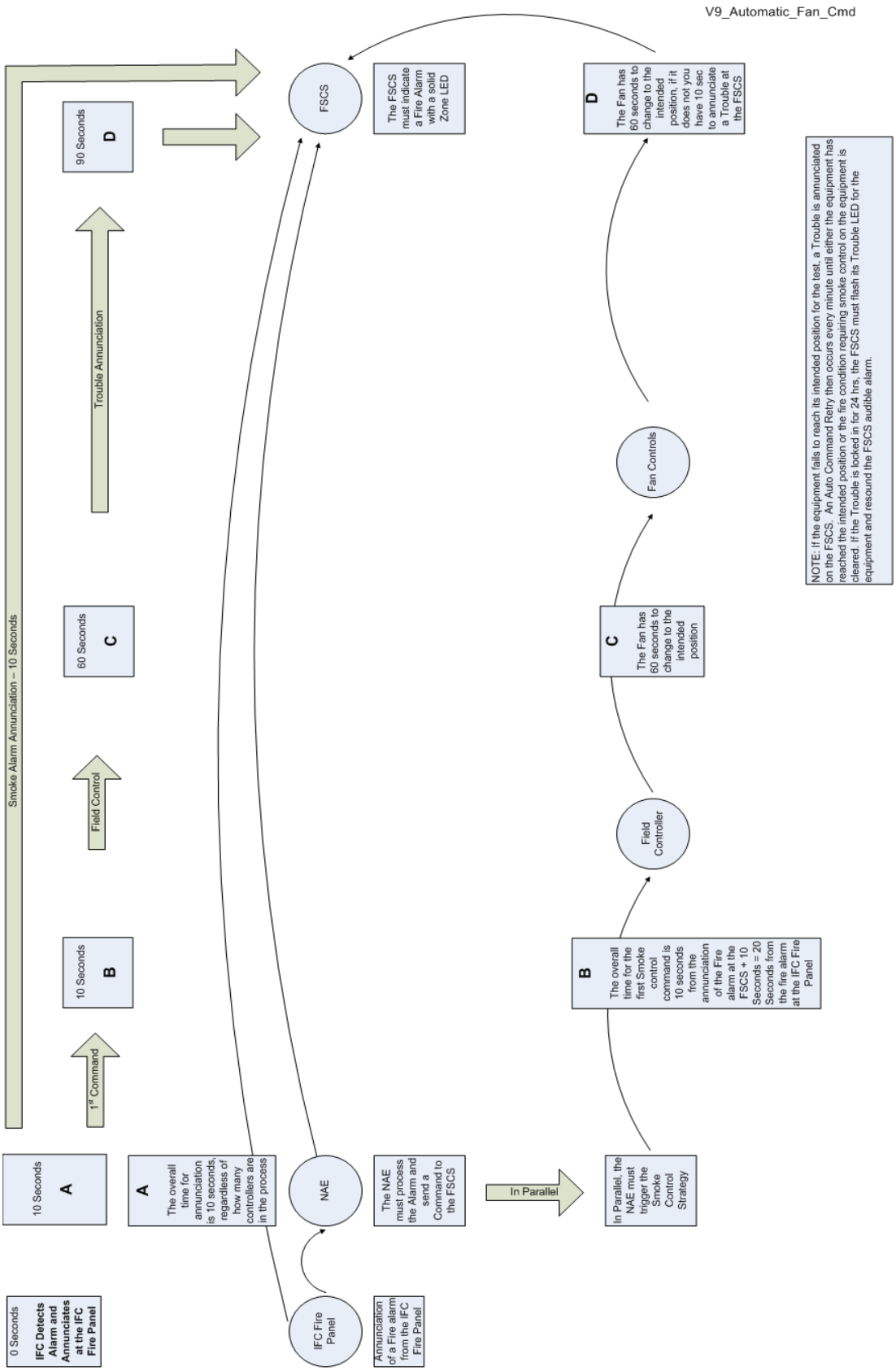

Figure 47: Automatic Fan Command Timing

Fan Switch

The FSCS's Fan switch, used for supply and exhaust fans, is a three-position toggle switch with four LEDs (Figure 48). The three switch positions are On, Off, and Auto, each with its associated LED. The Trouble LED illuminates when trouble is present for the fan. Its flash rate shows its acknowledged/ unacknowledged status.

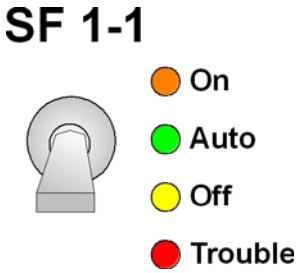

Figure 48: FSCS Fan Switch

Table 16: Fan Switch - 3-Position Toggle, 4 LEDs

Switch Position	Switch Setting	Associated With	LED	Description
1	Manual On	MS/TP banked LEDs	On	Illuminates the On LED when the switch is in position 1 and the associated feedback point is correct. Turns the On LED off when in any other position.
2	Auto		Auto	Illuminates the Auto LED when the switch is in position 2 and the associated feedback point is correct. Turns the Auto LED off when in any other position.
3	Manual Off		Off	Illuminates the Off LED when switch is in position 3 and the associated feedback point is correct. Turns the Off LED off when in any other position.
N/A	N/A	Single LED	Trouble	Flashes at a fast rate when Trouble exists. When acknowledged, flashes at a slower rate. Turns the Trouble LED off when the Zone's Trouble is cleared.

Fan Logic

The Fan main logic is shown in Figure 49. This logic is used for all fan types in all three smoke control application programs. Logic settings are used to program whether the fan is a Supply Fan, Exhaust Fan, Elevator Fan, or Stairwell Pressurization Fan. Additional program settings provide the specifics for each fan type and its use.

The FSCS Supply Fan 1 main logic consists of the fan inputs (Figure 50), Profile block (Figure 51), FSCS block (Figure 53), Trouble block (Figure 58), and the fan outputs that include the Fan Cmd MCO that commands the field controller points.

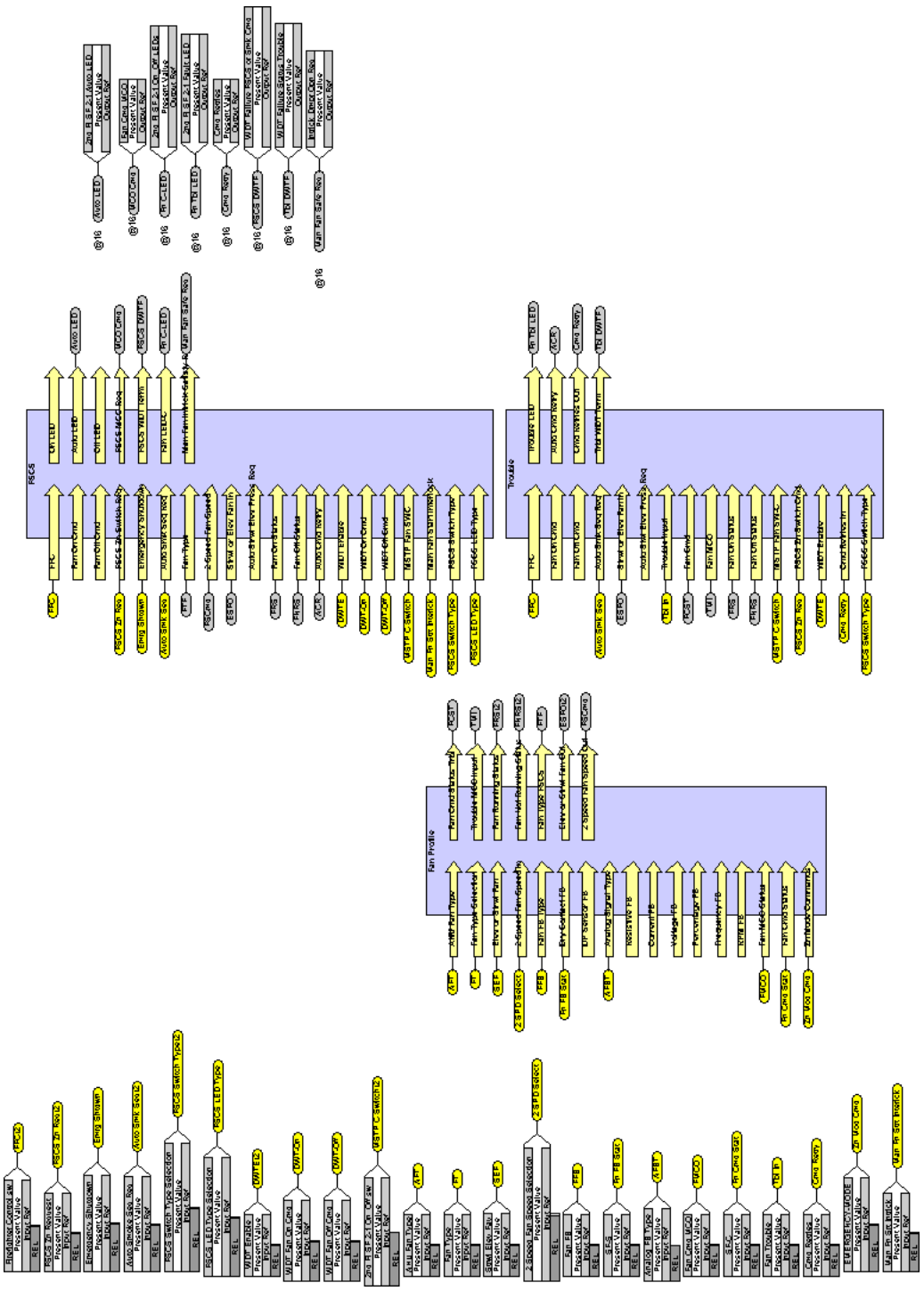

Figure 49: Fan Main Logic

Fan Logic Inputs

Figure 50 shows fan logic inputs for **all** possible fan types, with exceptions noted to the right. For example, selecting an exhaust fan does not display any of the inputs associated with an elevator or stairwell fan.

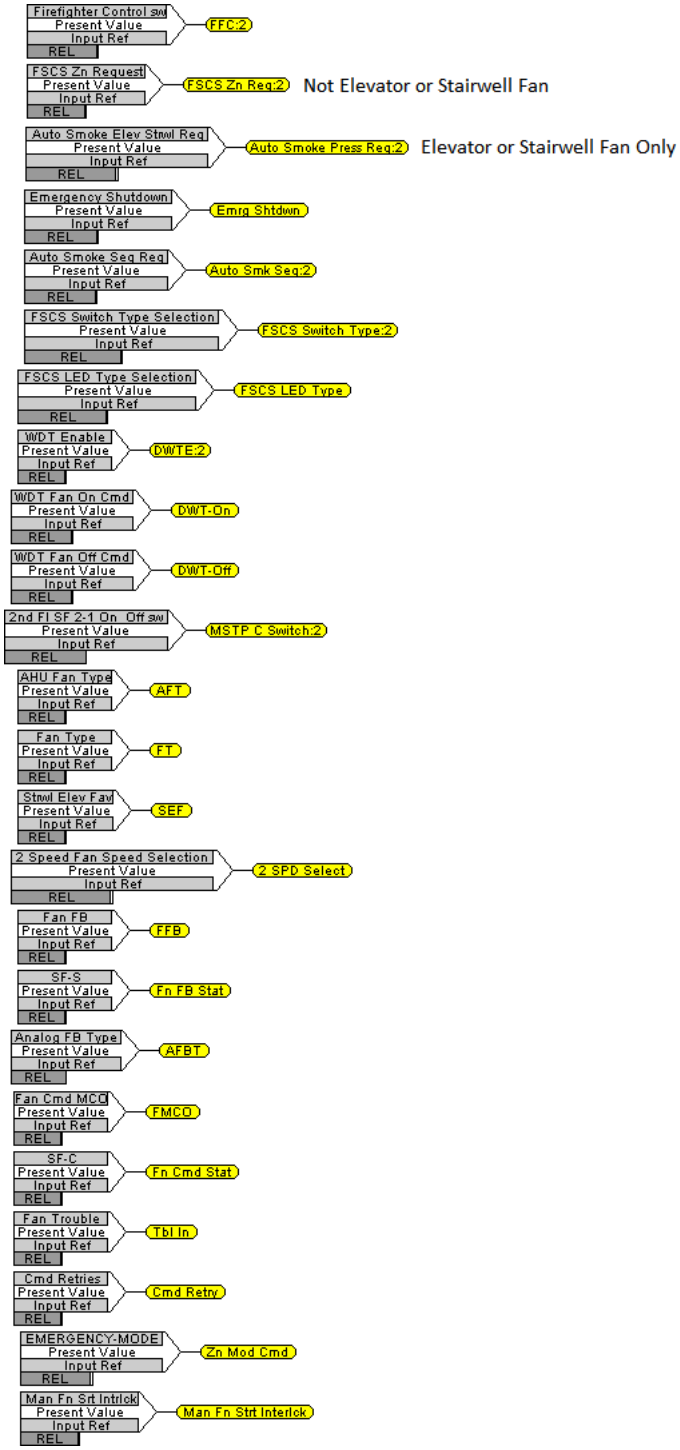

Figure 50: Fan Logic Inputs (Dry Contact Feedback)

Fan Input Connections List

Table 17 shows the Fan's inputs and their control system block connections.

IMPORTANT: Fans that are incorrectly configured prevent proper smoke control sequence operation.

Table 17: Fan Input Connections (Part 1 of 4)

Input Source	All Possible Fan Inputs	Label	Description	Control System Block	Control System Block Input
FSCS Controller	**Firemans Key**	FFC:2	Panel enable keyswitch position **States:** 0 = Auto 1 = Firefighter Control	FSCS	FFC
				Trouble	FFC
Zone Switch Folder	**FSCS Zn Request**	FSCS Zn Req:2	Zone request to control fan **States:** 0 = Normal 1 = Pressurize 2 = De-pressurize 3 = Purge	FSCS	FSCS Zn Switch Req
				Trouble	FSCS Zn Switch Cmd
Zone Switch Folder	**Auto Smoke Elev Strwl Req**	Auto Press Req	Auto smoke pressurization Request (Elev or SW Fan ONLY) **States:** 0 = Normal 1 = Pressurize	FSCS	Auto Strwl Elev Press Req
AHU Emergency Shutdown Control Folder	**Emergency Shutdown**	Emrg Shtdwn	Interlock to do an emergency shutdown of the AHU **States:** 0 = AHU run enable 1 = Emergency AHU shutdown	FSCS	Emergency Shutdown
Zone Switch Folder	**Auto Smoke Seq Req**	Auto Smk Seq:2	Auto smoke control request **States:** 0 = Normal 1 = Pressurize 2 = De-pressurize	FSCS	Auto Smk Seq Req
				Trouble	Auto Smk Seq Req
The main FSCS folder of the NxE physically connected to the FSCS	**FSCS Switch Type Selection**	FSCS Switch Type:2	Sets the FSCS Switch type **Selections:**[1] 0 = Individual Binary Input for each switch position. 1 = MSTP Converted 3 Position Banked Switch (AUTO, ON, OFF) 2 = MSTP Converted 2 Position Banked Switch (OFF, ON)	FSCS	FSCS Switch Type
				Trouble	FSCS Switch Type
The main FSCS folder of the NxE physically connected to the FSCS	**FSCS LED Type Selection**	FSCS LED Type	Sets the FSCS LED type **Selections:**[1] 0 = Individual Outputs for each feedback status of the fan. 1 = MSTP Converted 3 Position LED Bank (AUTO, ON, OFF) 2 = MSTP Converted 2 Position LED Bank (ON, OFF)	FSCS	FSCS LED Type

Table 17: Fan Input Connections (Part 2 of 4)

Input Source	All Possible Fan Inputs	Label	Description	Control System Block	Control System Block Input
Fan WDT Folder	**WDT Enable**	DWTE:2	Enables the Weekly Dedicated Test **States:** 0 = Normal 1 = Test enable	FSCS	WDT Enable
				Trouble	WDT Enable
Fan WDT Folder	**WDT Fan On Cmd**	DWT-On	Logic command to turn the fan On for a Weekly Dedicated Test **States:** 0 = Normal 1 = On	FSCS	WDT On Cmd
Fan WDT Folder	**WDT Fan Off Cmd**	DWT-Off	Logic command to turn the fan Off for a Weekly Dedicated Test **States:** 0 = Normal 1 = Off	FSCS	WDT Off Cmd
FSCS Controller	**Fan Ctrl On Off Switch**	MSTP C Switch:2	FSCS control switch for any fan type (HVAC, elevator, or stairwell) **States:** 0 = Auto 1 = On 2 = Off	FSCS	MSTP Fan SWC
				Trouble	MSTP Fan SW-C
Fan Profile Folder	**AHU Fan Type**	AFT	Selects the AHU fan type **Selections[1]:** 0 = Supply fan 1 = Exhaust fan	Profile	AHU Fan Type
Fan Profile Folder	**Fan Type**	FT	Selects the physical fan type **Selections[1]:** 0 = Constant volume fan 1 = Variable speed fan 2 = 2-Speed fan	Profile	Fan Type Selection
Fan Profile Folder	**Strwl - Elev Fan**	SEF	Selects building fan type **Selections[1]:** 0 = HVAC fan 1 = Elevator fan 2 = Stairwell fan	Profile	Elev or Strwl Fan
Fan Profile Folder	**2 Speed Fan Speed Selection**	2 SPD Select	Selects 2 speed fan speed **Selections[1]:** 0 = Slow 1 = Fast	Profile	2 Speed Fan Speed Selection
Fan Profile Folder	**Fan FB**	FFB	Selects fan feedback type **Selections[1]:** 0 = Dry contact 1 = Analog signal 2 = Differential pressure sensor	Profile	Fan FB Type

Table 17: Fan Input Connections (Part 3 of 4)

Input Source	All Possible Fan Inputs	Label	Description	Control System Block	Control System Block Input
Fan Field Controller	**Fan Status** **SF-S** **RF-S**	Fn FB Stat	Fan command feedback status. State is determined by the physical fan type installed in the field. **Feedback Options:** Dry contact DP sensor Resistive Current Voltage Percentage Frequency RPM	Profile	**Input Options:** Dry Contact FB DP sensor FB Resistive FB Current FB Voltage FB Percentage FB Frequency FB RPM FB
Fan Profile Folder	**Analog FB Type**	AFBT	Analog feedback type **Selections[1]:** 0 = R (Resistance) 1 = I (Current) 2 = V (Volts) 3 = % (Percentage) 4 = Freq (Frequency) 5 = RPM	Profile	Analog Signal Type
Fan FSCS Folder	**Fan Cmd MCO**	FMCO	State of the logic fan start/stop point in the NxE **States:** 0 = Auto 1 = On (Constant Volume) 2 = Off (CV or 2-Speed) 3 = VFD 100% 4 = VFD 0% 5 = Emergency Shutdown 6 = Pressurize (Zone Switch) 7 = De-pressurize (Zone Switch) 8 = Purge (Zone Switch) 9 = Pressurize (Auto Smoke Sequence) 10 = De-pressurize (Auto Smoke Sequence) 11 = 2 Speed Fan - Slow 12 = 2 Speed Fan - Fast 13 = WDT Fan On 14 = WDT Fan Off	Profile	Fan MCO Status

Table 17: Fan Input Connections (Part 4 of 4)

Input Source	All Possible Fan Inputs	Label	Description	Control System Block	Control System Block Input
Fan Field Controller	**Fan Command SF-C RF-C**	Fn Cmd Stat	State of the fan start/stop point in the field controller. State is determined by the physical fan type installed in the field.	Profile	Fan Cmd Status
Fan Trouble Folder	**Fan Trouble**	Tbl In	Fan trouble condition met **States:** 0 = Normal 1 = Trouble condition	Trouble	Trouble Input
Fan Trouble Folder	**CMD Retries**	Cmd Retry	Accumulator for the number of command retries. Value clears when the command is satisfied or the condition requiring the command is no longer active.	Trouble	Cmd Retries In
Fan Field Controller	**Emergency Mode**	Zn Mode Cmd	Emergency HVAC command point inside the controller **States:** 0 = Normal 1 = Pressurize 2 = De-pressurize 3 = Purge 4 = Shutdown	Profile	Zn Mod Cmd
Fan FSCS Folder	**Man Fn St Intrlck**	Man Fn Strt Interlck	Any safety condition that either prevents the fan from starting or stops continuous fan operation. **States:** 0 = Fan start disabled 1 = Fan start enabled	FSCS	Man Fan Start Interlock1

1. All Selections must be configured during the initial fan programming. Set the point's default value to the same value as the desired setup value to ensure the selection is maintained in the event of an NxE restart. Archive and upload the NxE database to the SCT database to save all changes for the fan configuration to prevent overwriting desired values on a download to the NxE.

Fan Profile Block

Figure 51 shows the Fan Profile block with its inputs and outputs.

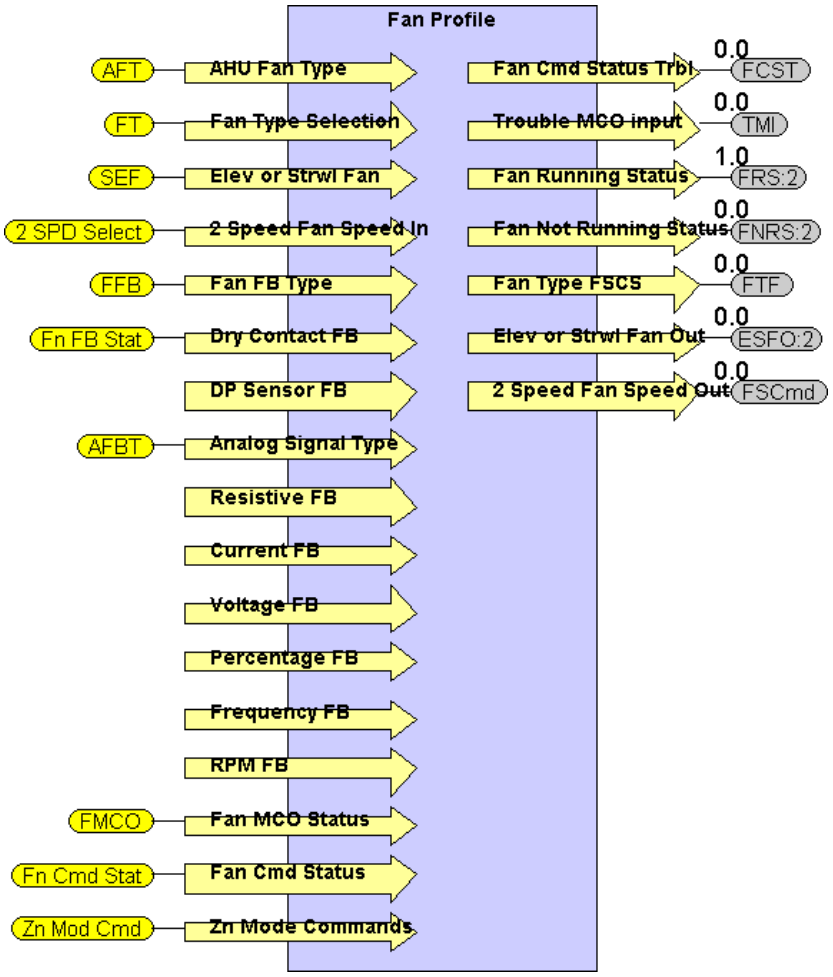

Figure 51: Fan Profile Block

Fan Profile Block Inputs

Table 18: Fan Profile Block Inputs (Part 1 of 2)

Fan Inputs	Label	Description
AHU Fan Type	AFT	Sets AHU Fan Type from the Fan Profile folder's **AHU Fan Type** point 0 = N/A 1 = Supply Fan (Default) 2 = Exhaust Fan
Fan Type Selection	FT	Sets the physical Fan Type from the Fan Profile folder's **Fan Type** point 0 = Constant Volume 1 = 2 Speed 2 = Variable Speed Drive
Elev or Strwl Fan	SEF	Sets the Fan, from the Fan Profile folder's **Strwl Elev Fan** point, as either an Elevator Fan or a Stairwell Fan 0 = N/A (Default) Fan is neither Elevator or Stairwell Pressurization Fan 1 = Elevator Fan 2 = Stairwell Fan
2 Speed Fan Speed In	2 SPD Select	Sets the speed of a 2 Speed Fan from the Fan Profile folder's **2 Speed Fan Speed Selection** point, for a smoke event 0 = Slow Speed 1 = Fast Speed
Fan FB Type	FFB	Sets the Fan Feedback Type from the Fan Profile folder's **Fan FB** point 0 = Dry Contact 1 = Analog Signal 2 = DP Sensor
Dry Contact FB	Fn FB Stat	Status of the fan field controller's feedback point Fan Feedback Input active when **Fan FB Type** is set to Dry Contact 0 = Dry Contact (Default) CT Dry Contact, Aux Contact on Motor Starter, Flow Switch, DP Switch
DP Sensor FB	Fn FB Stat	Status of the fan field controller's feedback point Fan Feedback Input active when Fan FB is set to Differential Pressure 2 = Differential Pressure Switch **Note:** To change the On setpoint of the DP signal, change the constant for that signal input.
Analog Signal Type	AFBT	Fan Feedback Input active when **Fan FB** is set to Analog Signal 1 = Analog Feedback Sets Analog Signal Input Type when **Fan FB** is set to Analog Signal
Resistive FB	Fn FB Stat	Status of the fan field controller's feedback point Analog Signal Input - 0 = Resistive Feedback (Default) - Based on 0 to 135 ohm, nominal
Current FB	Fn FB Stat	Status of the fan field controller's feedback point Analog Signal Input - 1 = Current Feedback - Based on 4 to 20 mA, nominal
Voltage FB	Fn FB Stat	Status of the fan field controller's feedback point Analog Signal Input - 2 = Voltage Feedback - Based on 0 to 10 Volts, nominal
Percentage FB	Fn FB Stat	Status of the fan field controller's feedback point Analog Signal Input - 3 = Percentage Feedback - Based on 0 to 100%
Frequency FB	Fn FB Stat	Status of the fan field controller's feedback point Analog Signal Input - 4 = Frequency Feedback - Based on 0 to 60 Hz
RPM FB	Fn FB Stat	Status of the fan field controller's feedback point Analog Signal Input - 5 = RPM Feedback - Based on motor name plate data 3,600 RPM maximum

Table 18: Fan Profile Block Inputs (Part 2 of 2)

Fan Inputs	Label	Description
Fan MCO Status	FMCO	Fan MCO command from the Fan FSCS folder's **Fan MCO** point to field controller's fan point 0 = Auto 1 = On CV 2 = Off - CV or 2 Speed 3 = VFD 100% 4 = VFD 0% 5 = Emergency Shutdown 6 = Pressurize (Zone Switch) 7 = De-pressurize (Zone Switch) 8 = Purge (Zone Switch) 9 = Pressurize (Auto Smoke Seq) 10 = De-Pressurize (Auto Smoke Seq) 11 = 2 Speed Fan Slow 12 = 2 Speed Fan Fast 13 = WDT Fan On 14 = WDT Fan Off
Fan Cmd Status	Fn Cmd Stat	Status of the Fan field controller's command point
Zn Mode Commands	Zn Mod Cmd	Emergency HVAC command point of the fan field controller **States:** 0 = Normal 1 = Pressurize 2 = De-pressurize 3 = Purge 4 = Shutdown

Fan Profile Block Outputs

Table 19 shows the outputs for the Fan Profile block.

Table 19: Fan Profile Block Outputs

Fan Outputs	Label	Description	Control System Block	Control System Block Input
Fan Cmd Status Trbl	FCST	Decoded status of the fan command point in the field controller	Trouble	Fan Cmd
Trouble MCO Input	TMI	Decoded status of the Fan FSCS folder's **Fan MCO** point	Trouble	Fan MCO
Fan Running Status	FRS:2	Decoded status - True when the fan is running	FSCS	Fan On Status
			Trouble	
Fan Not Running Status	FNRS:2	Decoded status - True when the fan is not running	FSCS	Fan Off Status
			Trouble	
Fan Type FSCS	FTF	Selected value of the **Fan Type** input	Trouble	Fan Type
Elev or Strwl Fan Out	ESFO:2	Selected value of the **Strwl - Elev Fan** input	FSCS	Strwl or Elev Fan In
			Trouble	
2 Speed Fan Speed Out	FSCmd	Selected value of the **2 Speed Fan Speed Selection** input	FSCS	2 Speed Fan Speed

Fan Profile Block Logic

Figure 52 shows the Fan's Profile Block logic.

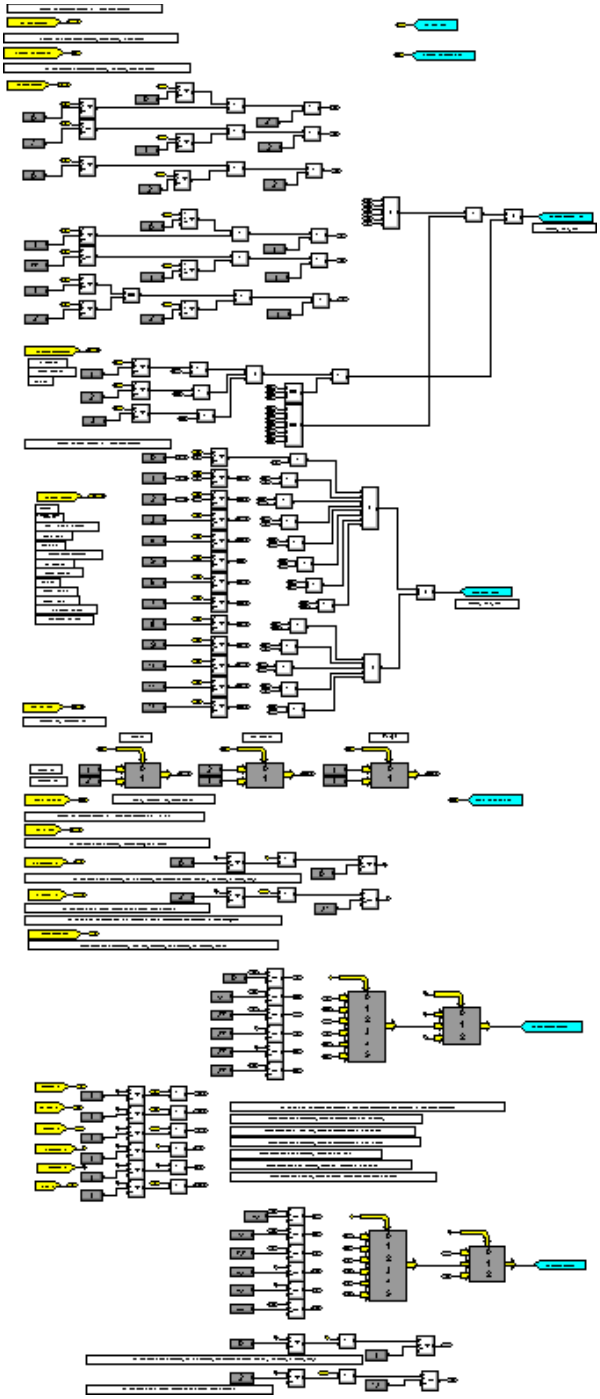

Figure 52: Fan Profile Block Logic

Fan FSCS Block

The Fan's FSCS control block controls the LEDs on the FSCS panel and commands the field controller (Figure 53).

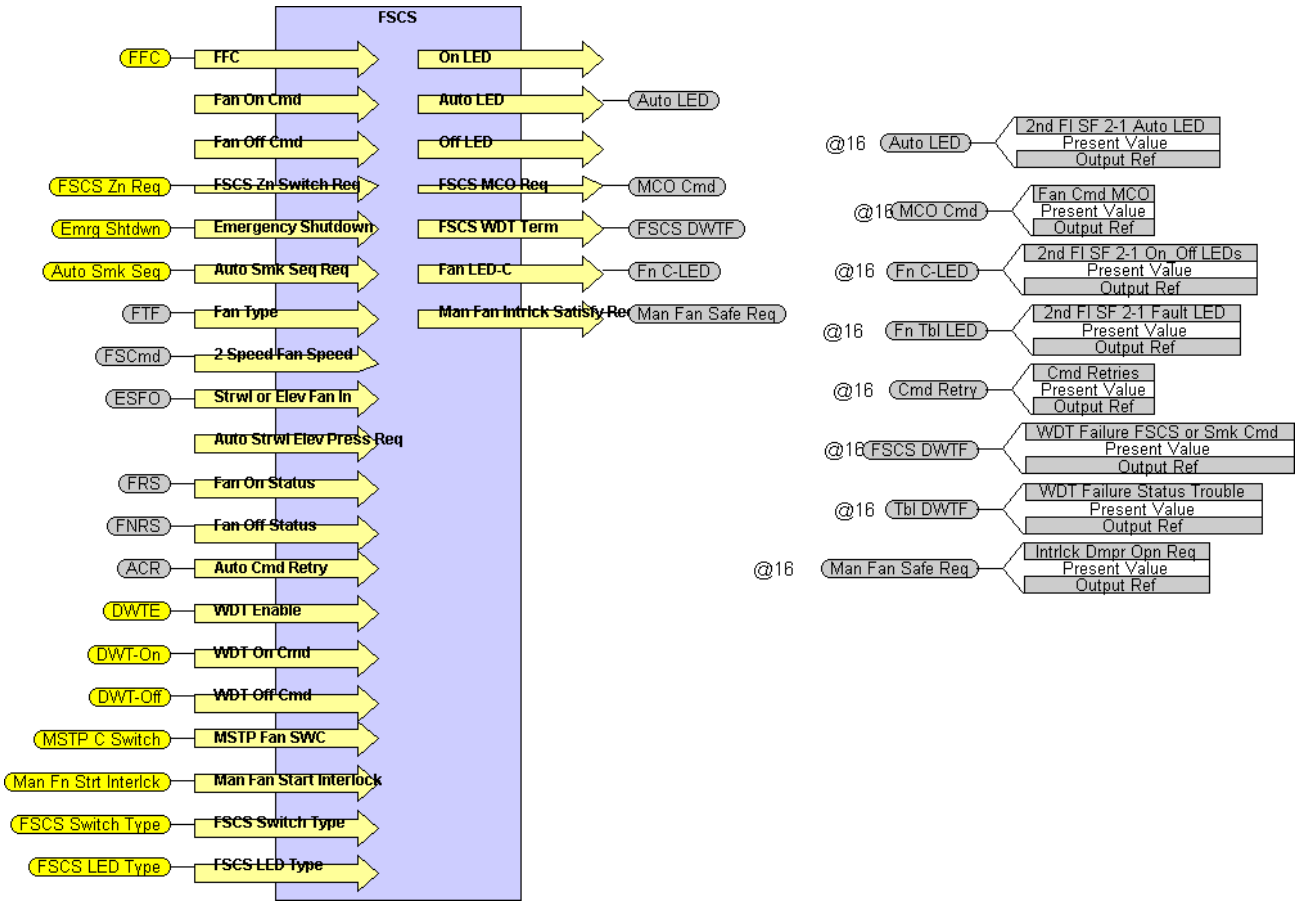

Figure 53: FSCS Control Block

The FSCS block logic is shown in Figure 54.

- The Fan On LED is turned on only if the FSCS is in Firefighter Control and the fan is on.
- The Fan Off LED is turned on only if the FSCS is in Firefighter Control and the fan is off.
- The Fan Auto LED is turned on only if the toggle switch is not in the On or Off setting.
- If the Firefighter Control Key is off, the FSCS Request is set to 0.

- If the Firefighter Control Key is on, the FSCS Request is set to the Table 20 values depending on the position of the Fan's toggle switch.

Table 20: Fan Toggle Switch FSCS Request Value

FSCS Fan Toggle Switch Position	FSCS Request State Value	Smoke Control Action
On	1	Depressurize
Auto	0	Auto
Off	2	Exhaust Fan Off

Fan FSCS Block Inputs

Table 21 shows the Fan's FSCS Block Inputs.

Table 21: Fan's FSCS Block Inputs (Part 1 of 2)

Inputs	Label	Description
FFC	FFC	Status of the FSCS MS/TP field controller's **Firemans Key** point
Fan On Cmd	FanOnCmd	This input is active when **FSCS Switch Type Selection** is set to **selection 0.** The Actual status of the Fan FSCS binary input for the On Command.
Fan Off Cmd	FanOffCmd	This input is active when **FSCS Switch Type Selection** is set to **selection 0.** The Actual status of the Fan FSCS binary input for the Off Command.
FSCS Zn Switch Req	FSCS Zn Req	Status of the FSCS Zone Switch folder's **FSCS Zn Request** point
Emergency Shutdown	Emerg Shtdwn	Status of the AHU Emergency Shutdown Control folder's **Emergency Shutdown** point
Auto Smk Seq Req	Auto Smk Seq	Status of the FSCS Zone Switch folder's **Auto Smoke Seq Req** point
Fan Type	FTF	Status of the Fan Profile Block's output - **Fan Type FSCS**
2 Speed Fan Speed	FSCmd	Status of the Fan Profile Block's output - **2 Speed Fan Speed Out**
Strwl or Elev Fan In	ESFO	Status of the Fan Profile Block's output - **Elev or Strwl Fan Out**
Auto Strwl Elev Press Req	Auto Smoke Press Req	Status of the FSCS Zone Switch folder's **Auto Smoke Elev Strwl Req** point
Fan On Status	FRS	Status of the Fan Profile Block's output - **Fan Running Status**
Fan Off Status	FNRS	Status of the Fan Profile Block's output - **Fan Not Running Status**
Auto Cmd Retry	ACR	Status of the Fan Trouble Block's output - **Auto Cmd Retry**
WDT Enable	DWTE	Status of the Fan WDT folder's **WDT Enable** point
WDT On Cmd	DWT-On	Status of the Fan WDT folder's **WDT Fan On Cmd** point

Table 21: Fan's FSCS Block Inputs (Part 2 of 2)

Inputs	Label	Description
WDT Off Cmd	DWT-Off	Status of the WDT folder's **WDT Fan Off Cmd** point
MSTP Fan SWC	MSTP C Switch	This input is active when **FSCS Switch Type Selection** is set to **selection 1 or 2.** Actual Status of the Fan FSCS MS/TP **Fan Control Switch** point. This can be a 3-position switch **(selection 1)** (Auto, On, Off) or a 2-position switch **(selection 2)** (On, Off).
Man Fan Start Interlock	Man Fn Strt Interlck	Status of the Fan FSCS folder's **Man Fn Str Intrlck** input point
FSCS Switch Type	FSCS Switch Type	Status of the FSCS folder's **FSCS Switch Type Selection** point
FSCS LED Type	FSCS LED Type	Status of the FSCS folder's **FSCS LED Type Selection** point

Fan FSCS Block Outputs

Table 22 shows the Fan's FSCS Block Outputs

Table 22: Fan's FSCS Block Outputs (Part 1 of 2)

Outputs	Label	Description	Output
On LED	(Future)	N/A	N/A
Auto LED	(Future)	N/A	N/A
Off LED	(Future)	N/A	N/A
FSCS MCO Req	MCO Cmd	Fan MCO command to field controller 0 = Auto 1 = On (Constant Volume) 2 = Off (Constant Volume) 3 = 100% - VFD Controlled Fan 4 = 0% - VFD Controlled Fan 5 = Emergency Shutdown - HVAC Emergency Command to Pressurize 6 = Pressurize - HVAC Emergency Command to Pressurize 7 = Pressurize - HVAC Emergency Command to De-Pressurize 8 = Purge - HVAC Emergency Command to Purge 9 = Pressurize (Auto Smoke Seq) 10 = De-pressurize (Auto Smoke Seq) 11 = Slow - 2 Speed Fan 12 = Fast - 2 Speed Fan 13 = WDT Fan On - Dedicated Weekly Test Fan On 14 = WDT Fan Off - Dedicated Weekly Test Fan Off	Commanded value of the Fan FSCS folder's **Fan Cmd MCO** point
FSCS WDT Term	FSCS DWDTF	Terminate the Weekly Dedicated Test **States:** 0 = No termination condition 1 = Condition met to terminate test	Commanded value of the Fan WDT folder's **WDT Failure FSCS or Smk Cmd** point
Fan LED-C	Fn C-LED	FSCS LED indication for the fan **States:** 0 = On 1 = Off	Commanded value of the Fan FSCS MS/TP field controller's **Fan Banked LED Indicator** point

Table 22: Fan's FSCS Block Outputs (Part 2 of 2)

Outputs	Label	Description	Output
Man Fan Intrlck Satisfy Req	Man Fn Safe Seq	Request to open the required damper(s) before the fan can start **States:** 0 = No request 1 = Request interlocked damper(s) to open	Commanded value of the Fan FSCS folder's **Intrlck Dmpr Opn Req** point

Fan FSCS Block Logic

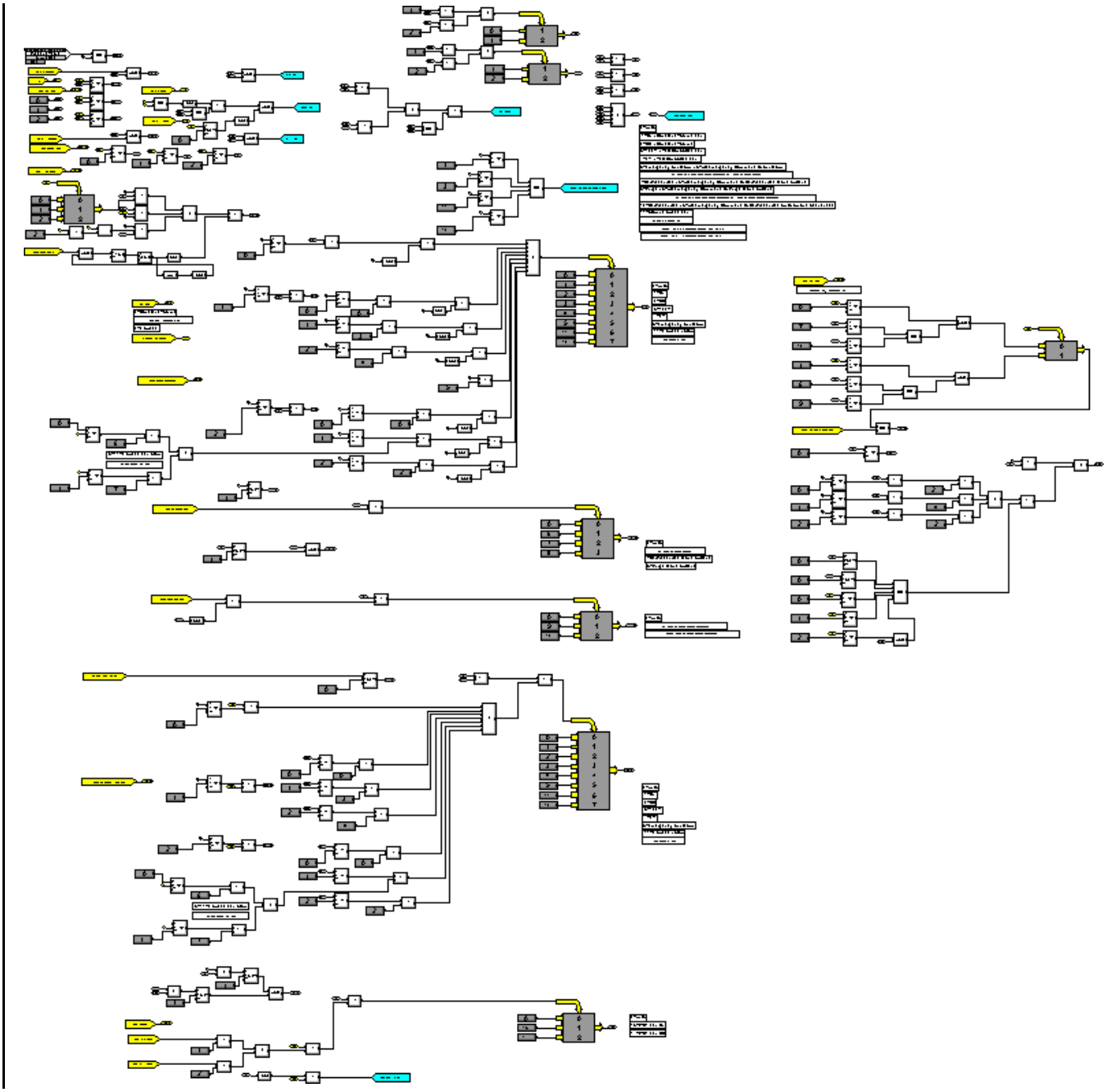

Figure 54: Fan FSCS Block Logic

Fan FSCS MCO

From the Fan Cmd MCO Action Table (Figure 55), program the command states (Table 23) to match your field equipment. Leave blank any states that are not applicable. All 13 states must remain, even though some states remain blank.

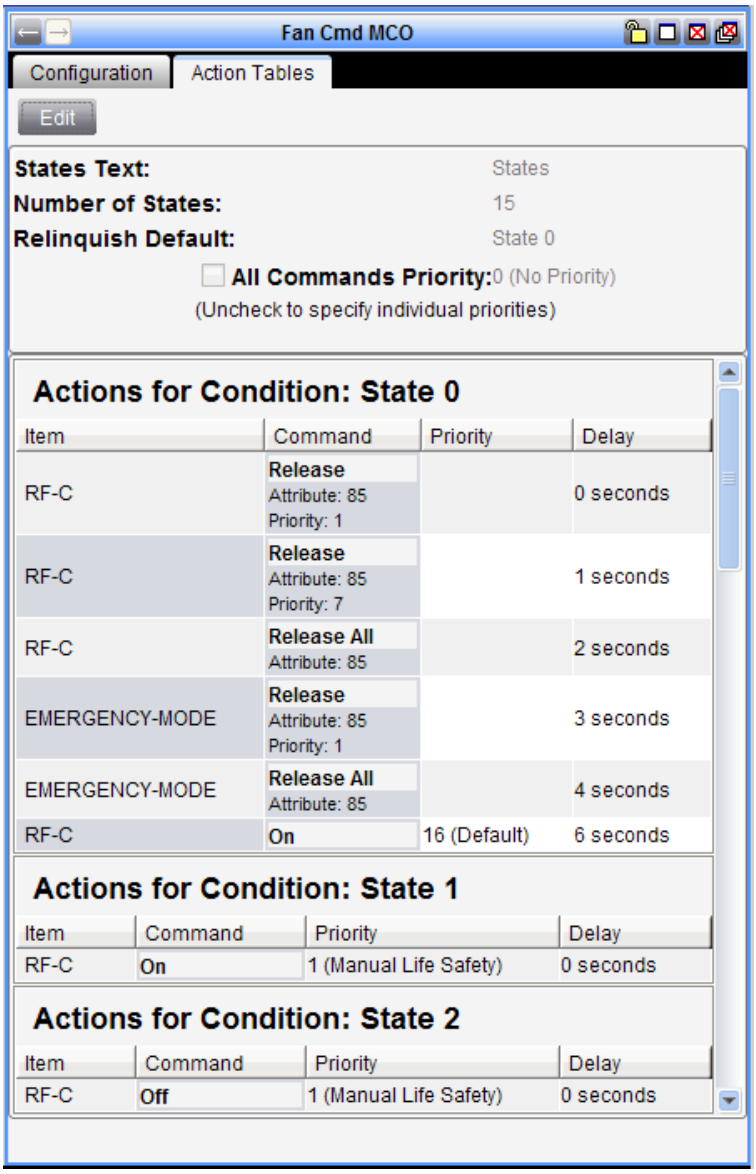

Figure 55: Fan MCO Action Table

Table 23: Fan Commands

State	Description	State Fan Type
0	Auto command of the fan point	All fan types
1	On command of the fan point	Constant Volume
2	Off command of the fan point	Constant Volume or 2-Speed
3	100% command of the fan point	Variable Frequency Drive
4	0% command of the fan point	Variable Frequency Drive
5	Shutdown state of the controller's HVAC Emergency point	All fan types
6	Pressurize state of the controller's HVAC Emergency point	All fan types
7	De-Pressurize state of the controller's HVAC Emergency point	All fan types
8	Purge state of the controller's HVAC Emergency point	All fan types
9	Fan On command of the fan point (Weekly Dedicated Test)	All fan types
10	Fan Off command of the fan point (Weekly Dedicated Test)	All fan types
11	Slow command of the fan point	2-Speed
12	Fast command of the fan point	2-Speed

Fan FSCS Interlock Damper Open Request

Figure 56 shows the Fan's FSCS Interlock Damper Open Request screen. This screen commands the damper open before the fan is allowed to start. In the event the damper fails to open, the fan start fails and the Trouble LED for the fan illuminates.

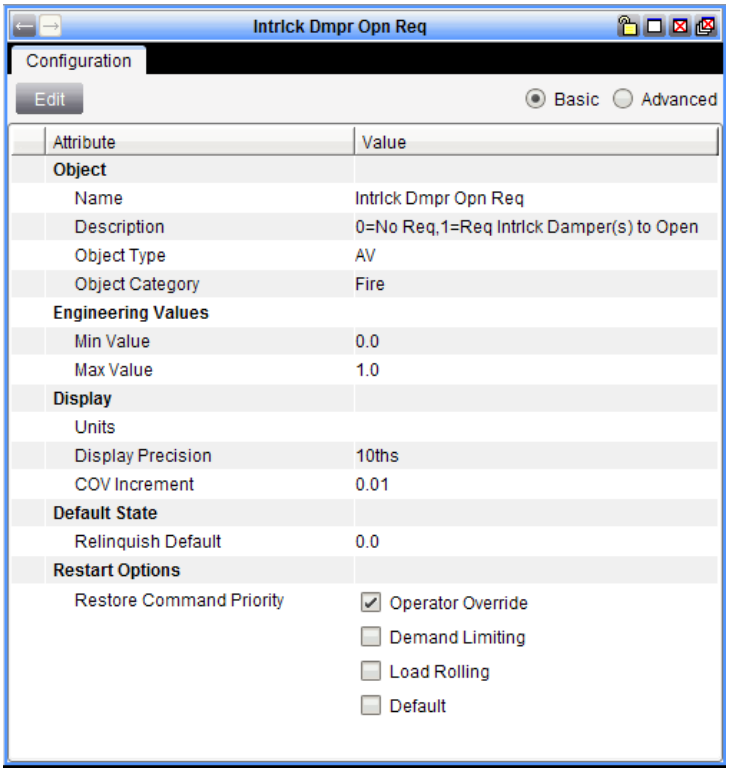

Figure 56: Fan FSCS Interlock Damper Open Request

Manual Fan Start Interlock Definition

Figure 57 shows the Manual Fan Start Interlock Definition. This interlock is the status value of the damper used in the Interlock Damper Open Request (Figure 56).

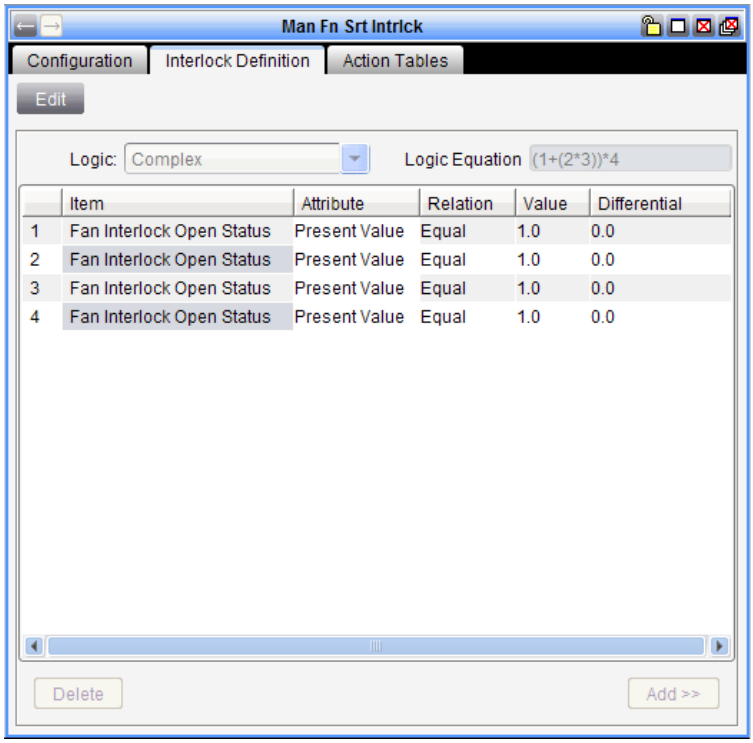

Figure 57: Fan FSCS Manual Fan Start Interlock

Fan Trouble Block

The Fan Trouble Control block is shown in Figure 58. The Fan Trouble Control block sets the FSCS fan Trouble LED.

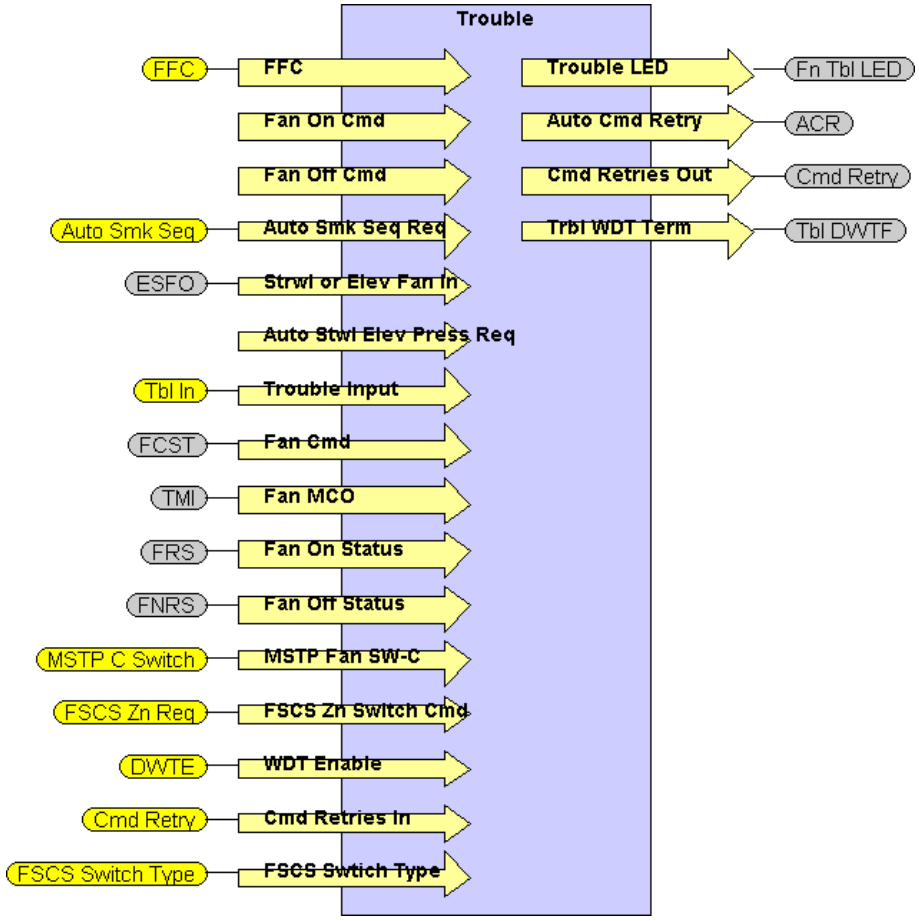

Figure 58: Fan Trouble Block

Fan Trouble Block Inputs

Table 24 shows the inputs for the Fan Trouble block.

Table 24: Fan Trouble Block Inputs (Part 1 of 2)

Fan Inputs	Label	Description
FFC	FFC	Status of the FSCS MS/TP field controller's **Firemans Key**
Fan On Cmd	FanOnCmd	This input is active when **FSCS Switch Type Selection** is set to **selection 0.** The Actual status of the Fan FSCS binary input for the On Command.
Fan Off Cmd	FanOffCmd	This input is active when **FSCS Switch Type Selection** is set to **selection 0.** The Actual status of the Fan FSCS binary input for the Off Command.
Auto Smk Seq Req	Auto Smk Seq	Status of the FSCS Zone Switch folder's **Auto Smoke Seq Req** point
Strwl or Elev Fan In	ESFO	Status of the Fan Profile block's output - **Elev or Strwl Fan Out**
Auto Strwl Elev Press Req	Auto Smoke Press Req	Status of the FSCS Zone Switch folder's **Auto Smoke Elev Strwl Req** point
Trouble Input	Tbl In	Status of the Fan Trouble block's **Fan Trouble** point

Table 24: Fan Trouble Block Inputs (Part 2 of 2)

Fan Inputs	Label	Description
Fan Cmd	FCST	Status of the Fan Profile block's output - **Fan Cmd Status Trbl**
Fan MCO	TMI	Status of the Fan Profile block's output - **Trouble MCO Input**
Fan On Status	FRS	Status of the Fan Profile block's output - **Fan Running Status**
Fan Off Status	FNRS	Status of the Fan Profile block's output - **Fan Not Running Status**
MSTP Fan SW-C	MSTP C Switch	This input is active when **FSCS Switch Type Selection** is set to **selection 1 or 2**. Actual Status of the Fan FSCS MS/TP **Fan Control Switch** point. This can be a 3-position switch **(selection 1)** (Auto, On, Off) or a 2-position switch **(selection 2)** (On, Off).
FSCS Zn Switch Cmd	FSCS Zn Req	Status of the FSCS Zone Switch folder's **FSCS Zn Request** point
WDT Enable	DWTE	Status of the Fan WDT folder's **WDT Enable** point
Cmd Retries In	Cmd Retry	Status of the Fan Trouble folder's **CMD Retries** point
FSCS Switch Type	FSCS Switch Type	Status of the FSCS folder's **FSCS Switch Type Selection** point

Fan Trouble Block Outputs

Table 25 shows the Fan's Trouble Block's Outputs.

Table 25: Fan's Trouble Block Outputs

Outputs	Label	Description	Output
Trouble LED	Fn Tbl LED	FSCS's Trouble LED indication for the fan **States:** 0 = Off 1 = On 2 = Slow blink 3 = Fast blink	Commanded value of the Fan FSCS MS/TP field controller's **Fan Trouble LED Indicator** point
Auto Cmd Retry	ACR	When a fan command fails, this retries the command until the command succeeds or the condition that required the command is no longer active.	Commanded value of the Fan Trouble block's output - **Auto Cmd Retry**
Cmd Retries Out	Cmd Retry	Increments the value of the Accumulator for the number of command retries. Value clears when the command is satisfied or the condition requiring the command is no longer active.	Increments the value of the Fan Trouble folder's **Cmd Retries** point
Trbl WDT Term	Tbl DWTF	Terminate the Weekly Dedicated Test **States:** 0 = No termination condition 1 = Condition met to terminate test	Commanded value of the Fan WDT folder's **WDT Failure Status Trouble** point

Fan Trouble Block Logic

The Fan Trouble Control block logic is shown in Figure 59. The Trouble LED is turned on if the fan is in smoke control and the fan has not reached its desired setpoint within 60 seconds. A fan is in smoke control if either the field controller is in pressurize or depressurize mode, or the Firefighter Control Key is on and the FSCS toggle switch is set to On or Off. If a fan does not reach its commanded state and goes into Trouble, the Auto Retry Command logic retries the command every 60 seconds.

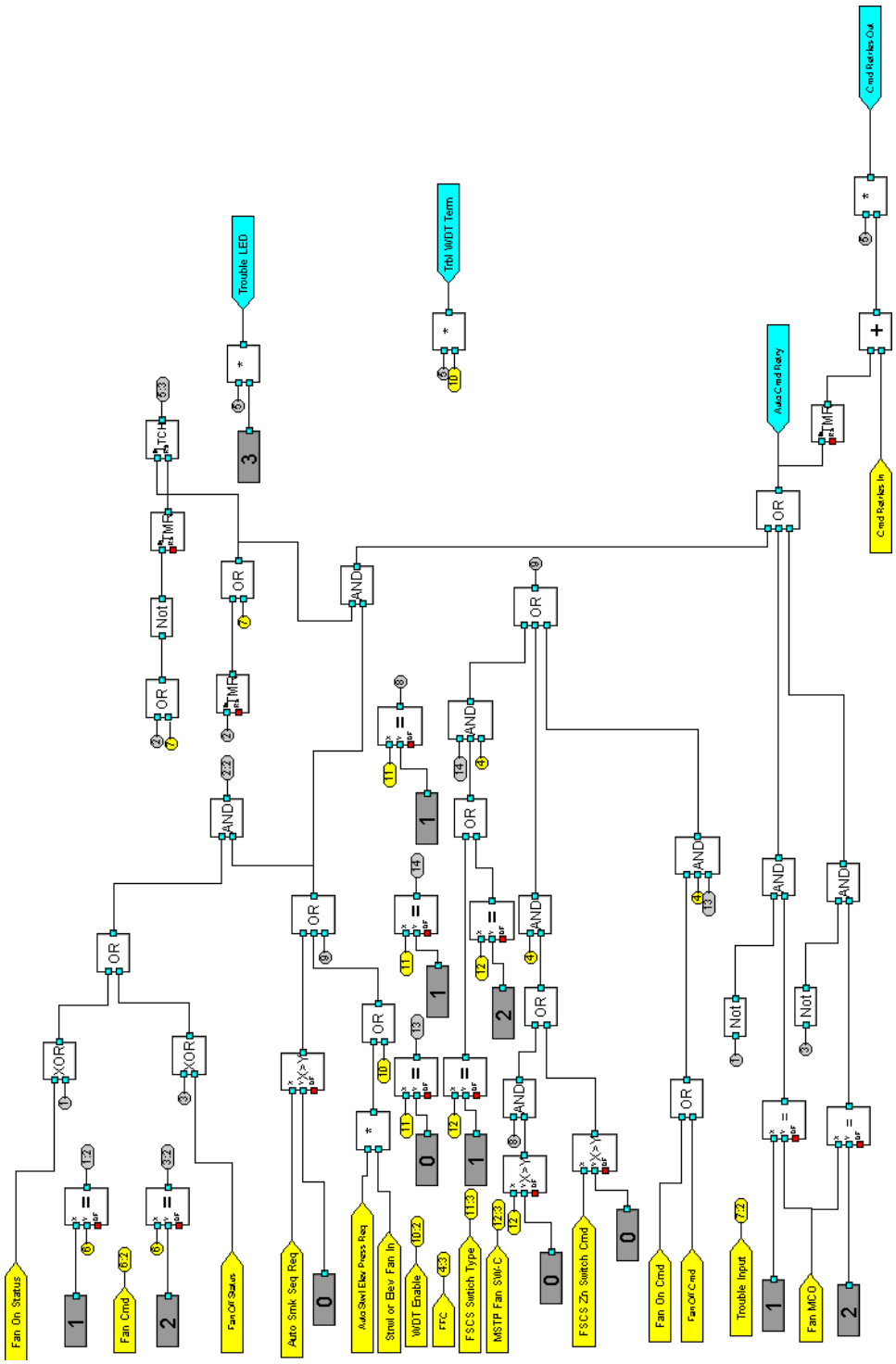

Figure 59: Fan Trouble Block Logic

The Fan Trouble Interlock Definition sets the values that, when reached, trigger an FSCS fan trouble alarm (Figure 60). The definition includes fan reliability and field controller offline status.

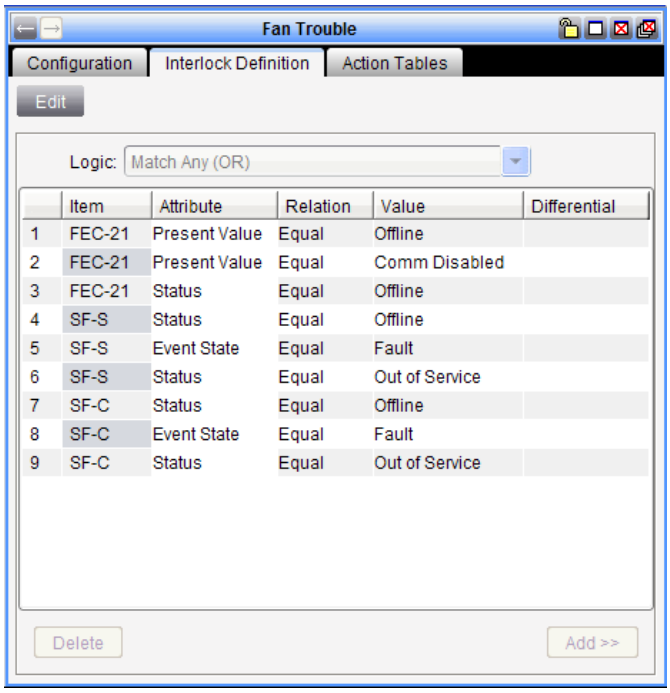

Figure 60: Fan Trouble Interlock Definition

Fan Outputs

Table 26 shows the Fan's outputs and their control system block connections.

Table 26: Fan Output Connections (Part 1 of 2)

Control System Block	Control System Block Output	All Possible Fan Outputs	Label	Description	Output Destination
FSCS	Fan Auto LED	**Fan Auto LED (can be indicator for any fan)**	Auto LED	FSCS Auto LED indication for the fan **States:** 0 = Off 1 = On	Commanded value of the Fan FSCS MS/TP field controller's **Fan Auto LED Indicator** point
FSCS	FSCS MCO Req	**Fan Cmd MCO**	MCO Cmd	Fan MCO command to field controller **States:** 0 = Auto 1 = On CV 2 = Off - CV or 2 Speed 3 = VFD 100% 4 = VFD 0% 5 = Emergency Shutdown 6 = Pressurize 7 = De-pressurize 8 = Purge 9 = Pressurize (Auto Smoke Seq) 10 = De-pressurize (Auto Smoke Seq) 11 = 2 Speed Fan Slow 12 = 2 Speed Fan Fast 13 = WDT Fan On 14 = WDT Fan Off	Commanded value of the Fan FSCS folder's **Fan Cmd MCO** point
FSCS	Fan On Off LEDs	**Fan On Off LED**	Fn C-LED	FSCS LED indication for the fan **States:** 0 = On 1 = Off	Commanded value of the Fan FSCS MS/TP field controller's **Fan Banked LED Indicator** point
Trouble	Fan Fault LEDs	**Fan Fault LED**	Fn Tbl LED	Fan Trouble condition met **States:** 0 = Off 1 = On (Not used) 2 = Slow flash (acknowledged) 3 = Fast flash (Unacknowledged)	Commanded value of the Fan FSCS MS/TP field controller's **Fan Trouble LED Indicator** point
Trouble	Cmd Retries Out	**Cmd Retries**	Cmd Retry	Accumulator for the number of command retries. Value clears when the command is satisfied or the condition requiring the command is no longer active.	Commanded value of the Fan Trouble folder's **Cmd Retries** point

Table 26: Fan Output Connections (Part 2 of 2)

Control System Block	Control System Block Output	All Possible Fan Outputs	Label	Description	Output Destination
FSCS	FSCS WDT Term	**WDT failure FSCS or Smk Cmd**	FSCS DWTF	WDT termination condition met. FSCS manual command or a smoke event occurring during the Weekly Test **States:** 0 = Normal 1 = Termination	Commanded value of the Fan WDT folder's **WDT Failure FSCS or Smoke** point
Trouble	**Trbl WDT Term**	**WDT Failure Status Trouble**	Tbl DWTF	WDT termination condition met. Command does not match status during the Weekly Test **States:** 0 = Normal 1 = Termination	Commanded value of the Fan WDT folder's **WDT Failure Status Trouble** point
FSCS	**Man Fan Intrlck Satisfy Req**	**Intrlck Dmpr Opn Req**	Man Fn Safe Req	Interlocked damper open request prior to starting the fan. Damper must reach its Open setpoint before the fan can start. **States:** 0 = Normal 1 = Damper Open request	Commanded value of the Fan FSCS folder's **Intrlck Dmpr Opn Req** point

Weekly Dedicated Fan Test Timing

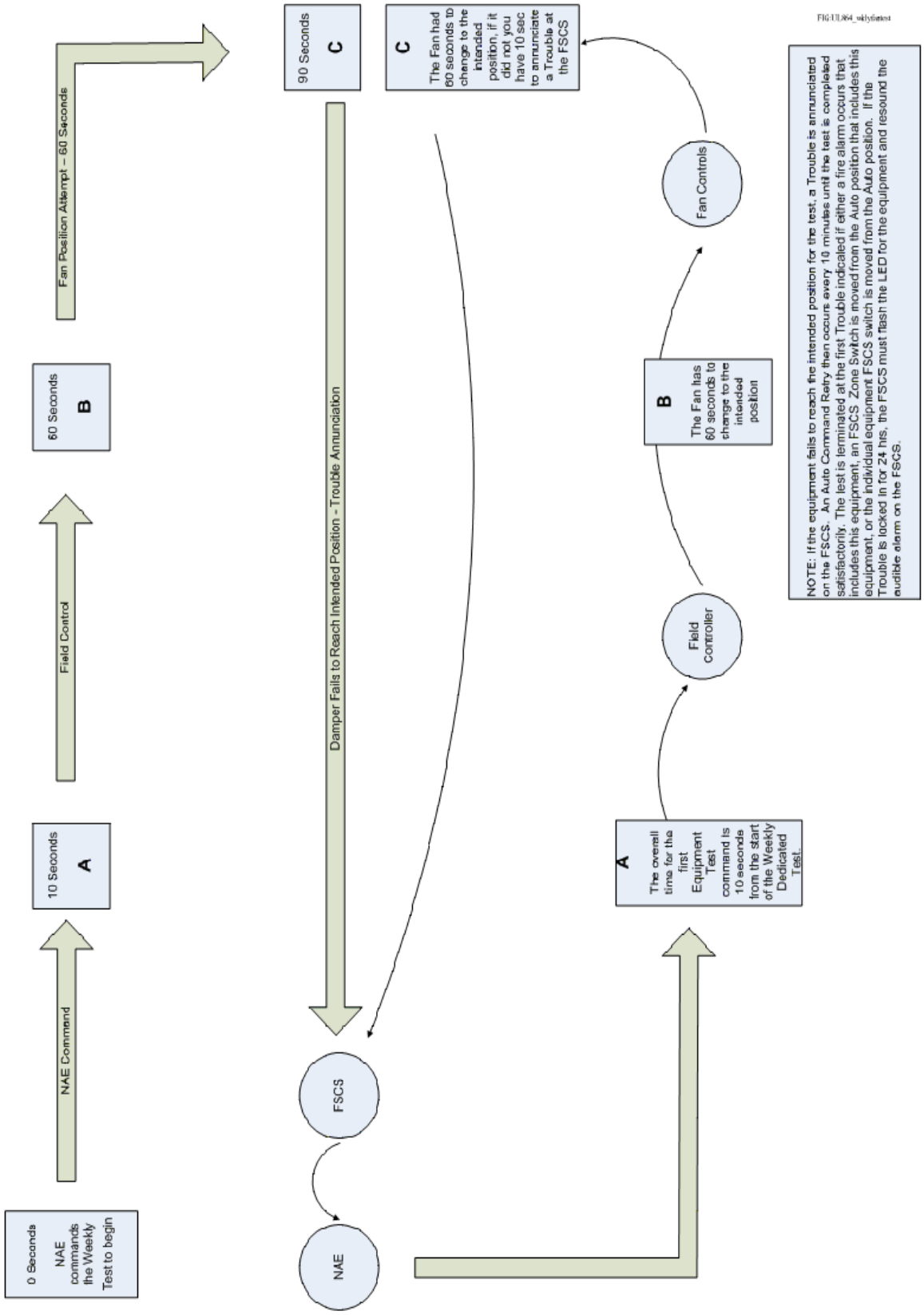

Figure 61: Weekly Dedicated Fan Test Timing

WDT Test Sequence Interlock

The WDT Test Sequence Interlock Definition (Figure 62) is used to define the point that enables the weekly dedicated fan test.

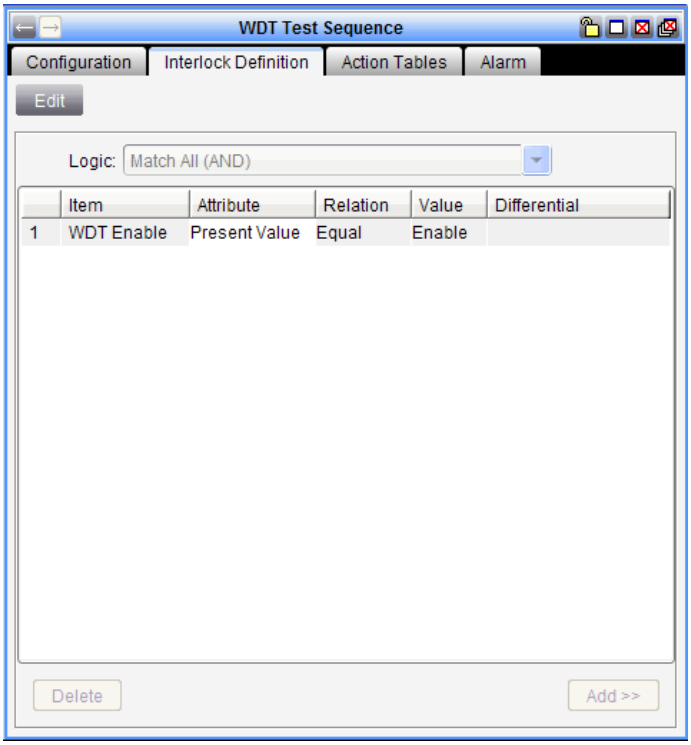

Figure 62: WDT Test Sequence Interlock Definition Screen

WDT Test Sequence Action Table

The WDT Test Sequence Action Table issues commands to carry out the test (Figure 63). Delays are included to allow the equipment to reach its commanded position or terminate the test and annunciate a Trouble. Do not alter the delay times.

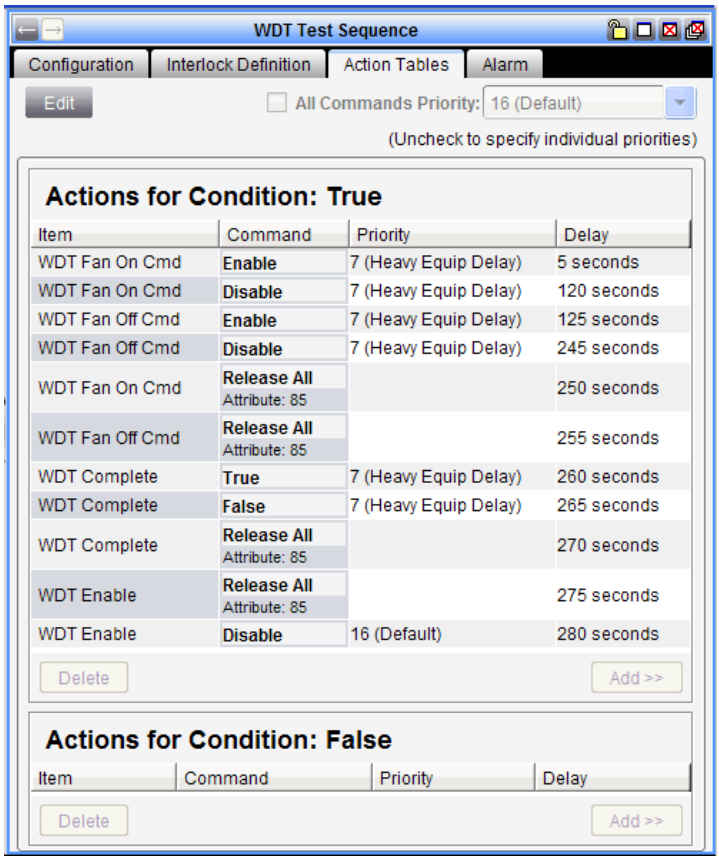

Figure 63: WDT Test Sequence Action Table Screen

WDT Test Sequence Alarm Tab

The WDT Test Sequence Alarm tab shows the Alarm Message Text that displays when the test begins (Figure 64).

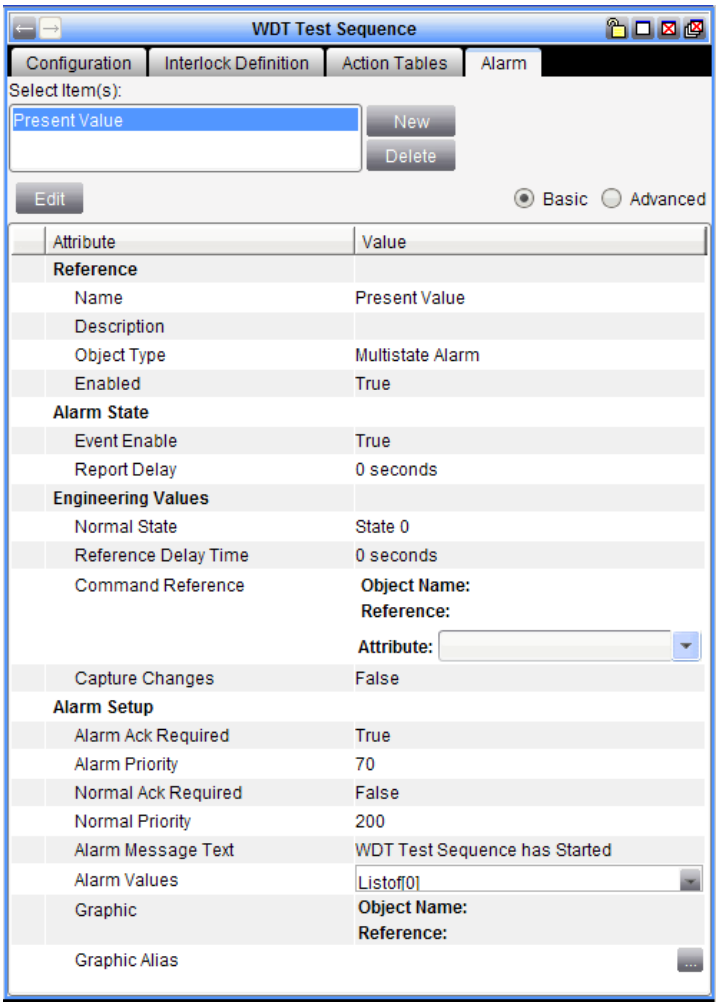

Figure 64: WDT Test Sequence Alarm Screen

WDT Enable

This point, when added to the Weekly Dedicated Test Schedule, starts the Weekly Dedicated Test at its scheduled time. When the weekly dedicated test starts, an alarm message appears as shown in the Alarm Message Text of Figure 65.

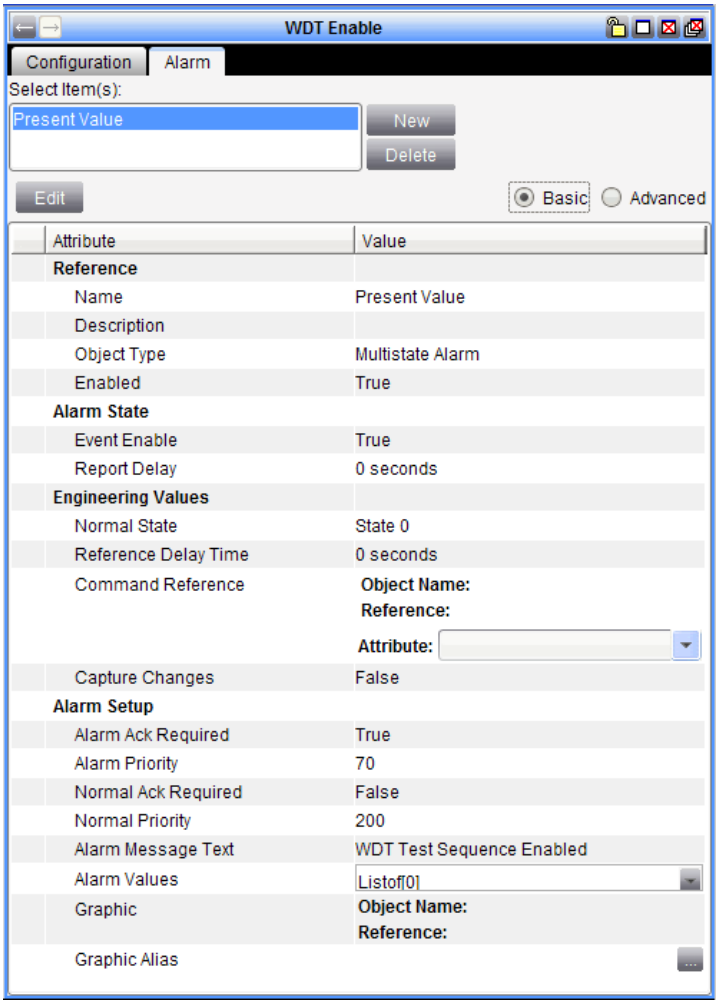

Figure 65: Fan Weekly Dedicated Test Enable Alarm Screen

WDT Fan On Command

When the weekly dedicated test commands a fan to the On position, an alarm message appears as shown in the Alarm Message Text of Figure 66.

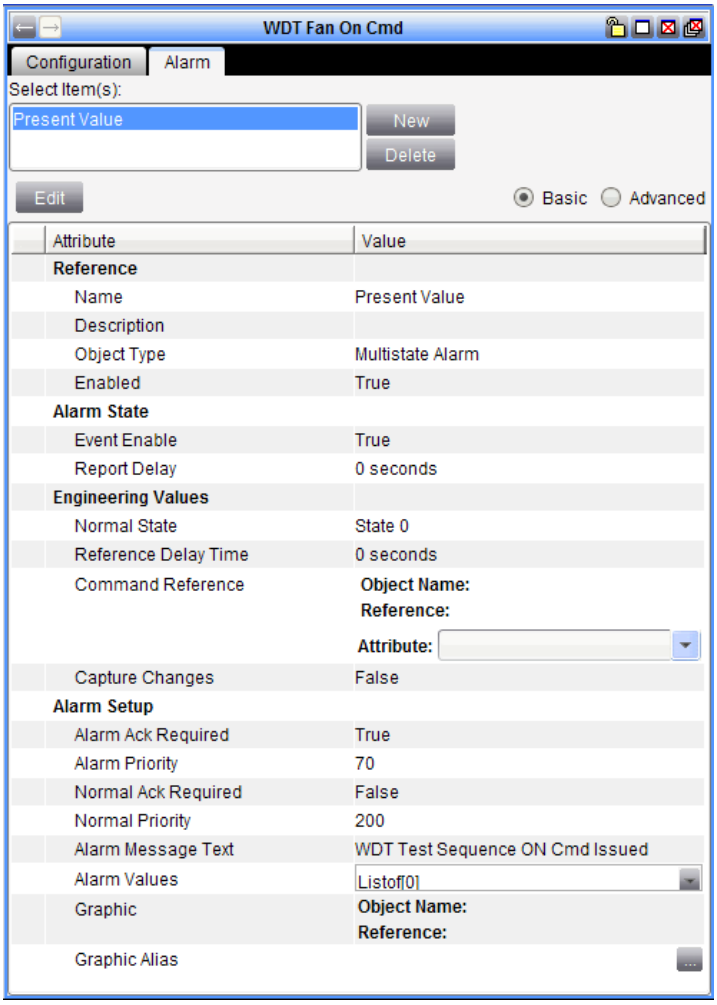

Figure 66: Weekly Dedicated Test Fan On Command Alarm Screen

WDT Fan Off Command

When the weekly dedicated test commands a fan to the Off position, an alarm message appears as shown in the Alarm Message Text of Figure 67.

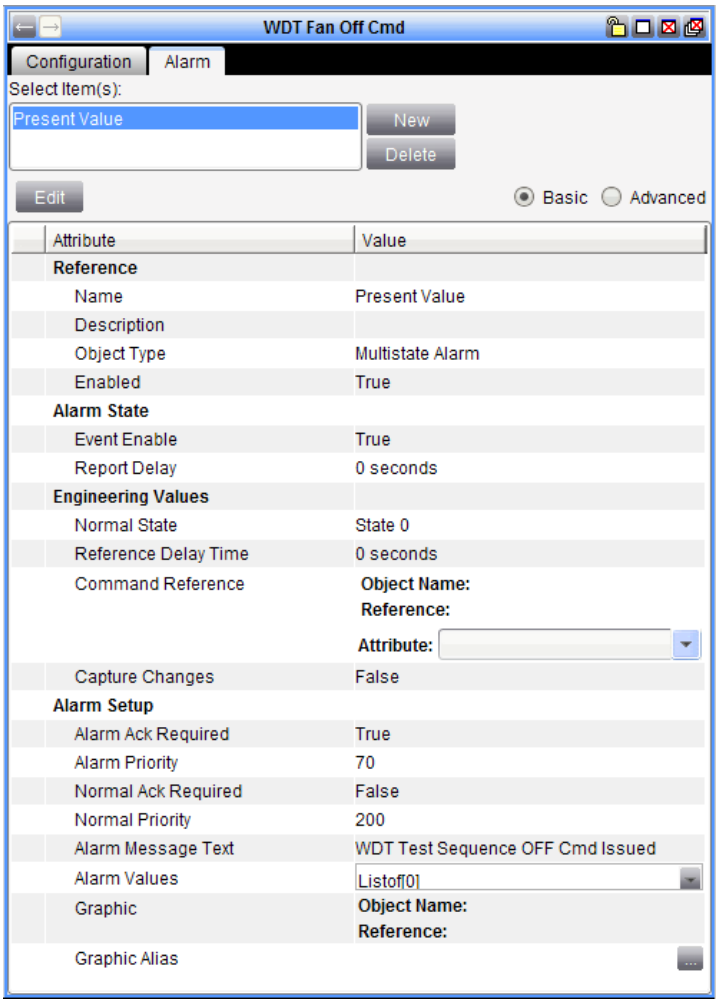

Figure 67: Weekly Dedicated Test Fan Off Command Alarm Screen

WDT Complete

When the weekly dedicated test completes with no errors, an alarm message appears as shown in the Alarm Message Text of Figure 68.

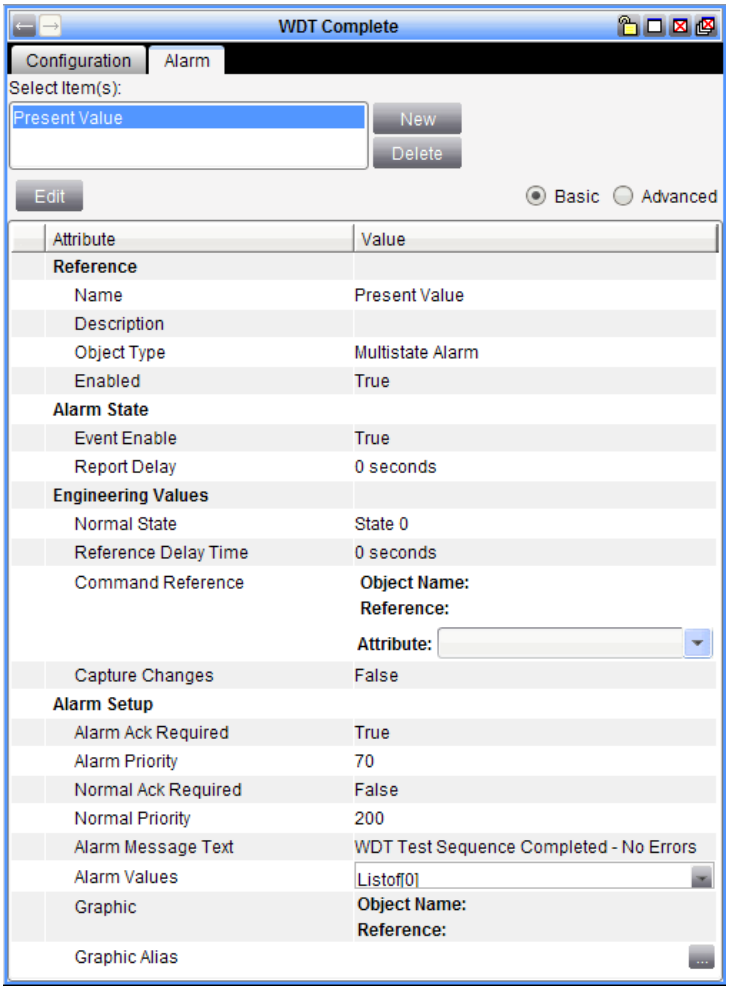

Figure 68: Fan Weekly Dedicated Test Complete

WDT Failure Sequence Interlock Definition

The WDT Failure Sequence Interlock Definition issues an alarm in the event the fan or damper fails to meet its commanded state and then terminates the weekly test (Figure 69).

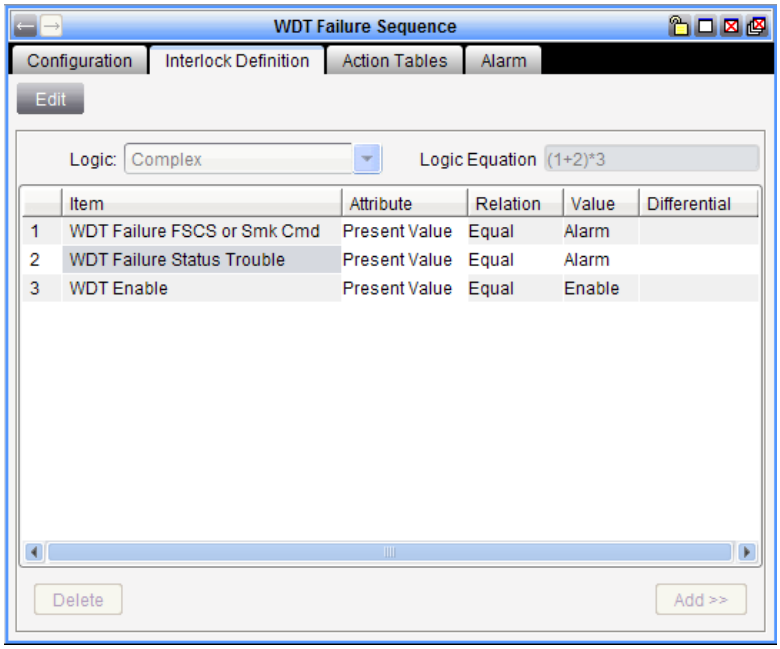

Figure 69: WDT Failure Sequence Interlock Definition Screen

WDT Failure Sequence Action Table

The WDT Failure Sequence Action Table (Figure 70), when conditions are True (meaning the test has failed), overrides the test commands and terminates the test.

Figure 70: WDT Failure Sequence Action Table

WDT Failure Sequence Alarm

The WDT Failure Sequence Alarm issues an alarm message that the WDT has been terminated (Figure 71).

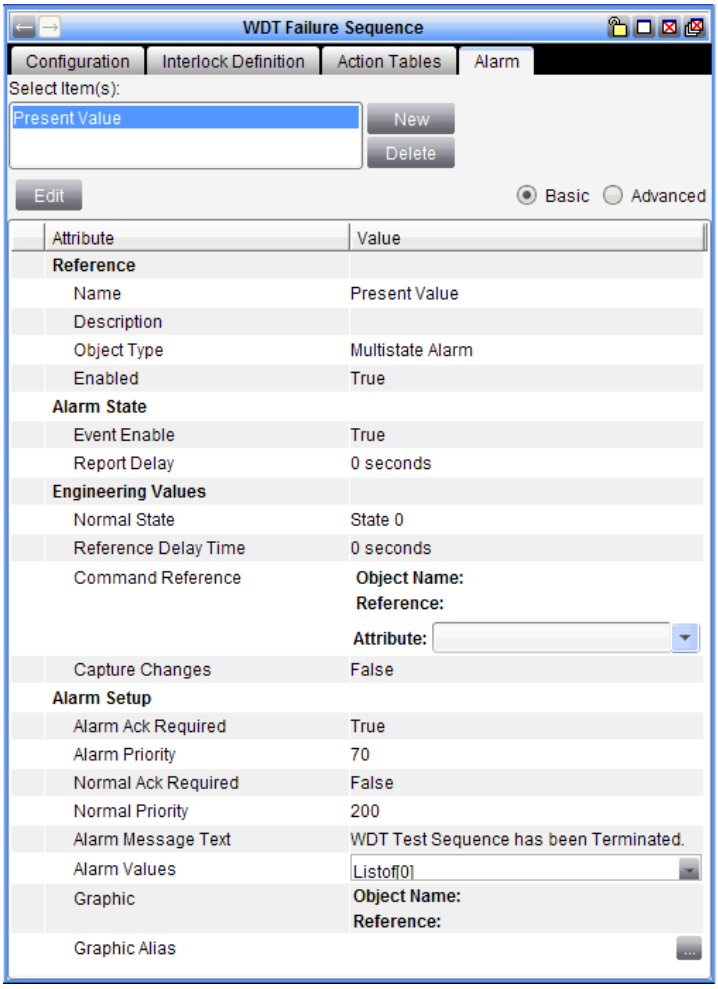

Figure 71: WDT Failure Sequence Alarm Screen

WDT Failure FSCS or Smoke Command

When a smoke control command or manual FSCS command is issued during the weekly dedicated test, the test terminates and an alarm message appears as shown in the Alarm Message Text of Figure 72.

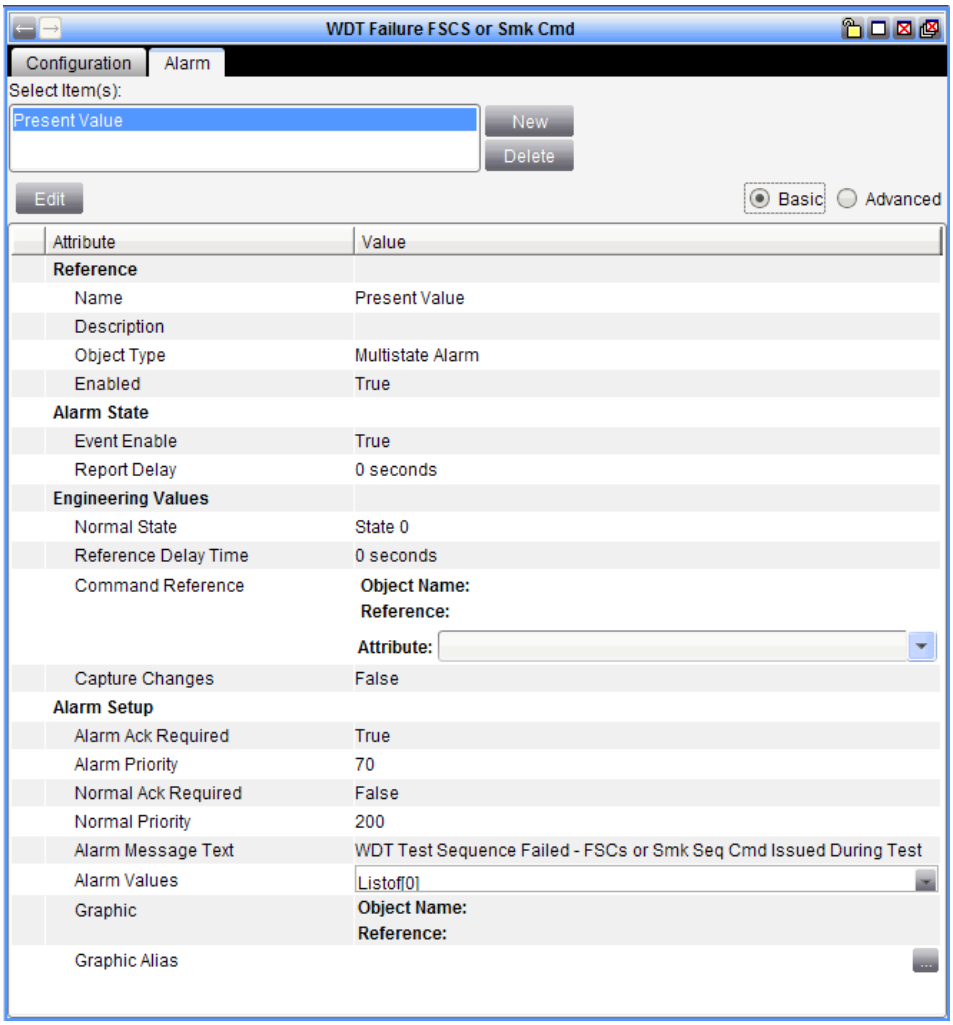

Figure 72: Fan WDT Failure FSCS or Smoke Command

WDT Failure Status Trouble

When the weekly dedicated test terminates due to a device not meeting its expected commanded condition, an alarm message appears as shown in the Alarm Message Text of Figure 73.

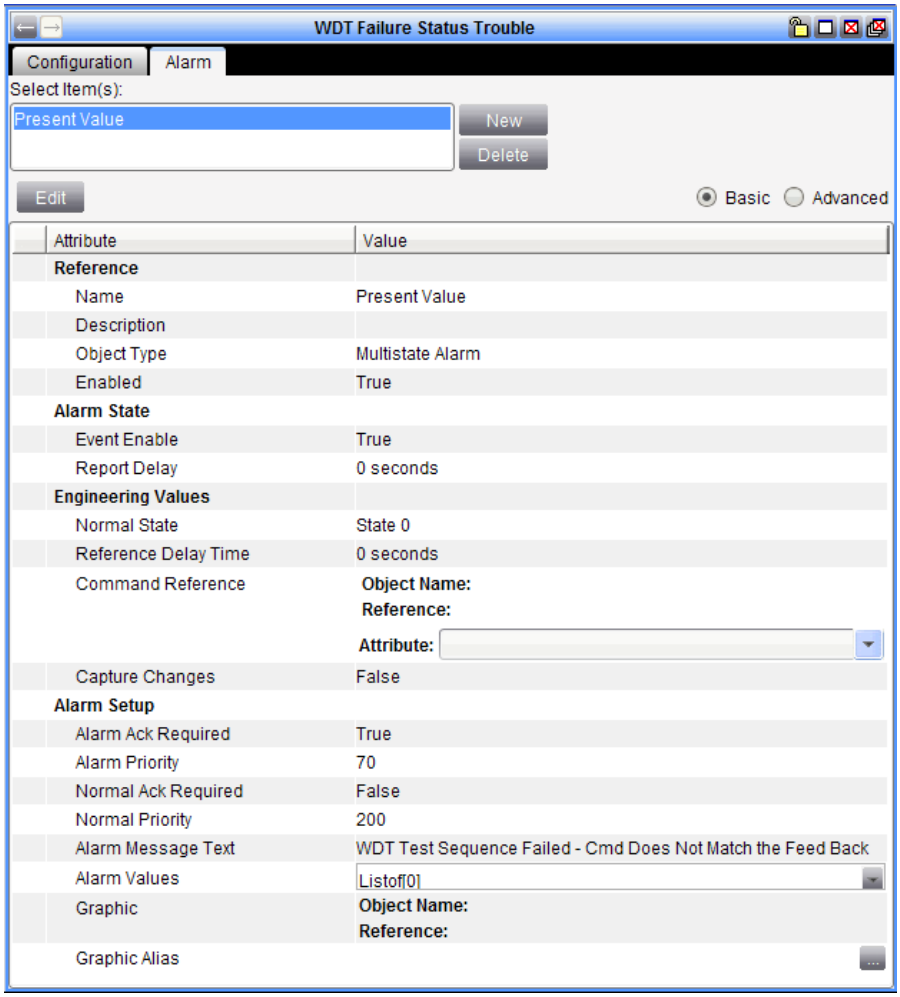

Figure 73: Fan WDT Failure Status Trouble Screen

Damper Folder

Damper Objects

Figure 74 shows all objects associated with any damper type. The FSCS folder is shown since some of the damper's logic references these points.

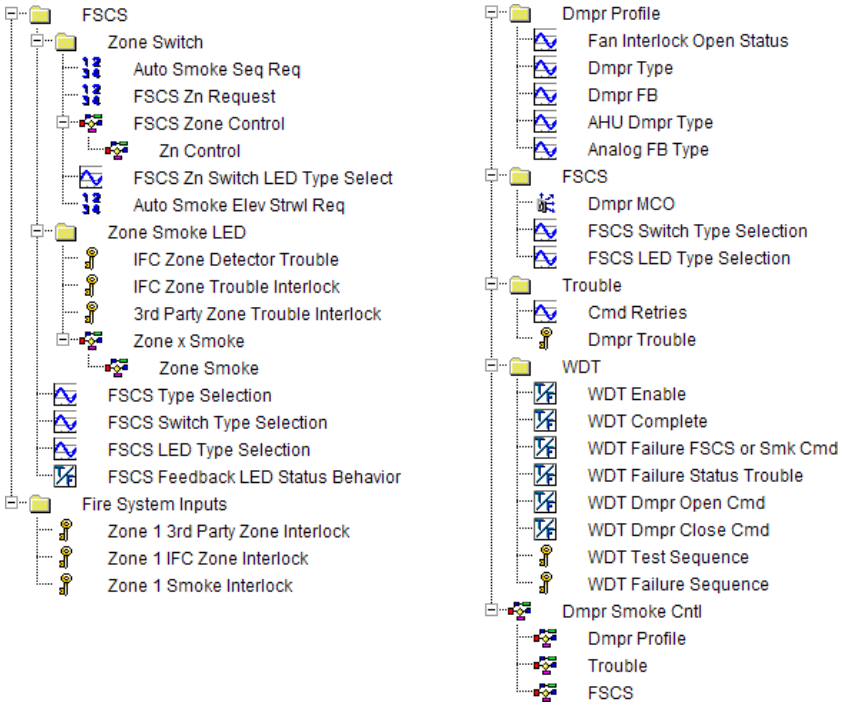

Figure 74: All Damper Objects

Damper Response Timing

Manual Damper Command Timing

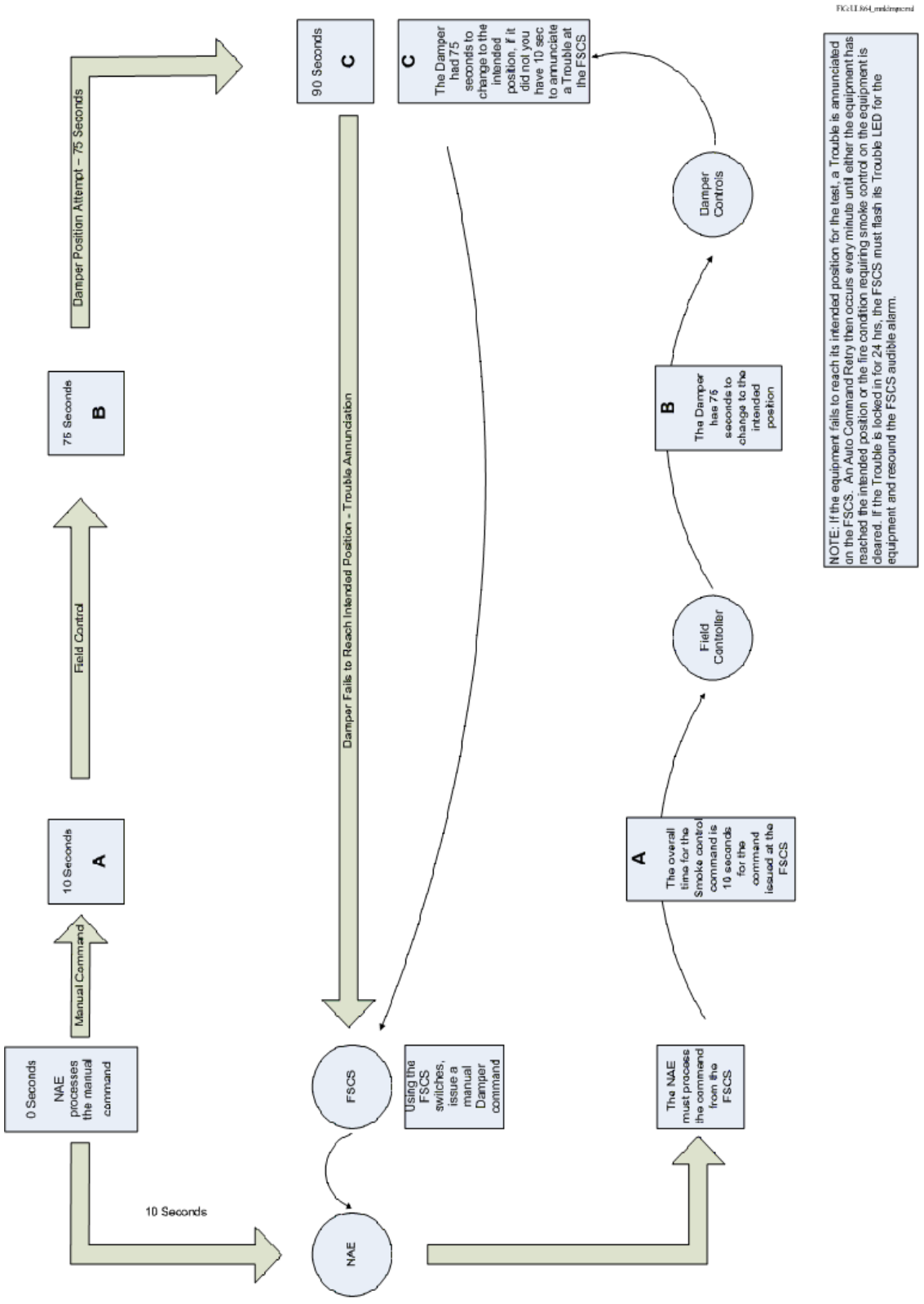

Figure 75: Manual Damper Command Timing

Automatic Damper Command Timing

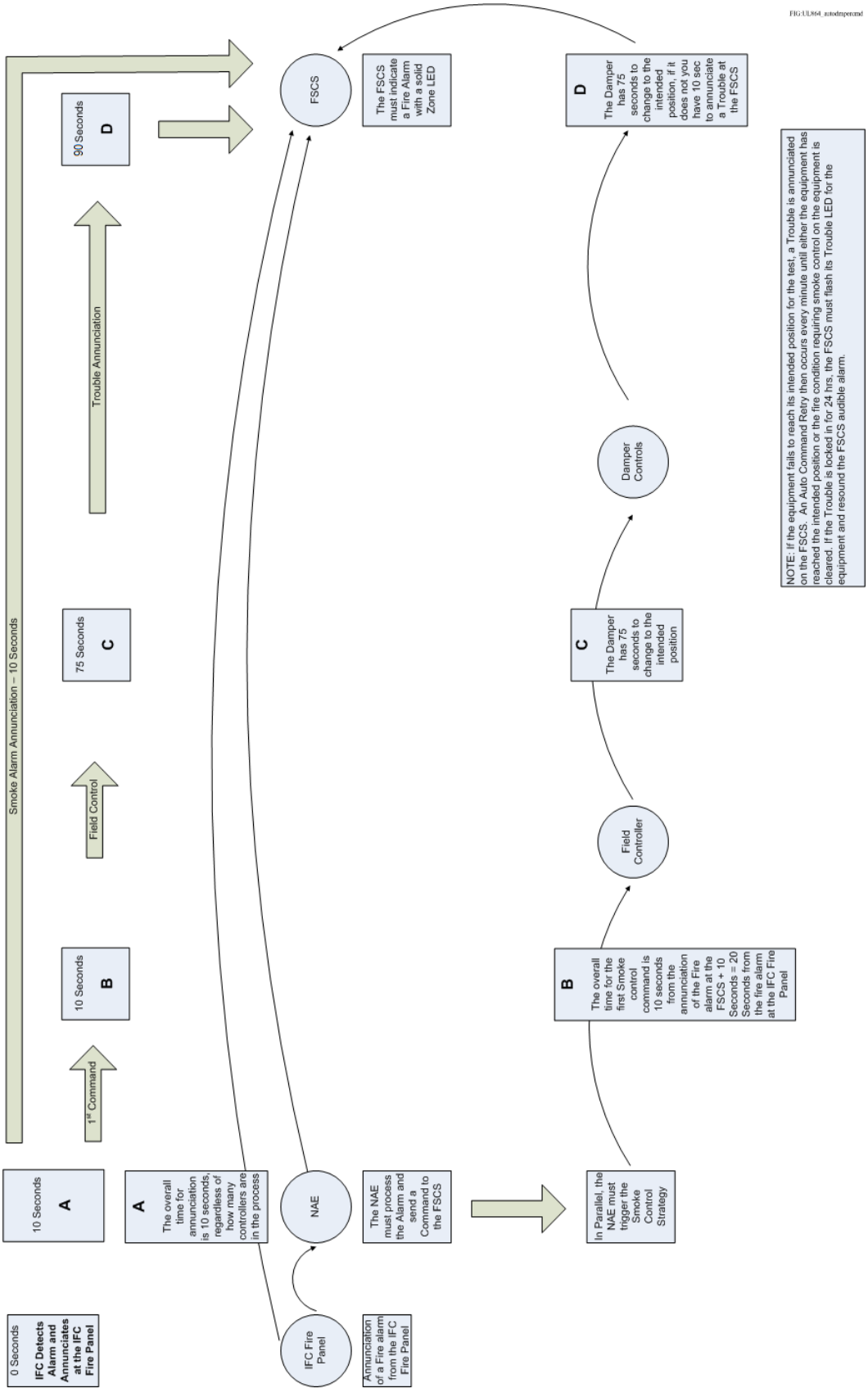

Figure 76: Automatic Damper Command Timing

FSCS Damper Switch

The FSCS's Damper switch is a three-position toggle switch with four LEDs (Figure 77). The three switch positions are Open, Auto, and Close, each with its associated LED. The Trouble LED illuminates when trouble is present for the damper. Its flash rate shows its acknowledged/unacknowledged status.

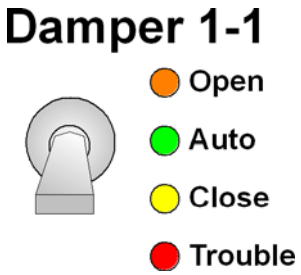

Figure 77: ADI FSCS Damper Switch

Table 27: Damper Switch - 3-Position Toggle, 4 LEDs

Switch Position	Switch Setting	Associated With	LED	Description
1	Manual Open	MS/TP banked LEDs	Open	Illuminates the Open LED when the switch is in position 1 and the associated feedback point is correct. Turns the Open LED off when in any other position.
2	Auto		Auto	Illuminates the Auto LED when the switch is in position 2 and the associated feedback point is correct. Turns the Auto LED off when in any other position.
3	Manual Close		Close	Illuminates the Close LED when switch is in position 3 and the associated feedback point is correct. Turns the Close LED off when in any other position.
N/A	N/A	Single LED	Trouble	Flashes at a fast rate when Trouble exists. When acknowledged, it flashes at a slower rate. Turns the Trouble LED off when the Zone's Trouble is cleared.

Damper Logic

The main damper logic (Figure 78) consists of the damper inputs (Figure 79), Profile Block (Figure 80), FSCS Block (Figure 82), Trouble Block (Figure 85), and damper outputs.

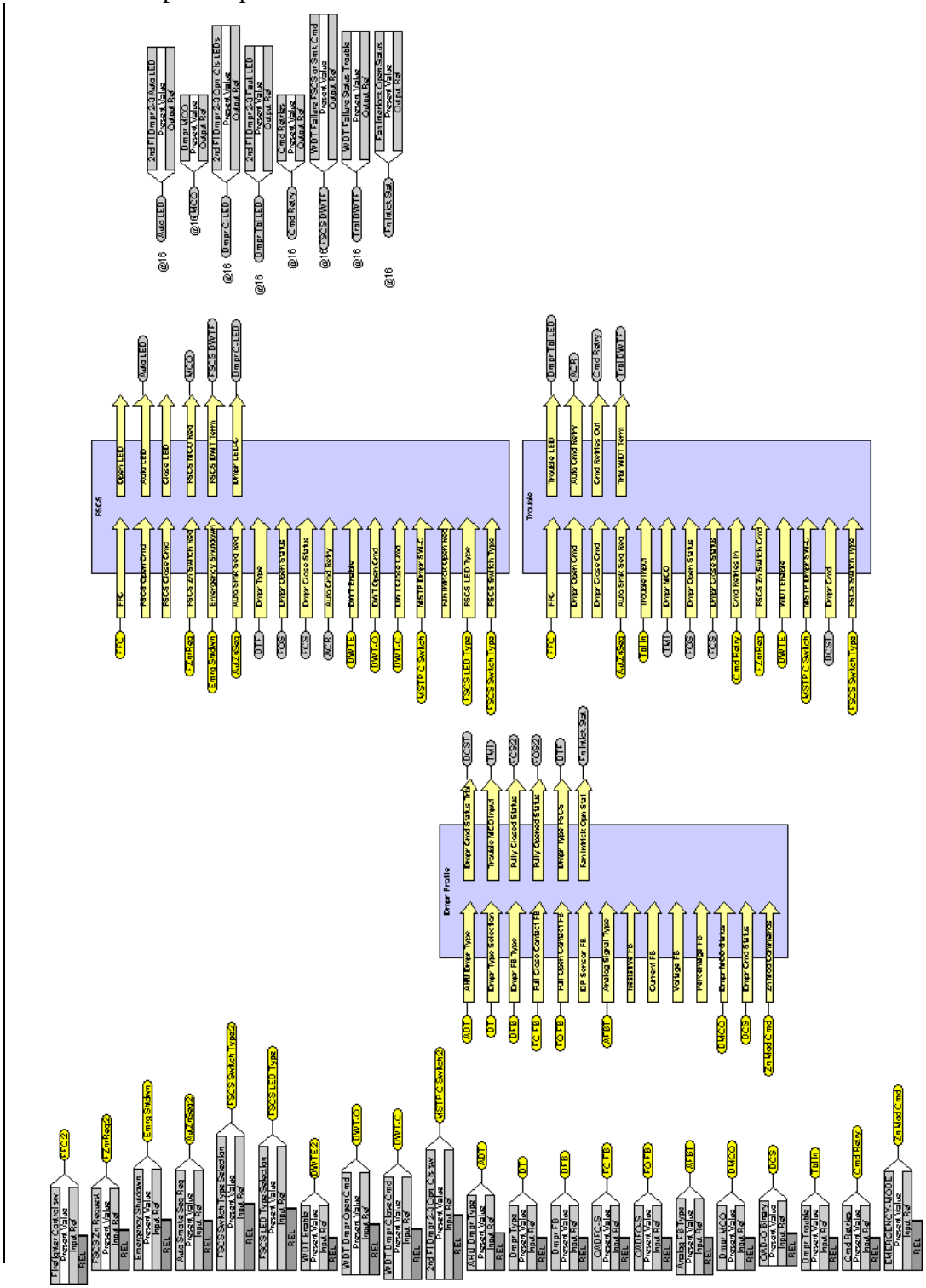

Figure 78: Damper Main Logic

Damper Logic Inputs

Figure 79 shows the damper logic inputs for all damper types.

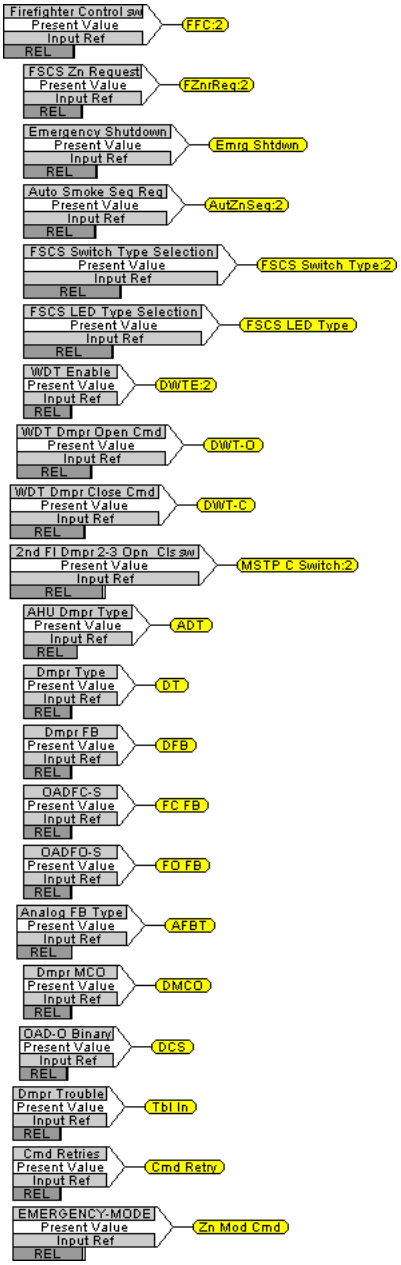

Figure 79: Damper Logic Inputs

Damper Input Connections List

IMPORTANT: Dampers that are incorrectly configured prevent proper smoke control sequence operation.

Table 28: Damper Input Connections (Part 1 of 4)

Input Source	All Possible Damper Inputs	Label	Description	Control System Block	Control System Block Input
FSCS Controller	**Firemans Key**	FFC:2	Panel enable keyswitch position **States:** 0 = Auto 1 = Firefighter Control	FSCS	FFC
				Trouble	FFC
Zone Switch Folder	**FSCS Zn Request**	FZnrReq:2	Zone request to control damper **States:** 0 = Normal 1 = Pressurize 2 = De-Pressurize 3 = Purge	FSCS	FSCS Zn Switch Req
				Trouble	FSCS Zn Switch Cmd
AHU Emergency Shutdown Control Folder	**Emergency Shutdown**	Emrg Shtdwn	Interlock to do an emergency shutdown of the AHU **States:** 0 = AHU run enable 1 = Emergency AHU shutdown	FSCS	Emergency Shutdown
FSCS Zone Switch Folder	**Auto Smoke Seq Req**	AutZnSeq:2	Auto smoke control request **States:** 0 = Normal 1 = Pressurize 2 = De-Pressurize	FSCS	Auto Smk Seq Req
				Trouble	Auto Smk Seq Req
The main FSCS folder of the NxE physically connected to the FSCS	**FSCS Switch Type Selection**	FSCS Switch Type:2	Sets the FSCS Switch type **Selections:**[1] 0 = individual Binary Input for each switch position. 1 = MSTP converted 3-position banked switch (AUTO, OPEN, CLOSE) 2 = MSTP converted 2-position banked switch (OPEN, CLOSE	FSCS	FSCS Switch Type
				Trouble	FSCS Switch Type
The main FSCS folder of the NxE physically connected to the FSCS	**FSCS LED Type Selection**	FSCS LED Type	Sets the FSCS LED type **Selections:**[1] 0 = individual Outputs for each feedback status of the damper. 1 = MSTP converted 3-position LED Bank (AUTO, OPEN, CLOSE) 2 = MSTP converted 2-position LED bank (OPEN, CLOSE)	FSCS	FSCS LED Type

Table 28: Damper Input Connections (Part 2 of 4)

Input Source	All Possible Damper Inputs	Label	Description	Control System Block	Control System Block Input
Damper WDT Folder	**WDT Enable**	DWTE:2	Enables the Weekly Dedicated Test **States:** 0 = Normal 1 = Test enable	FSCS	WDT Enable
				Trouble	WDT Enable
Damper WDT Folder	**WDT Dmpr Open Cmd**	DWT-O	Logic command to Open the damper for a Weekly Dedicated Test **States:** 0 = Normal 1 = Open	FSCS	WDT Open Cmd
Damper WDT Folder	**WDT Dmp Close Cmd**	DWT-C	Logic command to Close the damper for a Weekly Dedicated Test **States:** 0 = Normal 1 = Close	FSCS	WDT Close Cmd
FSCS Controller	**Damper Open Close Switch**	MSTP C Switch:2	FSCS Multistate Switch **State:** 0 = Auto 1 = On 2 = Off	FSCS	MSTP Damper SW-C
				Trouble	MSTP Damper SW-C
Damper Profile Folder	**AHU Dmpr Type**	ADT	Selects the AHU damper type **Selections:**[1] 0 = OAD 1 = EAD 2 = RAD	Profile	AHU Dmpr Type
Damper Profile Folder	**Dmpr Type**	DT	Selects the physical damper type **Selections:**[1] 0 = 2 Position 1 = Modulating	Profile	Damper Type Selection
Damper Profile Folder	**Dmpr FB**	DFB	Selects damper feedback type **Selections:**[1] 0 = Dry contact 1 = Analog signal 2 = DP sensor	Profile	Damper FB Type
Damper Field Controller	**RADFC-S**	FC FB	Damper full close feedback status **States:** 0 = Normal 1 = Close	Profile	Full Close Contact FB
Damper Field Controller	**RADFO-S**	FO FB	Damper full open feedback status **States:** 0 = Normal 1 = Open	Profile	Full Open Contact FB

Table 28: Damper Input Connections (Part 3 of 4)

Input Source	All Possible Damper Inputs	Label	Description	Control System Block	Control System Block Input
Damper Profile Folder	**Analog FB Type**	AFBT	Analog Feedback type **Selections[1]:** 0 = Resistance (0 to 135 Ohms) 1 = Current (4 to 20 mA) 2 = Volts (0 to 10 Volts) 3 = Percentage (0 to 100%)	Profile	Analog Signal Type
Damper FSCS Folder	**Dmpr Cmd MCO**	DMCO	Checks status of the Damper MCO command 0 = Auto (Dmpr in Auto Control) 1 = Open (Damper Fully Open) 2 = Closed (Dmpr Fully Closed) 3 = 100% (Dmpr Fully Open) 4 = 0% (Dmpr Fully Closed) 5 = Emergency Shutdown (HVAC Emergency to Shutdown) 6 = Emergency Shutdown (HVAC Emergency to Pressurize) (Zone Switch) 7 = Emergency Shutdown (HVAC Emergency to De-Pressurize) (Zone Switch) 8 = Emergency Shutdown (HVAC Emergency to Purge) (Zone Switch) 9 = Pressurize (Auto Smoke Seq) 10 = De-pressurize (Auto Smoke Seq) 11 = WDT Open (Weekly Dedicated Test Command Open) 12 = WDT Close (Weekly Dedicated Test Command Close)	Profile	Damper MCO Status
Damper Field Controller	**RAD-O**	DCS	Damper Command Status State of the damper start/ stop point in the field controller. State is determined by the physical damper type installed in the field.	Profile	Damper Cmd Status
Damper Trouble Folder	**Dmpr Trouble**	Tbl In	Damper trouble condition met **States:** 0 = Normal 1 = Trouble condition	Trouble	Trouble Input

Table 28: Damper Input Connections (Part 4 of 4)

Input Source	All Possible Damper Inputs	Label	Description	Control System Block	Control System Block Input
Damper Trouble Folder	**CMD Retries**	Cmd Retry	Accumulator for the number of command retries. Value clears when the command is satisfied or the condition requiring the command is no longer active.	Trouble	Cmd Retries In
Fan Field Controller	**Emergency Mode**	Zn Mod Cmd	Emergency HVAC command point inside the controller **States:** 0 = Normal 1 = Pressurize 2 = De-pressurize 3 = Purge 4 = Shutdown	Profile	Zn Mod Cmd

1. All **Selections** must be configured during the initial damper programming.

Damper Profile Block

Figure 80 shows the Damper Profile Block.

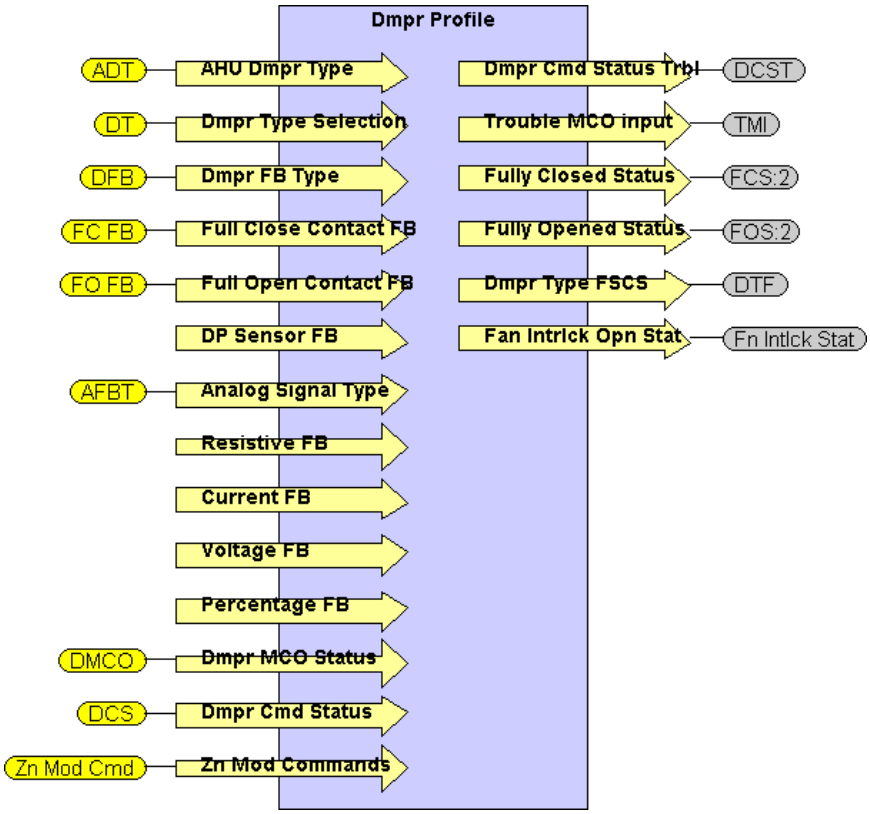

Figure 80: Damper Profile Block

Damper Profile Block Inputs

Table 29: Damper Profile Block Inputs (Part 1 of 2)

Inputs	Label	Description / Logic Value
AHU Damper Type	ADT	Sets AHU Damper Type from the Damper Profile folder's **AHU Dmpr Type** point 0 = OAD (Outside Air Damper) 1 = EAD (Exhaust Air Damper) 2 = RAD (Return Air Damper)
Damper Type Selection	DT	Sets the Damper Type from the Damper Profile folder's **Dmpr Type** point 0 = 2 Position 1 = Modulating
Dmpr FB Type	DFB	Sets Damper Feedback Type from the Damper Profile folder's **Dmpr FB** point 0 = Dry Contact 1 = Analog Signal 2 = Differential Pressure Sensor
Full Close Contact FB	FC FB	Status of the damper field controller's fully closed feedback point. Damper Feedback Input active when **Damper FB Type** is set to Dry Contact 0 = Dry Contact (End Limit Switch, Binary Signal…)
Full Open Contact FB	FO FB	Status of the damper field controller's fully open feedback point. Damper Feedback Input active when **Damper FB Type** is set to Dry Contact 0 = Dry Contact (End Limit Switch, Binary Signal…)
DP Sensor FB	Dmpr FB Stat	Status of the damper field controller's feedback point. Damper Feedback Input active when **Damper FB Type** is set to Differential Pressure 2 = Differential Pressure Sensor
Analog Signal Type	AFBT	Status of the Damper Profile folder's **Analog FB Type** point. Damper Feedback Input active when **Damper FB Type** is set to Analog Signal 1 = Analog Signal Sets Analog Signal Input Type when is set to Analog Signal
Resistive FB	Dmpr FB Stat	Status of the damper field controller's feedback point. Analog Input Signal - 0 = Resistive Feedback (Default) Based on 0 to 135 Ohms, nominal
Current FB	Dmpr FB Stat	Status of the damper field controller's feedback point. Analog Input Signal - 1 = Current Feedback - Based on 4 to 20 mA, nominal
Voltage FB	Dmpr FB Stat	Status of the damper field controller's feedback point. Analog Input Signal - 2 = Voltage Feedback - Based on 0 to 10 Volts, nominal
Percentage FB	Dmpr FB Stat	Status of the damper field controller's feedback point. Analog Input Signal -3 = Percentage Feedback - Based on 0 to 100%

Table 29: Damper Profile Block Inputs (Part 2 of 2)

Inputs	Label	Description / Logic Value
Dmpr MCO Status	DMCO	Damper MCO command from the Damper FSCS folder's **Dmpr MCO** point to field controller's damper point. 0 = Auto (Dmpr in Auto Control) 1 = Open (Damper Fully Open) 2 = Closed (Dmpr Fully Closed) 3 = 100% (Dmpr Fully Open) 4 = 0% (Dmpr Fully Closed) 5 = Emergency Shutdown (HVAC Emergency to Shutdown) 6 = Emergency Shutdown (HVAC Emergency to Pressurize) (Zone Switch) 7 = Emergency Shutdown (HVAC Emergency to De-Pressurize) (Zone Switch) 8 = Emergency Shutdown (HVAC Emergency to Purge) (Zone Switch) 9 = Pressurize (Auto Smoke Seq) 10 = De-pressurize (Auto Smoke Seq) 11 = WDT Open (Weekly Dedicated Test Command Open) 12 = WDT Close (Weekly Dedicated Test Command Close)
Dmpr Cmd Status	DCS	Status of the Damper field controller's command point
Zn Mod Commands	Zn Mod Cmd	Emergency HVAC command point inside the controller **States:** 0 = Normal 1 = Pressurize 2 = De-pressurize 3 = Purge 4 = Shutdown
Note: Decoding the Damper Feedback results in a Fully Closed or Fully Open output. To change the Close or Open setpoint, adjust the corresponding constant for the desired signal.		

Damper Profile Block Outputs

Table 30: Damper Profile Block Outputs

Outputs	Label	Description / Logic Value	Control System Block	Control System Block Input
Dmpr Cmd Status Trbl	DCST	Decoded status of the damper command point in the field controller	Trouble	Dmpr Cmd
Trouble MCO Input	TMI	Decoded status of the Damper FSCS folder's **Damper MCO** point.	Trouble	Dmpr MCO
Fully Closed Status	FCS:2	Damper status - True when the damper is fully closed.	FSCS Trouble	Dmpr Close Status
Fully Opened Status	FOS:2	Damper status - True when the damper is fully open.	FSCS Trouble	Dmpr Open Status
Dmpr Type FSCS	DTF	Selected value of the **Damper Type** input	FSCS	Dmpr Type
Fn Intrlck Opn Stat	Fn Intrlck Stat	Commanded value of the Profile block's **Fan Interlock Open Status** point	N/A	N/A

Damper Profile Block Logic

Figure 81 shows the logic for the damper Profile block.

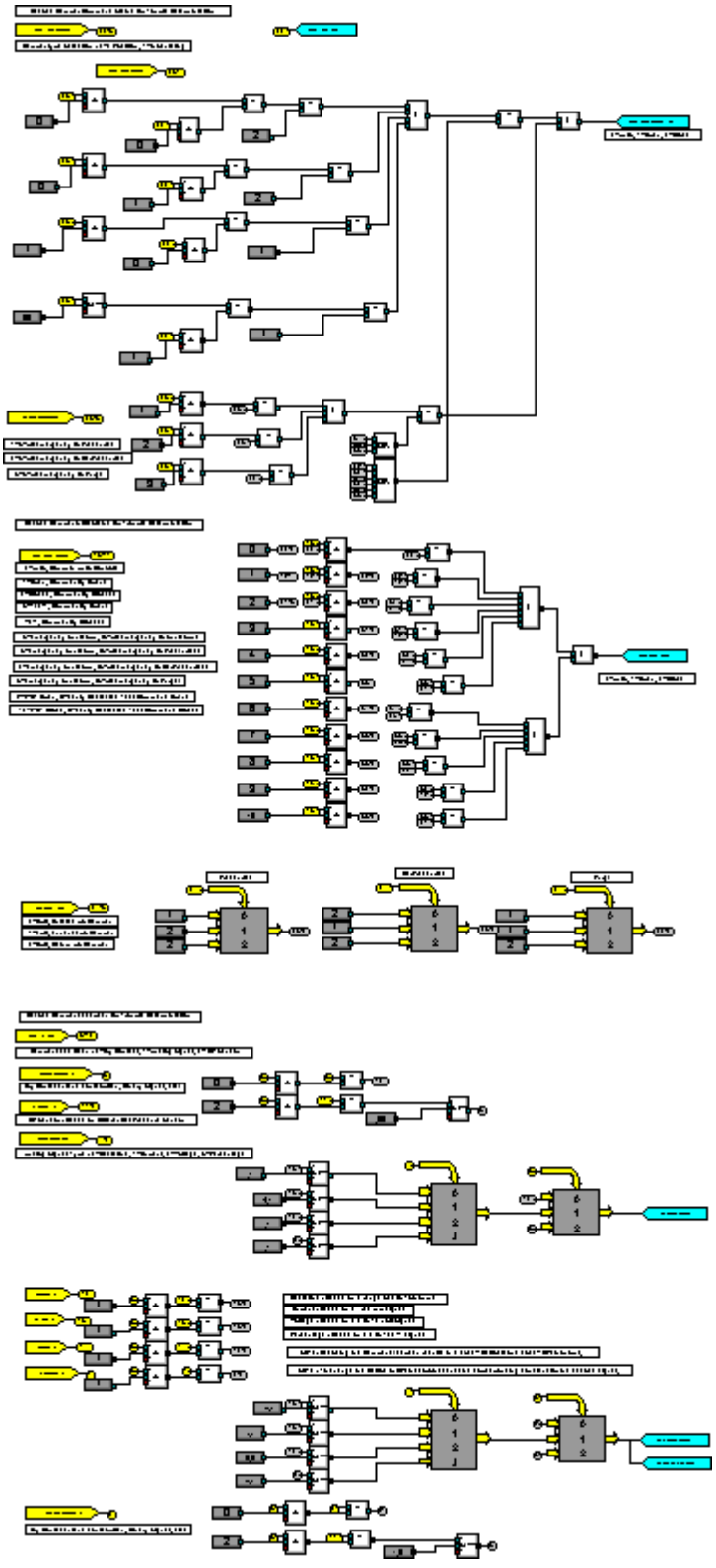

Figure 81: Damper Profile Block Logic

Damper FSCS Block

The damper's FSCS control block controls the LEDs on the FSCS panel and commands the field controller (Figure 82).

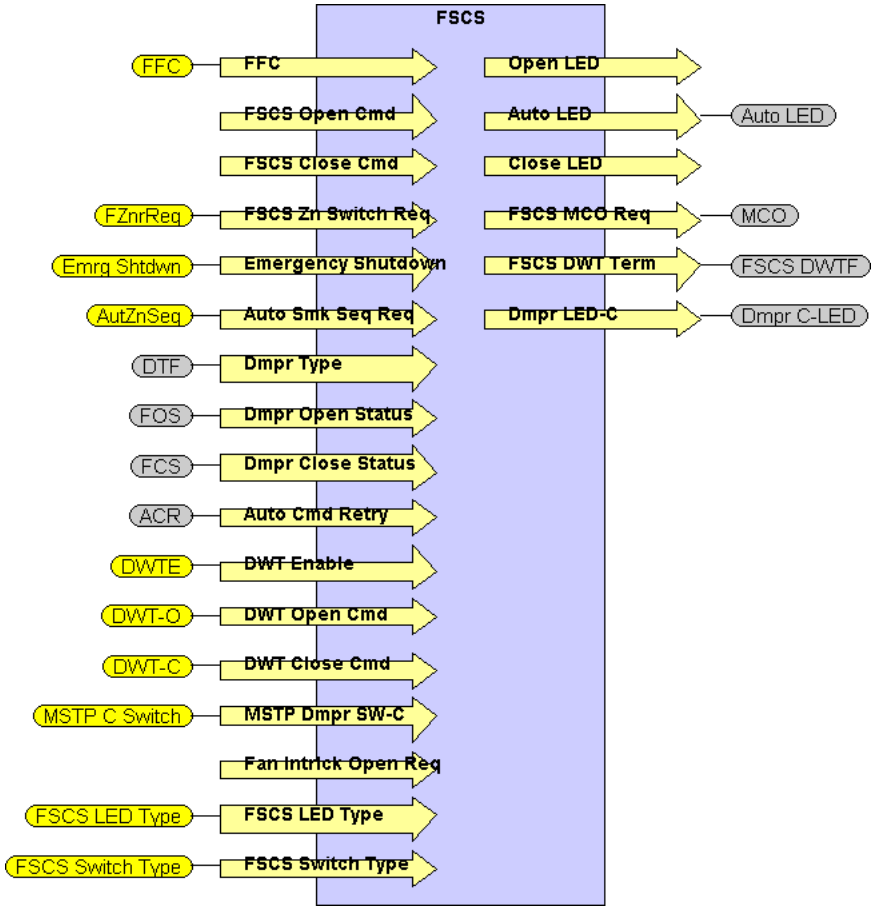

Figure 82: Damper FSCS Block

- The damper Open LED is turned on only if the FSCS is in Firefighter Control and the damper is open.
- The damper Close LED is turned on only if the FSCS is in Firefighter Control and the damper is fully closed.
- The damper Auto LED is turned on only if the toggle switch is not in the Open or Close setting.
- If the Firefighter Control Key is off, the FSCS Request is set to 0.
- If the Firefighter Control Key is on, the FSCS Request is set to the Table 20 values depending on the position of the Fan's toggle switch.

Table 31: Fan Toggle Switch FSCS Request Value

FSCS Fan Toggle Switch Position	FSCS Request State Value	Smoke Control Action
On	1	Depressurize
Auto	0	Auto
Off	2	Exhaust Fan Off

Damper FSCS Block Inputs

Table 32: Damper FSCS Block Inputs

Inputs	Label	Description
FFC	FFC	Status of the FSCS MS/TP field controller's **Firemans Key** point
FSCS Open Cmd	DmprOpnCmd	This input is active when the **FSCS Switch Type Selection** is set to selection **0**. The actual status of the damper FSCS binary input for the Open Command.
FSCS Close Cmd	DmprCloCmd	This input is active when the **FSCS Switch Type Selection** is set to selection **0**. The actual status of the damper FSCS binary input for the Close Command.
FSCS Zn Switch Req	FZnReq	Status of the FSCS Zone Switch folder's **FSCS ZN Request** point
Emergency Shutdown	Emrg Shtdwn	Status of the AHU Emergency Shutdown Control folder's **Emergency Shutdown** point
Auto Smoke Seq Req	AutZnSeq	Status of the FSCS Zone Switch folder's **Auto Smoke Seq Req** point
Dmpr Type	DTF	Status of the Damper Profile Block's output - **Dmpr Type FSCS** 0 = 2 Position 1 = Modulating
Damper Open Status	FOS	Status of the Damper Profile Block's output - **Fully Opened Status**
Damper Closed Status	FCS	Status of the Damper Profile Block's output - **Fully Closed Status**
Auto Cmd Retry	ACR	Status of the Damper Trouble Block's output - **Auto Cmd Retry**
DWT Enable	DWTE	Status of the Damper WDT folder's **WDT Enable** point
DWT Open Cmd	DWT-O	Status of the Damper WDT folder's **WDT Dmpr Open Cmd** point
DWT Close Cmd	DWT-C	Status of the Damper WDT folder's **WDT Dmpr Close Cmd** point
MSTP Damper SW-C	MSTP C Switch	Status of the Damper FSCS MS/TP field controller's **Damper Control Switch** point
Fan Intrlck Open Req	Fn Open Req	Status of the Fan FSCS folder's **Intrlck Dmpr Opn Req** point
FSCS LED Type Selection	FSCS LED Type	FSCS LED Configuration 0 = Individual LED 1 = Ganged 3 LED 2 = Ganged 2 LED
FSCS Switch Type Selection	FSCS Switch Type	FSCS Switch Configuration 0 = Individual Switch 1 = 3 Ganged Switch 2 = 2 Ganged Switch

Damper FSCS Block Outputs

Table 33: Damper FSCS Block Outputs

Outputs	Label	Description
Open LED	N/A	(Future)
Auto LED	N/A	(Future)
Close LED	N/A	(Future)
FSCS MCO Req	MCO	Damper MCO command to field controller 0 = Auto (AHU in Automatic Control) 1 = Open (Fully Open Damper) 2 = Close (Fully Closed Damper) 3 = 100% (Dmpr Fully Open) 4 = 0% (Dmpr Fully Closed) 5 = Emergency Shutdown (HVAC Emergency Command to Shutdown) 6 = Emergency Shutdown (HVAC Emergency Command to Pressurize) (Zone Switch) 7 = Emergency Shutdown (HVAC Emergency Command to De- Pressurize) (Zone Switch) 8 = Emergency Shutdown (HVAC Emergency Command to Purge) (Zone Switch) 9 = Pressurize (Auto Smoke Seq) 10 = De-pressurize (Auto Smoke Seq) 11 = WDT Dmpr Open (Weekly Dedicated Test Command, Fully Open) 12 = WDT Dmpr Close (Weekly Dedicated Test Command, Fully Close)
FSCS WDT Term	FSCS DWTF	Terminate the Weekly Dedicated Test **States:** 0 = No termination condition 1 = Condition met to terminate test
Dmpr LED-C	Dmpr LED-C	FSCS LED indication for the damper **States:** 0 = No request 1 = Request interlocked damper(s) to open

Damper FSCS Block Logic

Figure 83 shows the damper FSCS block logic.

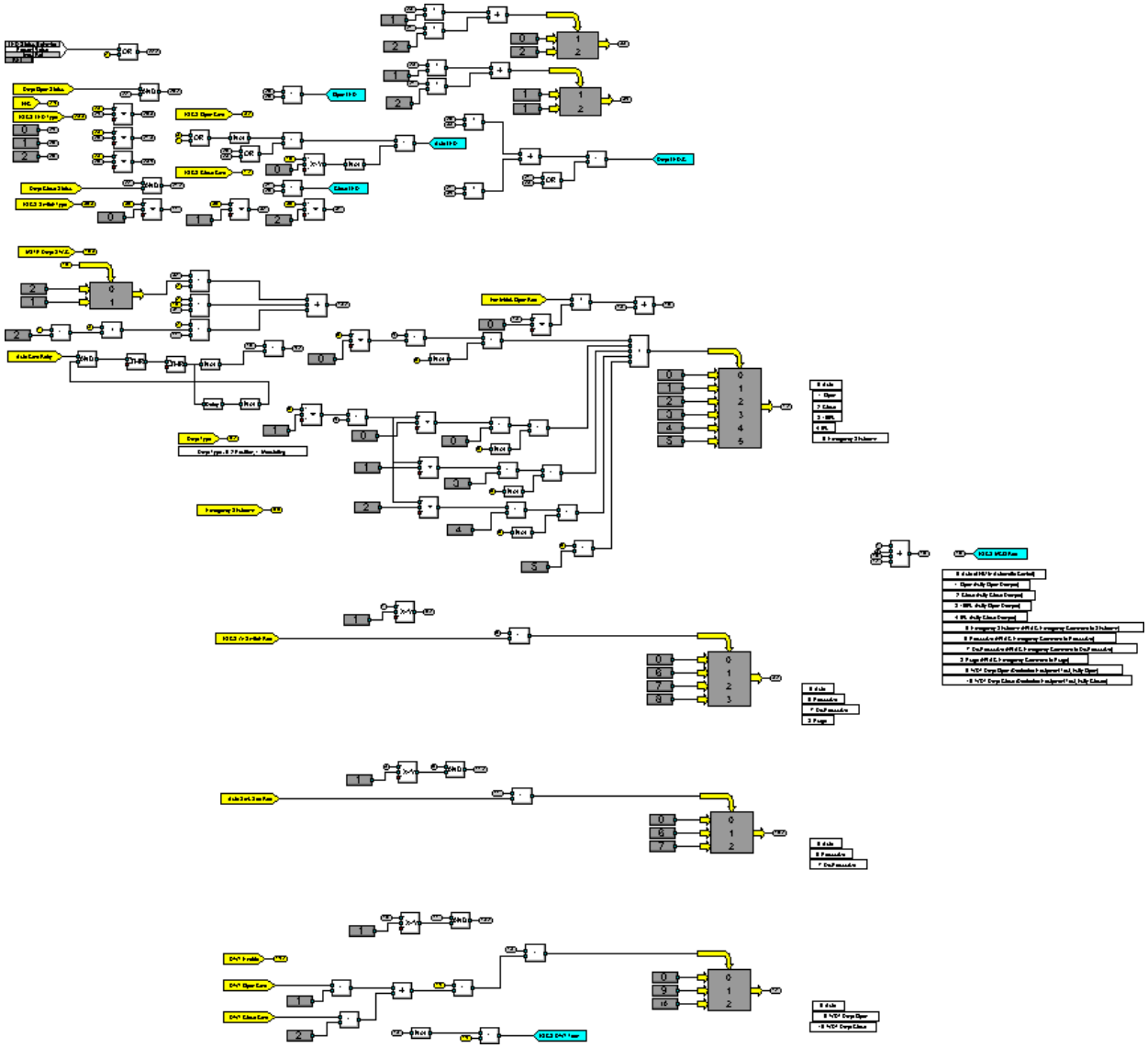

Figure 83: Damper FSCS Block Logic

Damper FSCS MCO Action Table

From the Damper Cmd MCO Action Table (Figure 84), program the command states (Table 34) to match your field equipment. Leave blank any states that are not applicable. All 11 states must remain, even though some states remain blank.

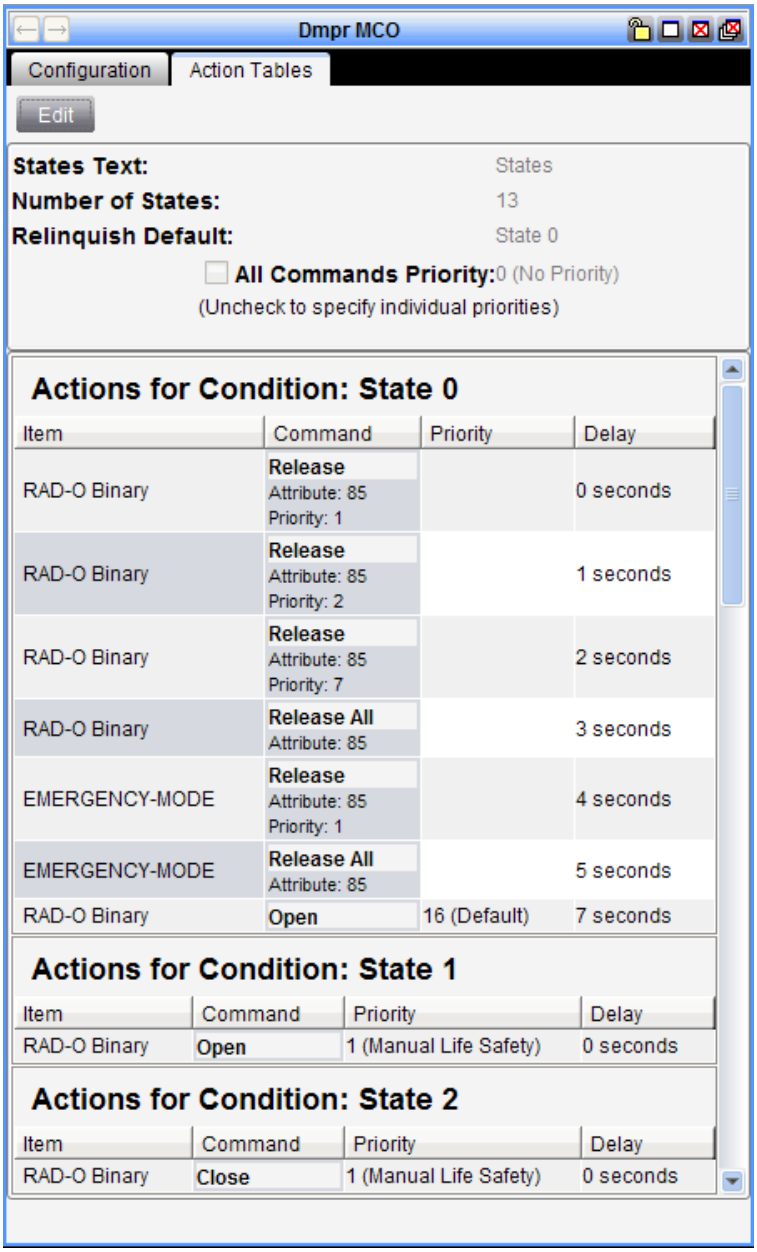

Figure 84: Damper MCO Action Table

Table 34: Damper Commands

State	Description	State Damper Type
0	Auto command of the damper point	All damper types
1	Open command of the damper point (Damper fully open)	2-Position
2	Closed command of the damper point (Damper fully closed)	2-Position
3	100% command of the damper point (Damper fully open)	Modulating
4	0% command of the damper point (Damper fully closed)	Modulating
5	Shutdown state of the controller's HVAC Emergency point	All damper types
6	Pressurize state of the controller's HVAC Emergency point	All damper types
7	De-Pressurize state of the controller's HVAC Emergency point	All damper types
8	Purge state of the controller's HVAC Emergency point	All damper types
9	Open command of the damper point (Weekly Dedicated Test)	All damper types
10	Close command of the damper point (Weekly Dedicated Test)	All damper types

Damper Trouble Block

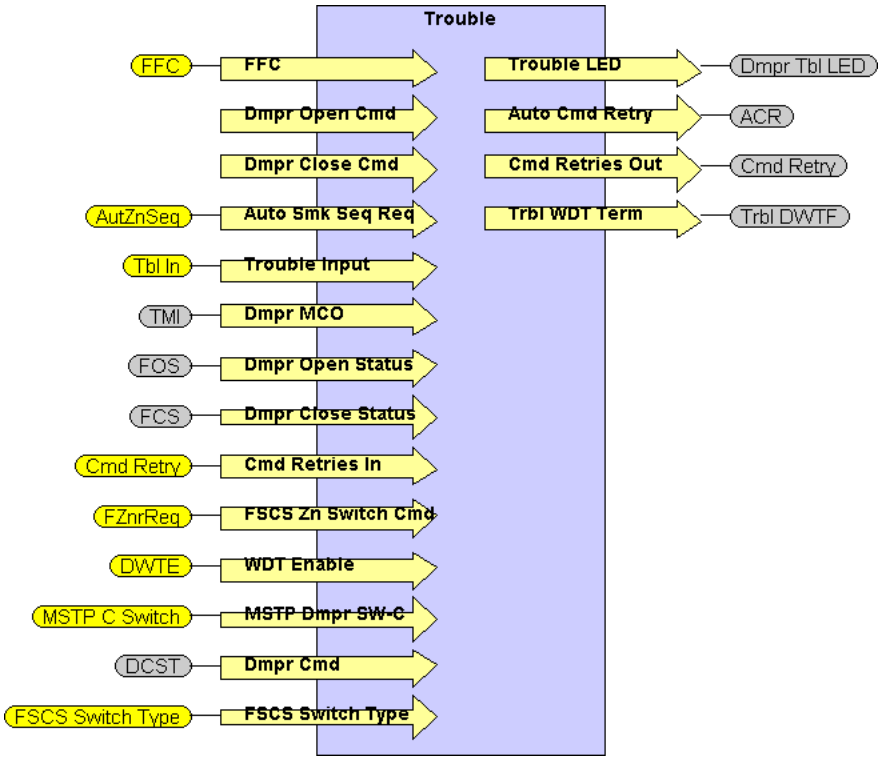

Figure 85: Damper Trouble Block

Damper Trouble Block Inputs

Table 35: Damper Trouble Block Inputs (Part 1 of 2)

Inputs	Label	Description
FFC	FFC	Status of the FSCS MS/TP field controller's **Firemans Key**
Damper Open Cmd	DmprOpnCmd	This input is active when the **FSCS Switch Type Selection** is set to selection **0**. The actual status of the damper FSCS binary input for the Open command.
Damper Close Cmd	DmprCloCmd	This input is active when the **FSCS Switch Type Selection** is set to selection **0**. The actual status of the damper FSCS binary input for the Close command.
Auto Smk Seq Req	AutZnSeq	Status of the FSCS Zone Switch folder's **Auto Smoke Seq Req** point
Trouble Input	Tbl In	Status of the Damper Trouble folder's **Dmpr Trouble** point
Dmpr MCO	TMI	Status of the Damper Profile Block's output - **Trouble MCO Input**
Dmpr Open Status	FOS	Status of the Damper Profile Block's output - **Damper Fully Opened Status**
Dmpr Close Status	FCS	Status of the Damper Profile Block's output - **Damper Fully Closed Status**
Cmd Retries In	Cmd Retry	Status of the Damper Trouble folder's **Cmd Retries** point

Table 35: Damper Trouble Block Inputs (Part 2 of 2)

Inputs	Label	Description
FSCS Zn Switch Cmd	FSCS Zn Req	Status of the FSCS Zone Switch folder's **FSCS Zn Request** point
WDT Enable	DWTE	Status of the Damper WDT folder's **WDT Enable** point
MSTP Dmpr SW-C	MSTP C Switch	Status of the Damper FSCS MS/TP field controller's **Damper Control Switch** point
Dmpr Cmd	DCST	Status of the Damper Profile Block's output - **Dmpr Cmd Status Trbl**
FSCS Switch Type Selection	FSCS Switch Type	FSCS Switch Configuration 0 = Individual Switch 1 = 3 Ganged Switch 2 = 2 Ganged Switch

Damper Trouble Block Outputs

Table 36: Damper Trouble Block Outputs

Outputs	Label	Description	Output
Trouble LED	Fn Tbl LED	FSCS's Trouble LED indication for the damper **States:** 0 = Off 1 = On 2 = Slow blink 3 = Fast blink	Commanded value of the Damper MS/TP field controller's **Damper Trouble LED Indicator** point
Auto Cmd Retry	ACR	When a damper command fails, this retries the command until the command succeeds or the condition that required the command is no longer active.	Commanded value of the Damper Trouble Block's output - **Auto Cmd Retry**
Cmd Retries Out	Cmd Retry	Increments the value of the Accumulator for the number of command retries. Value clears when the command is satisfied or the condition requiring the command is no longer active.	Increments the value of the Damper Trouble folder's **Cmd Retries** point
Trbl WDT Term	Tbl DWTF	Terminate the Weekly Dedicated Test **States:** 0 = No termination condition 1 = Condition met to terminate test	Commanded value of the Damper WDT folder's **WDT Failure Status Trouble** point

Damper Trouble Block Logic

Figure 86 shows the damper Trouble block logic.

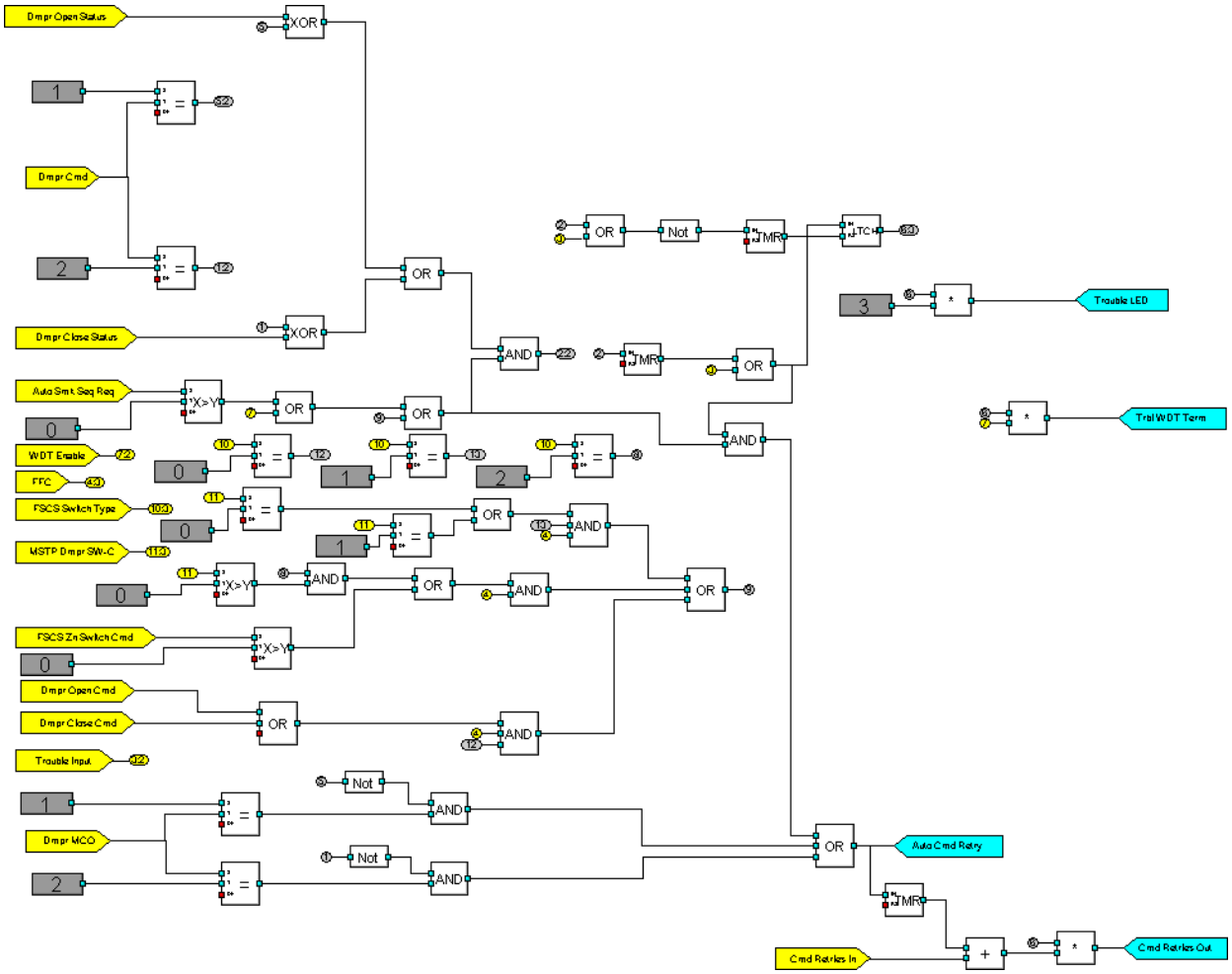

Figure 86: Damper Trouble Block Logic

Damper Trouble Interlock Definition

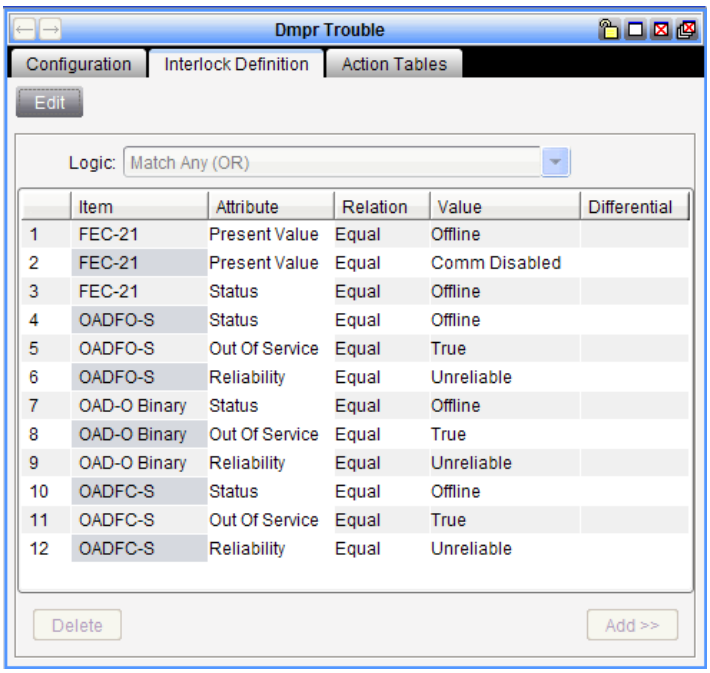

Figure 87: Damper Trouble Interlock Definition

Damper Outputs

Table 37: Damper Output Connections (Part 1 of 3)

Control System Block	Control System Block Output	Label	Damper Output	Description	Output Destination
FSCS	Dmpr Auto LED	Auto LED	Dmpr Auto LED	FSCS damper LED indication **States:** 0 = Off 1 = On	Commanded value of the Damper FSCS MS/TP field controller's **Damper Auto LED Indicator** point

Table 37: Damper Output Connections (Part 2 of 3)

Control System Block	Control System Block Output	Label	Damper Output	Description	Output Destination
FSCS	FSCS MCO Req	MCO	Damper MCO	Damper MCO command to field controller **States:** 0 = Auto 1 = Open - 2 Position 2 = Close - 2 Position 3 = 100% - Modulating 4 = 0% - Modulating 5 = Emergency Shutdown 6 = Pressurize (Zone Switch) 7 = De-pressurize (Zone Switch) 8 = Purge (Zone Switch) 9 = Pressurize (Auto Smoke Seq) 10 = De-pressurize (Auto Smoke Seq) 11 = WDT Dmpr Open 12 = WDT Dmpr Close	Commanded value of the Damper FSCS folder's **Damper MCO** point
FSCS	Dmpr Open Close LEDs	Dmpr C-LED	DMP LED	FSCS LED indication for the damper **States:** 0 = Auto 1 = Open 2 = Close	Commanded value of the Damper FSCS MS/TP field controller's **Damper Banked LED Indicator** point
Trouble	Dmpr Fault LED	Dmpr Tbl LED	Dmp Trouble LED	Damper Trouble condition met **States:** 0 = Off 1 = On (Not used) 2 = Slow flash (Acknowledged) 3 = Fast flash (Unacknowledged)	Commanded value of the Damper FSCS MS/TP field controller's **Damper Trouble LED Indicator** point
Trouble	Cmd Retries Out	Cmd Retry	Cmd Retries	Accumulator for the number of command retries. Value clears when the command is satisfied or the condition requiring the command is no longer active.	Commanded value of the Damper Trouble folder's **Cmd Retries** point
Trouble	Tbl WDT Term	Tbl DWTF	WDT Failure Status Trouble	WDT termination condition met. Command does not match status during the Weekly Test **States:** 0 = Normal 1 = Termination	Commanded value of the Damper WDT folder's **WDT Failure Status Trouble** point

Table 37: Damper Output Connections (Part 3 of 3)

Control System Block	Control System Block Output	Label	Damper Output	Description	Output Destination
FSCS	FSCS DWDT Term	FSCS DWTF	WDT Failure Status Trouble	WDT termination condition met. FSCS manual command or a smoke event occurring during the Weekly Test **States:** 0 = Normal 1 = WDT Termination	Commanded value of the Damper WDT folder's **WDT Failure FSCS or Smoke** point
Profile	Fan Intrlck Opn Stat	Fn Intlck Stat	Fan Interlock Open Status	Interlocked damper open request prior to starting the fan. Damper must reach its Open setpoint before the fan can start. **States:** 0 = Normal 1 = Damper Open request	Commanded value of the Damper Profile folder's **Fan Interlock Open Status** point

Weekly Dedicated Damper Test

Weekly Dedicated Damper Test Timing

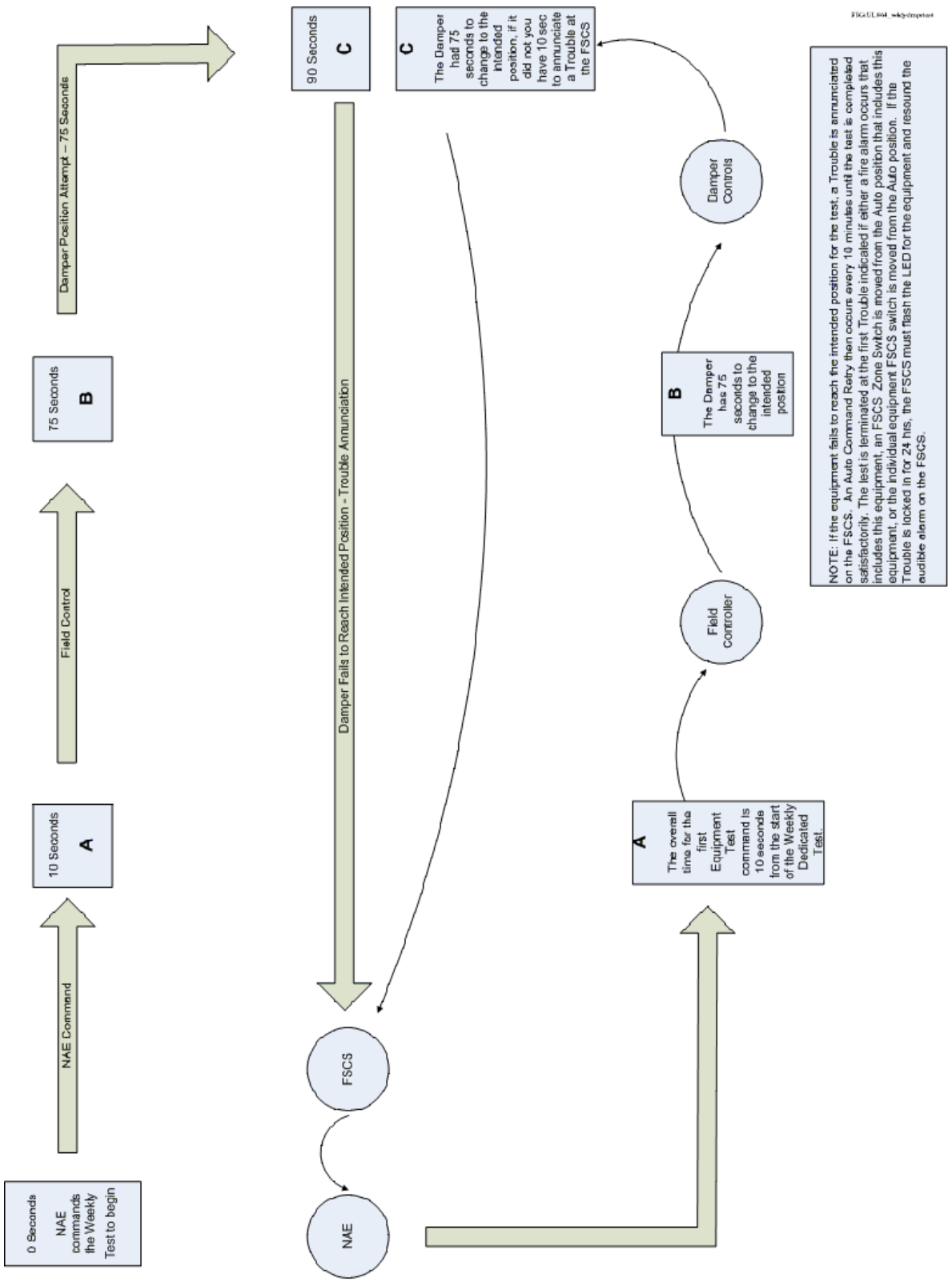

Figure 88: Weekly Dedicated Damper Test Timing

WDT Test Sequence Interlock Definition

The WDT Test Sequence Interlock Definition (Figure 89) is used to define the point that enables the weekly dedicated damper test.

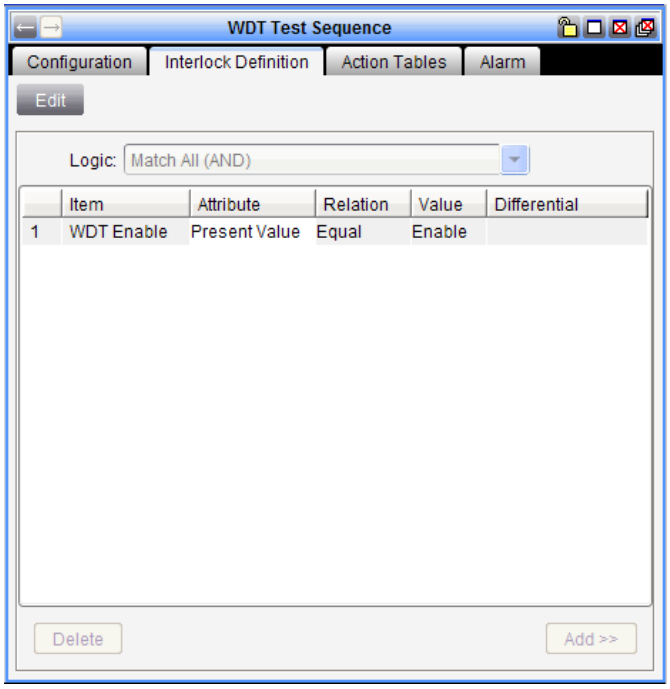

Figure 89: WDT Test Sequence Interlock Definition Screen

WDT Test Sequence Action Table

The WDT Test Sequence Action Table issues commands (Figure 90) to carry out the test. Delays are included to allow the equipment to reach its commanded position or terminate the test and annunciate a Trouble. Do not alter the delay times.

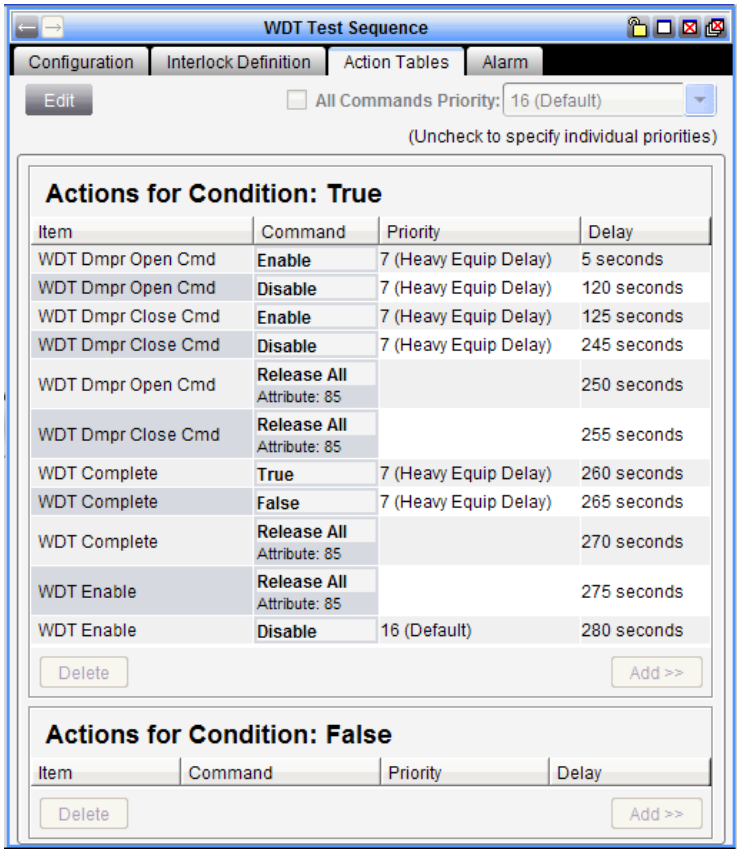

Figure 90: WDT Test Sequence Action Table Screen

WDT Test Sequence Alarm Tab

The WDT Test Sequence Alarm tab shows the Alarm Message Text that appears when the test begins (Figure 91).

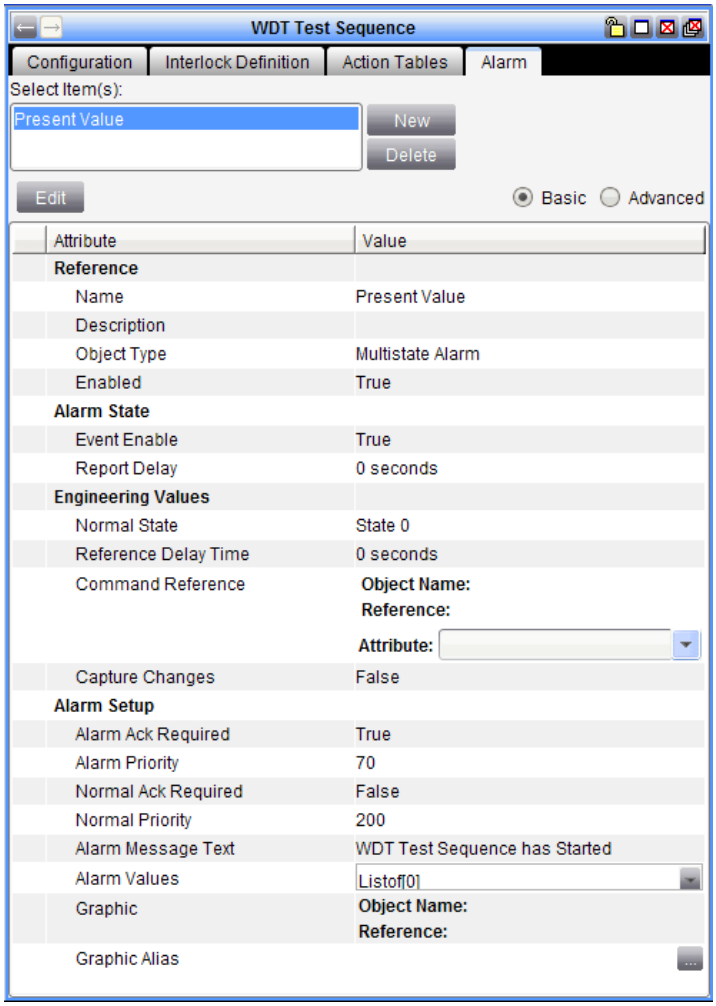

Figure 91: WDT Test Sequence Alarm Tab Screen

WDT Enable

This point, when added to the Weekly Dedicated Test Schedule, starts the Weekly Dedicated Test at its scheduled time. When the weekly dedicated test starts, an alarm message appears as shown in the Alarm Message Text of Figure 92.

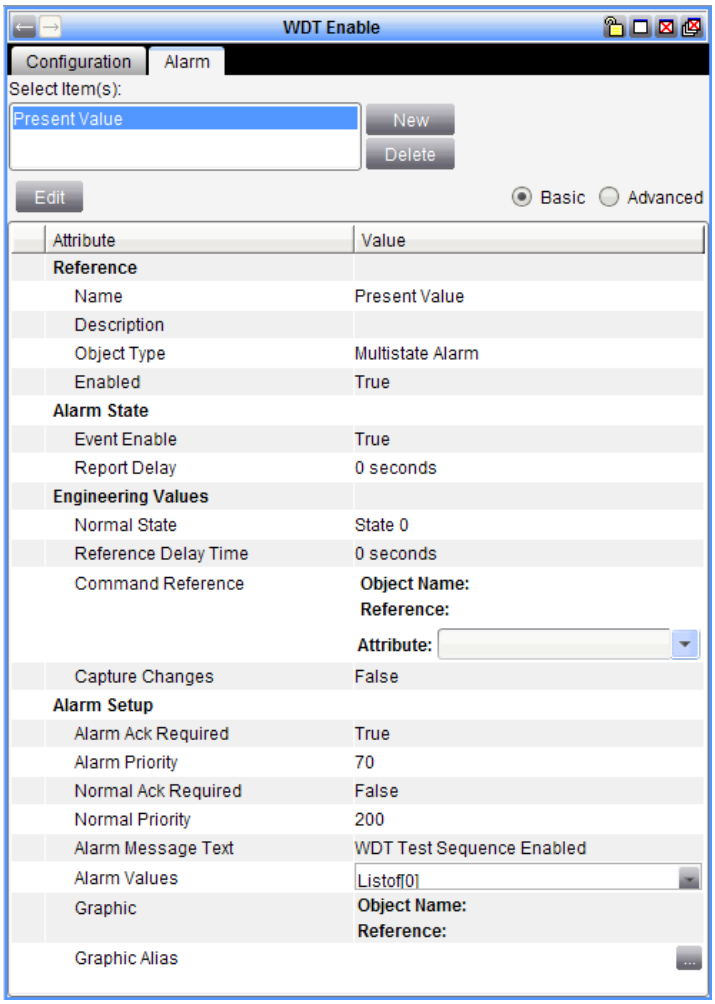

Figure 92: Damper Weekly Dedicated Test Enable

WDT Damper Open Command

When the Weekly Dedicated Test commands the damper to the Open position, an alarm message appears as shown in the Alarm Message Text of Figure 93.

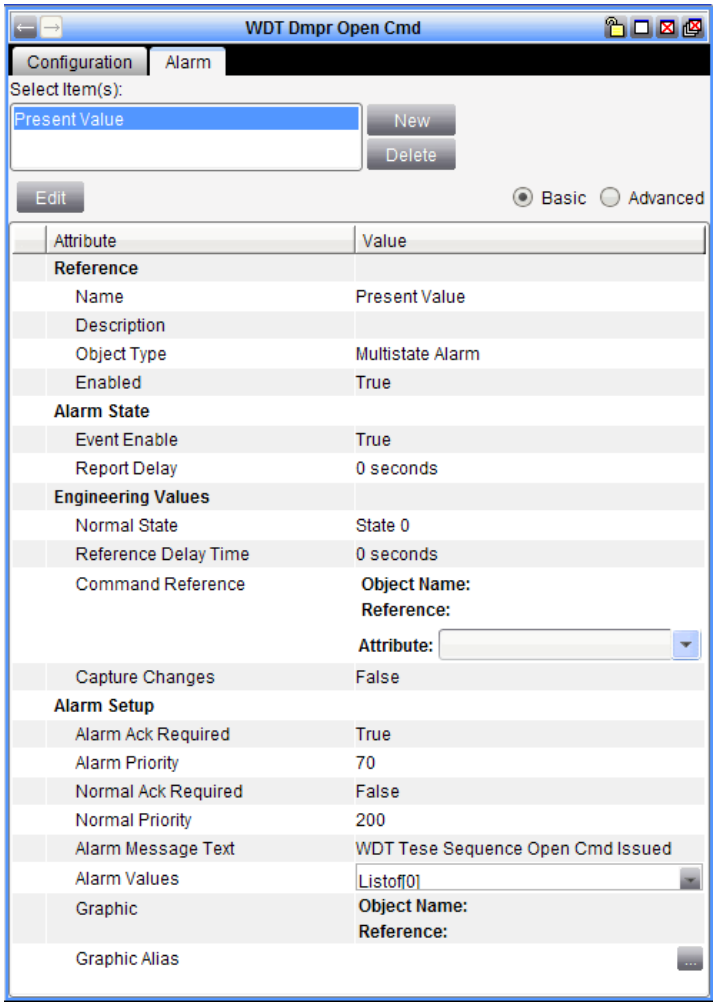

Figure 93: Weekly Dedicated Test Damper Open Command Screen

WDT Damper Close Command

When the Weekly Dedicated Test commands the damper to the Closed position, an alarm message appears as shown in the Alarm Message Text of Figure 94.

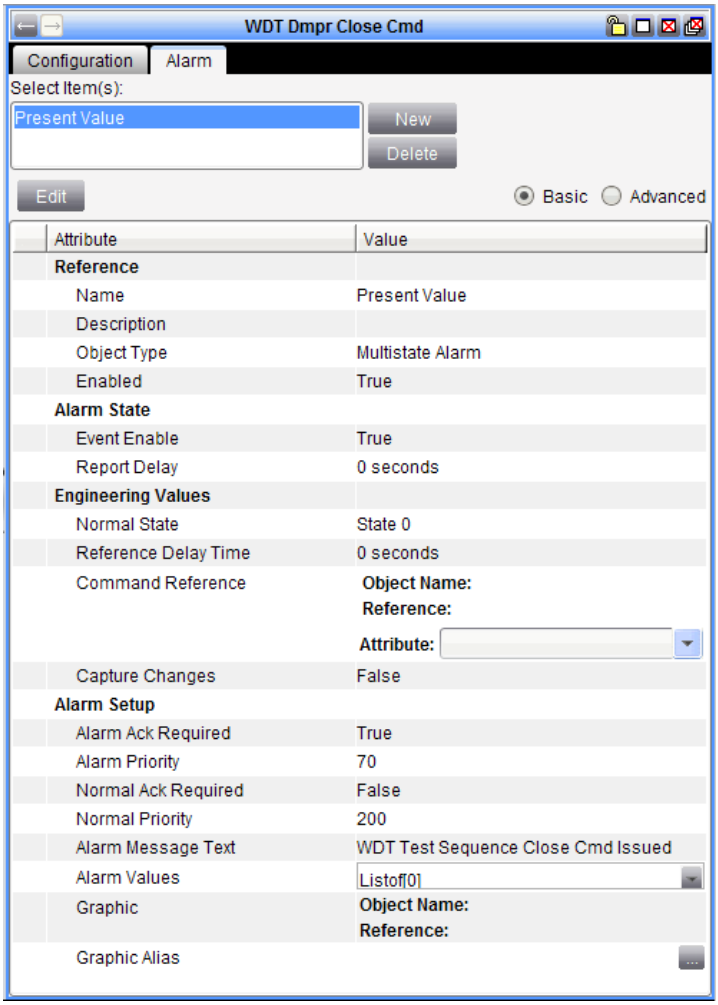

Figure 94: Weekly Dedicated Test Damper Close Command Screen

WDT Complete

When the weekly dedicated test completes with no errors, an alarm message appears as shown in the Alarm Message Text of Figure 95.

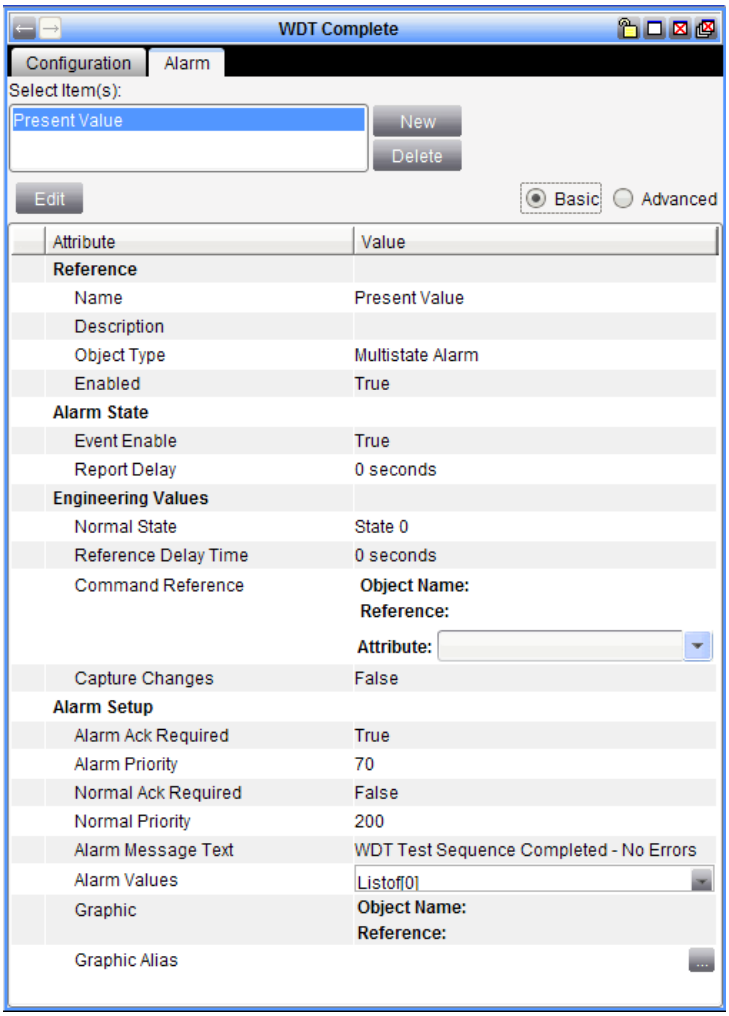

Figure 95: Damper Weekly Dedicated Test Complete

WDT Failure Sequence Interlock Definition

The WDT Failure Sequence Interlock Definition issues an alarm in the event the damper fails to meet its commanded state and then terminates the weekly test (Figure 96).

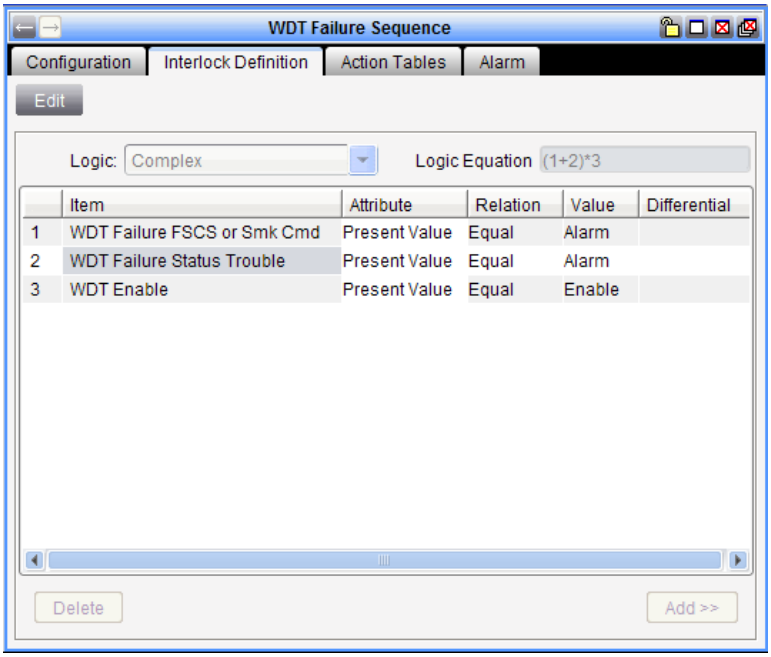

Figure 96: WDT Failure Sequence Interlock Definition Screen

WDT Failure Sequence Action Table

The WDT Failure Sequence Action Table, when conditions are True (meaning the test has failed), overrides the test commands and terminates the test (Figure 97).

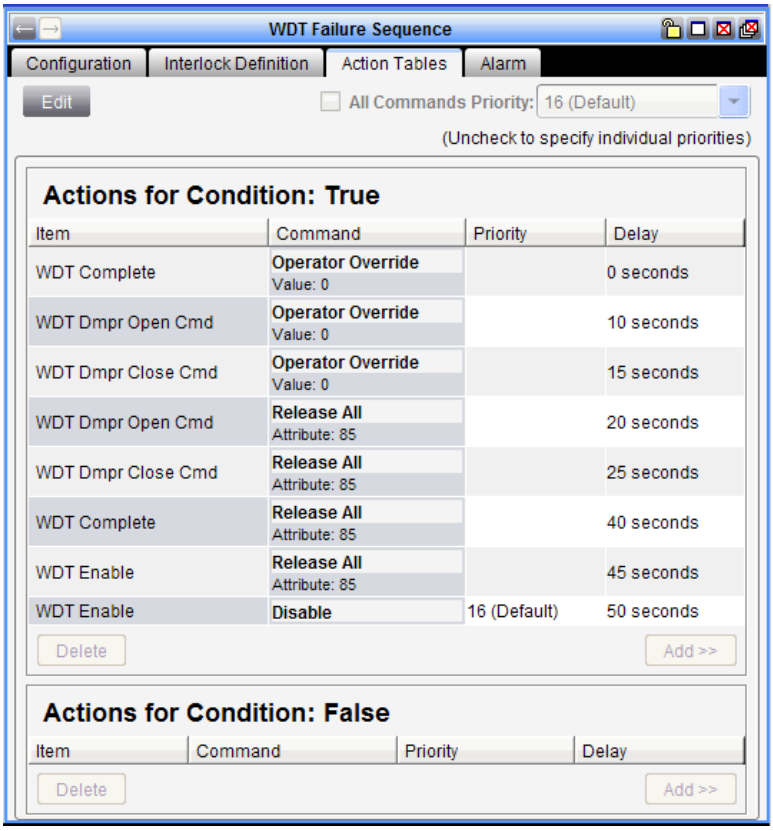

Figure 97: WDT Failure Sequence Action Table

WDT Failure Sequence Alarm

The WDT Failure Sequence Alarm issues an alarm message that the WDT has been terminated (Figure 98).

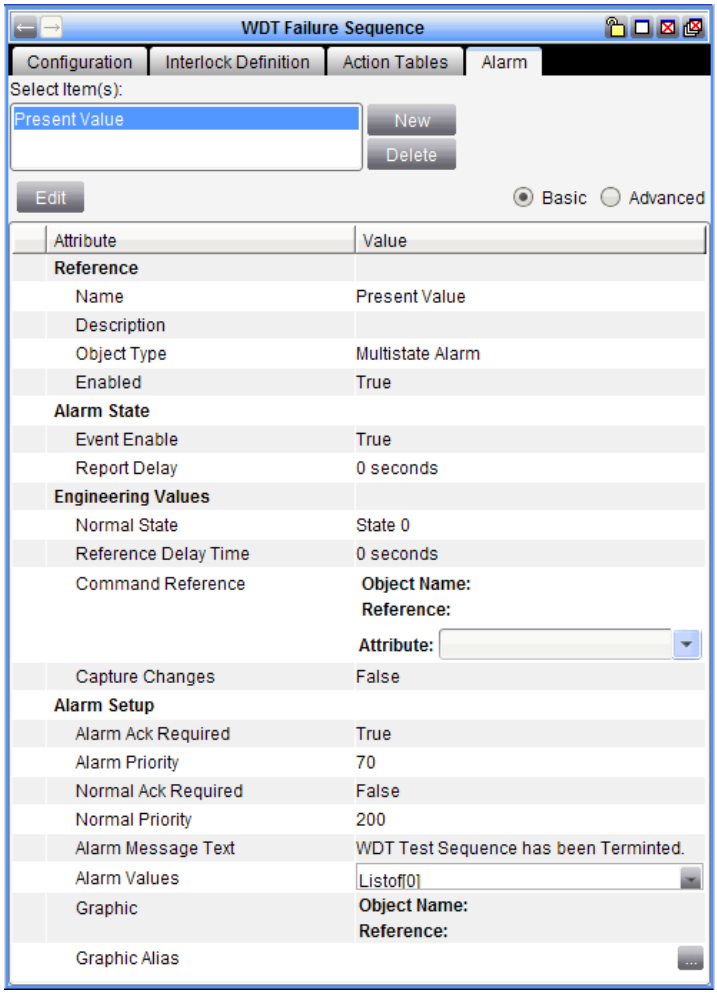

Figure 98: WDT Failure Sequence Alarm Screen

WDT Failure FSCS or Smoke Command

When a smoke control command or manual FSCS command is issued during the weekly dedicated test, the test terminates and an alarm message appears as shown in the Alarm Message Text of Figure 99.

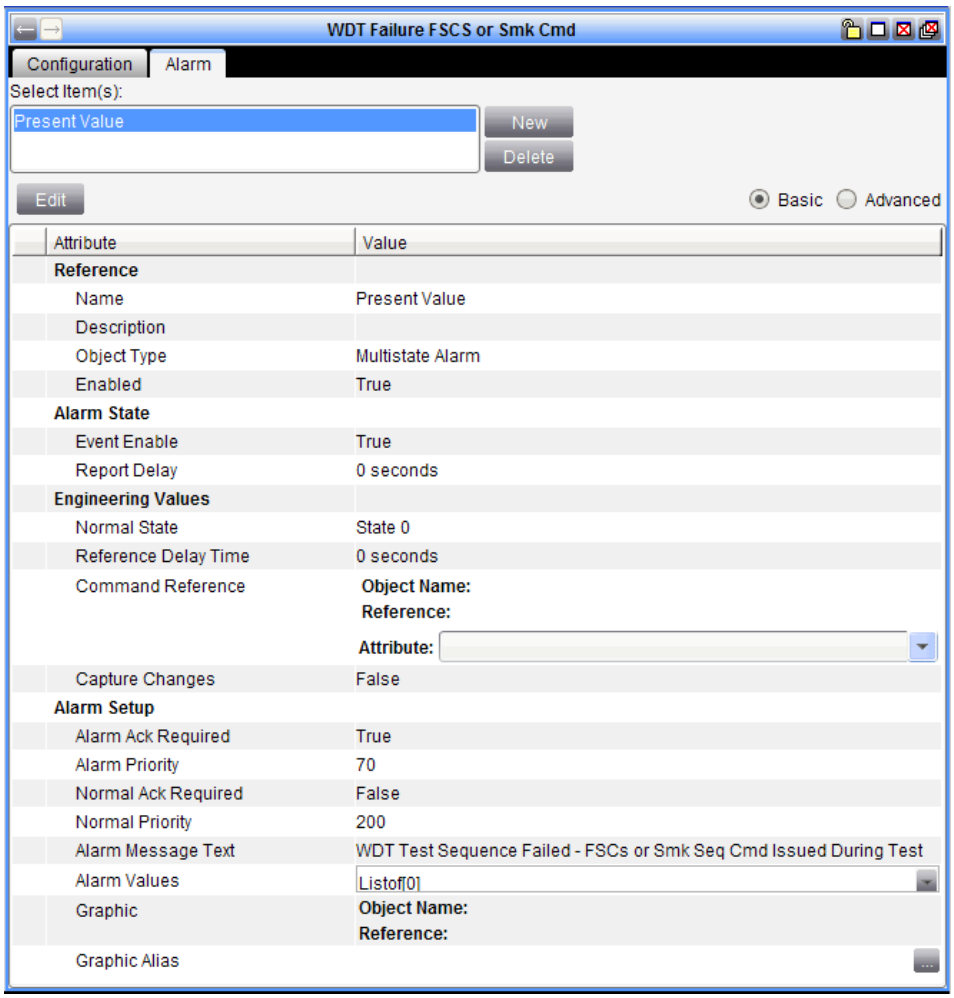

Figure 99: Damper WDT Failure FSCS or Smoke Command

WDT Failure Status Trouble

When the weekly dedicated test terminates due to a device not meeting its expected commanded condition, an alarm message appears as shown in the Alarm Message Text of Figure 100.

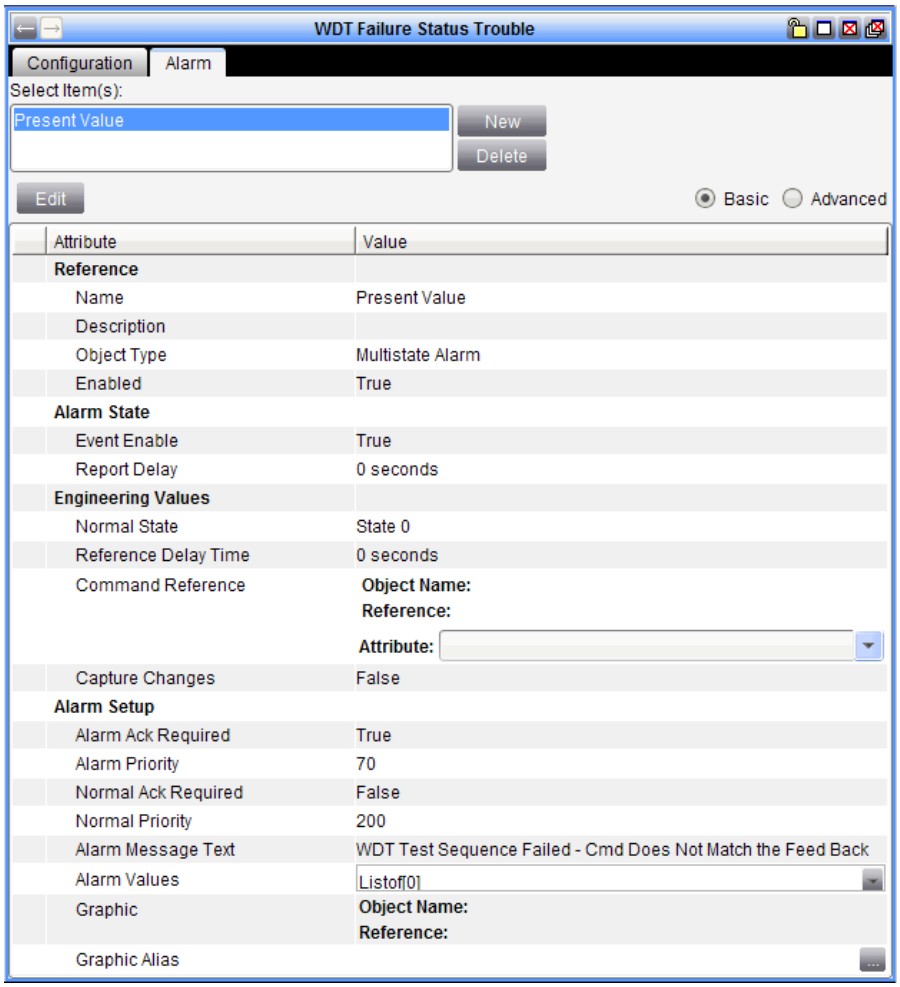

Figure 100: Damper WDT Failure Status Trouble Screen

Vxx (VMA/VAV) Folder

Vxx Device Commands

Since there can be multiple Vxx devices per zone, when a manual or automatic smoke control command is sent to a Vxx, **all** Vxx devices in that zone **must** respond to that command.

Vxx Objects

Figure 101 shows all objects associated with any Vxx type. The FSCS folder is shown since some of the Vxx's logic references these points.

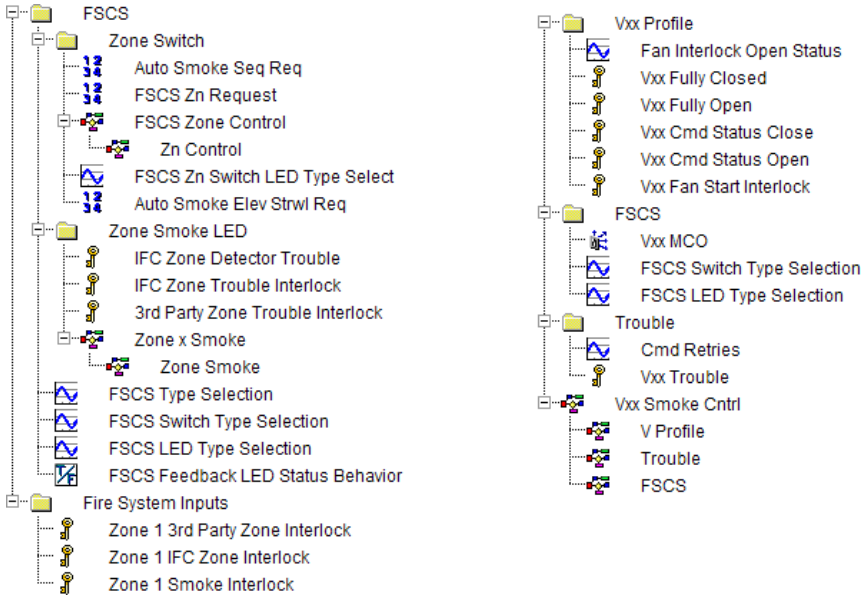

Figure 101: All Vxx Objects

FSCS VAV/VMA Switch

The FSCS's VAV/VMA switch (Figure 102) is a three-position toggle switch with four LEDs. The three switch positions are Open, Auto, and Close, each with its associated LED. The Trouble LED illuminates when trouble is present for the VAV/VMA. Its flash rate shows its acknowledged/unacknowledged status.

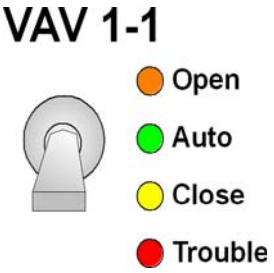

Figure 102: ADI FSCS VAV/VMA Switch

Table 38: VAV/VMA Switch - 3-Position Toggle, 4 LEDs

Switch Position	Switch Setting	Associated With	LED	Description
1	Manual Open	MS/TP banked LEDs	Open	Illuminates the Open LED when the switch is in position 1 and the associated feedback point is correct. Turns the Open LED off when in any other position.
2	Auto		Auto	Illuminates the Auto LED when the switch is in position 2 and the associated feedback point is correct. Turns the Auto LED off when in any other position.
3	Manual Close		Close	Illuminates the Close LED when switch is in position 3 and the associated feedback point is correct. Turns the Close LED off when in any other position.
N/A	N/A	Single LED	Trouble	Flashes at a fast rate when Trouble exists. When acknowledged, flashes at a slower rate. Turns the Trouble LED off when Trouble is cleared.

Vxx Logic

The Vxx's main logic (Figure 103) consists of the Vxx inputs (Figure 104), Profile Block (Figure 105), FSCS Block (Figure 113), Trouble Block (Figure 115), and the Vxx outputs.

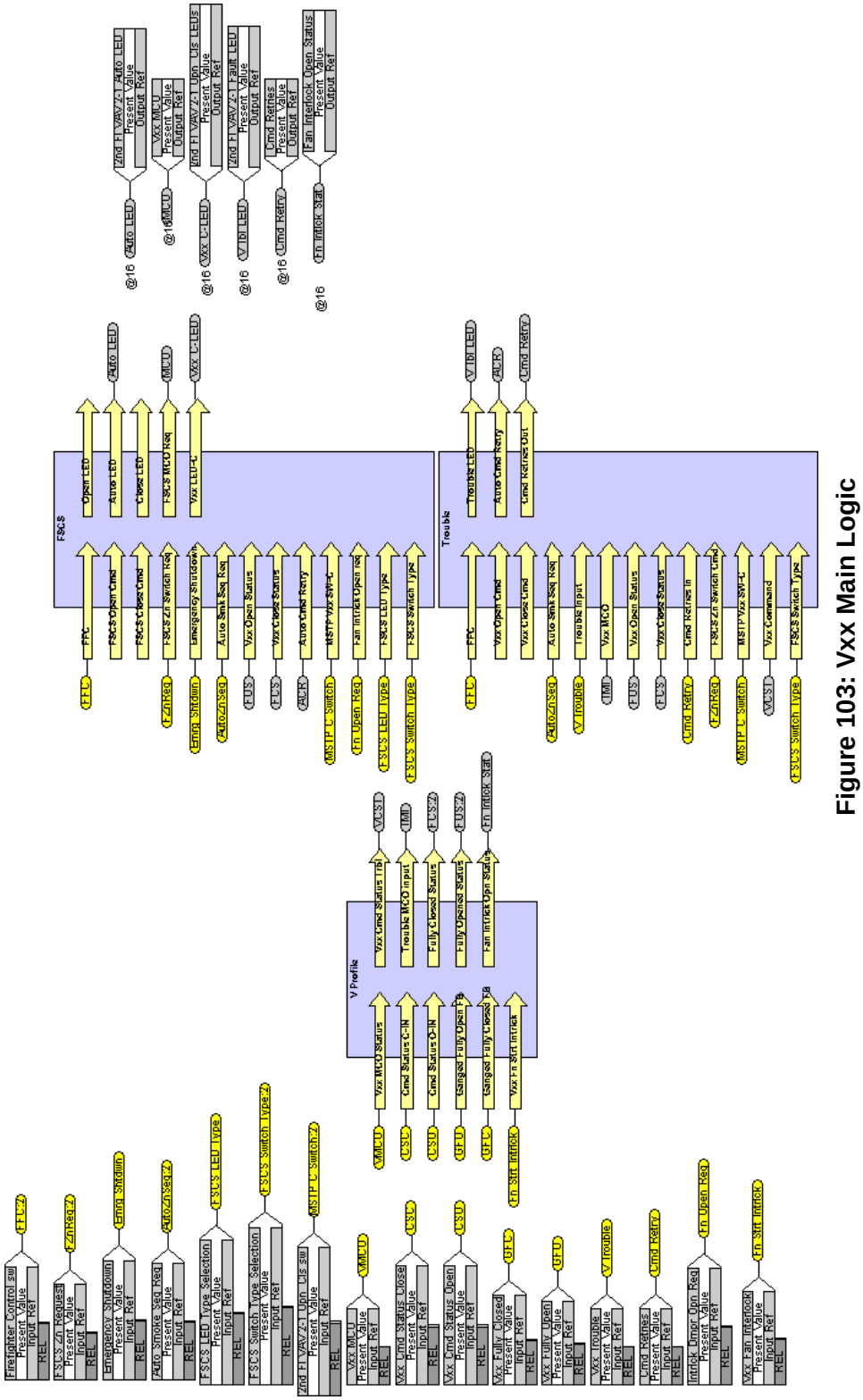

Figure 103: Vxx Main Logic

Vxx Logic Inputs

Figure 104 shows the Vxx's logic inputs for all Vxx devices.

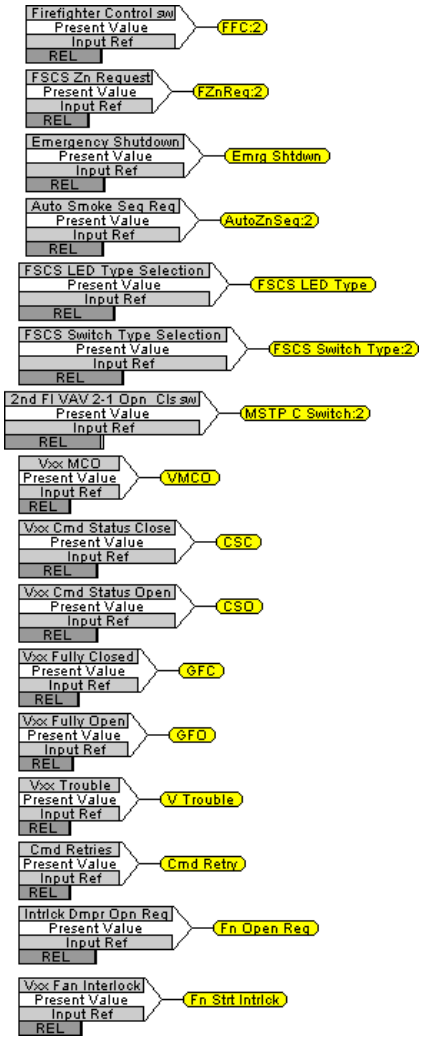

Figure 104: Vxx Logic Inputs (Dry Contact Feedback)

Vxx Input Connections List

Table 39 shows the Vxx's inputs and their system control block connections.

IMPORTANT: VAV/VMAs that are incorrectly configured prevent proper smoke control sequence operation.

Table 39: Vxx Input Connections (Part 1 of 3)

Input Source	Vxx Inputs	Label	Description	Control System Block	Control System Block Input
FSCS Controller	Firemans Key	FFC:2	Panel enable keyswitch position **States:** 0 = Auto 1 = Firefighter Control	FSCS	FFC
				Trouble	FFC
Zone Switch Folder	FSCS Zn Request	FZnReq:2	Zone request to control Vxx **States:** 0 = Normal 1 = Pressurize 2 = De-Pressurize 3 = Purge	FSCS	FSCS Zn Switch Req
				Trouble	FSCS Zn Switch Cmd
AHU Emergency Shutdown Control Folder	Emergency Shutdown	Emrg Shtdwn	Interlock to do an emergency shutdown of the AHU **States:** 0 = AHU run enable 1 = Emergency AHU shutdown	FSCS	Emergency Shutdown
FSCS Zone Switch Folder	Auto Smoke Seq Req	AutoZnSeq:2	Auto smoke control request **States:** 0 = Normal 1 = Pressurize 2 = De-Pressurize	FSCS	Auto Smk Seq Req
				Trouble	Auto Smk Seq Req
The main FSCS folder of the NxE physically connected to the FSCS	FSCS LED Type Selection	FSCS LED Type	Sets the FSCS LED Type **Selections:**[1] 0 = Individual Output for each feedback status of the Vxx 1 = MS/TP converted 3 position LED bank (AUTO, OPEN, CLOSE) 2 = MS/TP converted 2 position LED bank (OPEN, CLOSE)	FSCS	FSCS LED Type
				Trouble	FSCS Switch Type
The main FSCS folder of the NxE physically connected to the FSCS	FSCS Switch Type Selection	FSCS Switch Type:2	Sets the FSCS Switch Type **Selections:**[1] 0 = Individual Binary Input for each switch position 1 = MS/TP converted 3 position Banked Switch (AUTO, OPEN, CLOSE) 2 = MS/TP converted 2 position Banked Switch (OPEN, CLOSE)	FSCS	FSCS Switch Type
				Trouble	FSCS Switch Type
FSCS Controller	VAV Open Close Switch	MSTP C Switch:2	FSCS control switch for a Vxx **States:** 0 = Auto 1 = Open 2 = Close	FSCS	MSTP Vxx SW-C
				Trouble	MSTP Vxx SW-C

Table 39: Vxx Input Connections (Part 2 of 3)

Input Source	Vxx Inputs	Label	Description	Control System Block	Control System Block Input
Vxx FSCS Folder	Vxx MCO	VMCO	Checks status of the Vxx MCO command **States:** 0 = Auto 1 = Open 2 = Closed 3 = 100% 4 = 0% 5 = Emergency Shutdown 6 = Pressurize (Zone Switch) 7 = De-pressurize (Zone Switch) 8 = Purge (Zone Switch) 9 = Pressurize (Auto Smoke Seq) 10 = De-pressurize (Auto Smoke Seq) 11 = WDT Open 12 = WDT Close	Profile	Vxx MCO Status
Vxx Profile Folder	Vxx Cmd Status Closed	CSC	Ganged command status- All Vxx closed command status	Profile	Cmd Status C-IN
Vxx Profile Folder	Vxx Cmd Status Open	CSO	Ganged command status- All Vxx open command status	Profile	Cmd Status O-IN
Vxx Profile Folder	Vxx Fully Closed	GFC	Ganged fully closed Vxx feedback Binary Representation of all Vxx associated with the AHU. Every Vxx on the output of the AHU must be FULLY CLOSED for this to be TRUE.	Profile	Ganged Fully Closed FB

Table 39: Vxx Input Connections (Part 3 of 3)

Input Source	Vxx Inputs	Label	Description	Control System Block	Control System Block Input
Vxx Profile Folder	Vxx Fully Open	GFO	Ganged fully open Vxx feedback. Binary Representation of all Vxx associated with the AHU. Every Vxx on the output of the AHU must be FULLY OPEN for this to be TRUE.	Profile	Ganged Fully Open FB
VMA Trouble Folder	Vxx Trouble	V Trouble	Vxx trouble condition met **States:** 0 = Normal 1 = Trouble condition	Trouble	Trouble Input
VMA Trouble Folder	CMD Retries	Cmd Retry	Accumulator for the number of command retries. Value clears when the command is satisfied or the condition requiring the command is no longer active.	Trouble	Cmd Retries In
Supply Fan FSCS Folder	Intrlck Dmpr Opn req	Fn Open Req	Fan requesting the Vxx to open to its setpoint before the fan can start. **States:** 0 = Normal 1 = Request to open	FSCS	Fan Intrlck Open Req
Vxx Profile Folder	Vxx Fan Interlock	Fan Strt Intrlck	Allows the fan to turn on when the interlock is satisfied.	Profile	Fan Start Interlock

1. All **Selections** must be configured during the initial Vxx programming. Set the point's default value to the same value as the desired setup value to ensure the selection is maintained in the event that the NxE restarts. Archive and upload the NxE database to the SCT database to save all changes for the Vxx configuration to prevent overwriting desired values on a download to the NxE.

Vxx Profile Block

Figure 105 shows the Vxx's Profile block and its inputs and outputs.

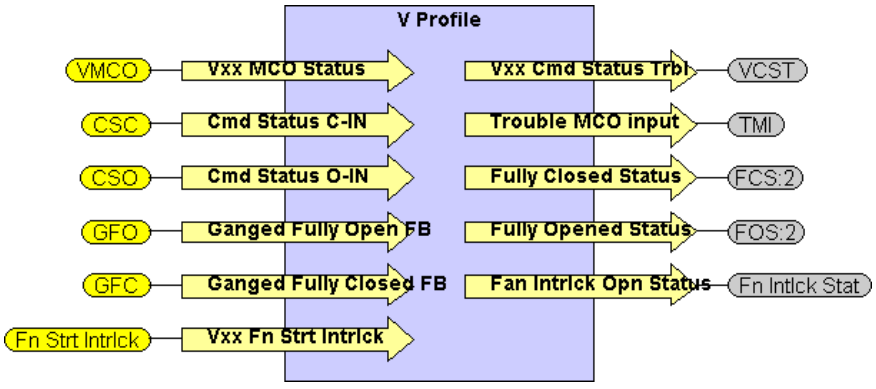

Figure 105: Vxx Profile Block

Vxx Profile Block Inputs

Table 40: Vxx Profile Block Inputs

Inputs	Label	Description / Logic Value
Vxx MCO Status	VMCO	Vxx MCO command from the Vxx FSCS folder's **Vxx MCO** point to the field controller's Vxx point
Vxx Cmd Status Close	CSC	Status of the Vxx Profile block's **Vxx Cmd Status Close** point
Vxx Cmd Status Open	CSO	Status of the Vxx Profile block's **Vxx Fully Open** interlock
Vxx Fully Closed	GFC	Status of the Vxx Profile block's **Vxx Fully Closed** interlock
Vxx Fully Open	GFO	Status of the Vxx Profile block's **Vxx Fully Opened** interlock
Vxx Fan Interlock Open Status	Fn Intrlck Opn Status	Damper is open enough for the fan to turn on.

Vxx Profile Block Outputs

Table 41: Vxx Profile Block Outputs

Outputs	Label	Description / Logic Value	Control System Block	Control System Block Input
Vxx Cmd Status Trbl	VCST	VMA Command Status Trouble 0 = Auto 1 = Open 2 = Close	Trouble	Vxx Command
Trouble MCO Input	TMI	Trouble MCO Input 0 = Auto 1 = Open 2 = Close	Trouble	Vxx MCO
Fully Closed Status	FCS:2	Damper Fully Closed Status	FSCS	Vxx Close Status
			Trouble	Vxx Close Status
Fully Opened Status	FOS:2	Damper Fully Opened Status	FSCS	Vxx Open Status
			Trouble	Vxx Open Status

Vxx Profile Block Logic

Figure 106 shows the Vxx's Profile Block logic.

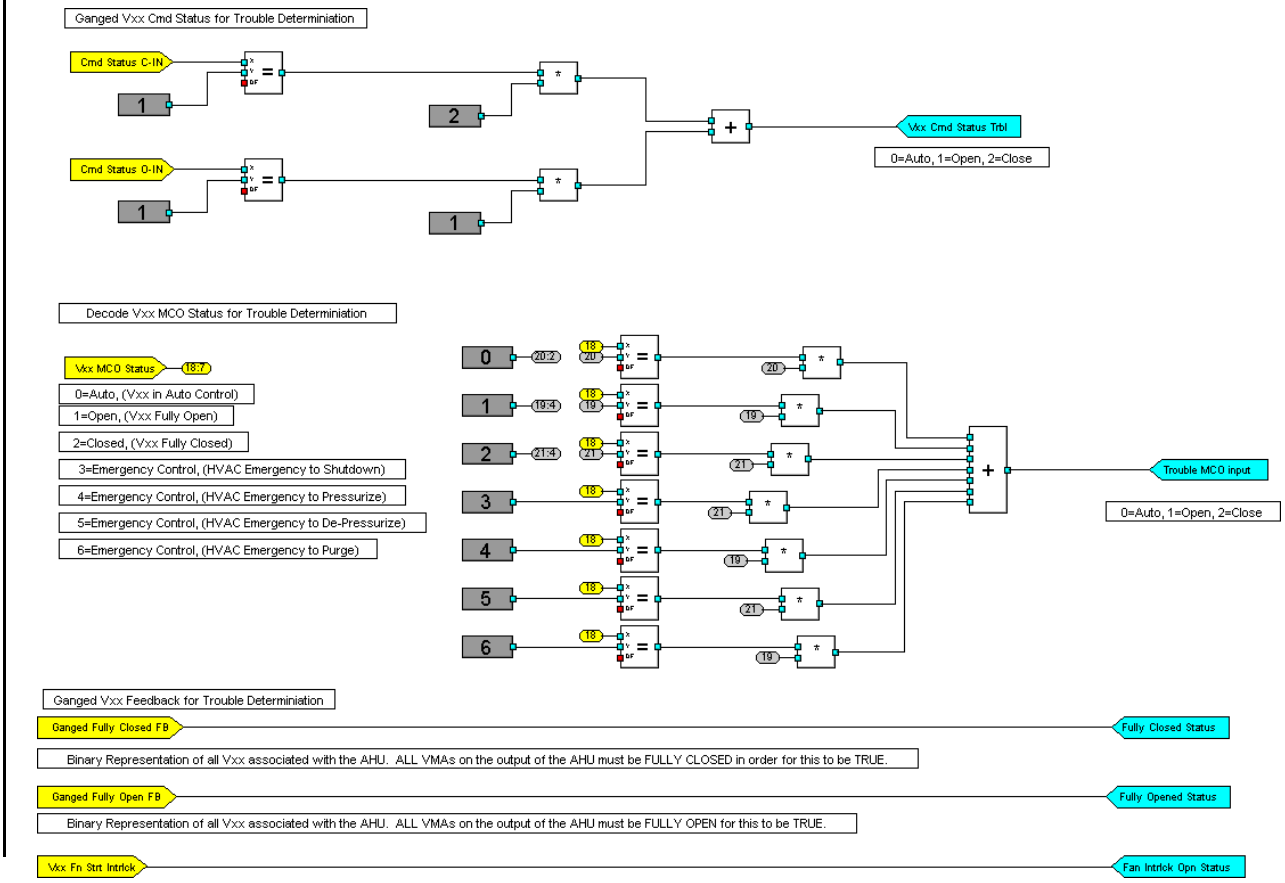

Figure 106: Vxx's Profile Block Logic

Vxx Fan Interlock Open Status

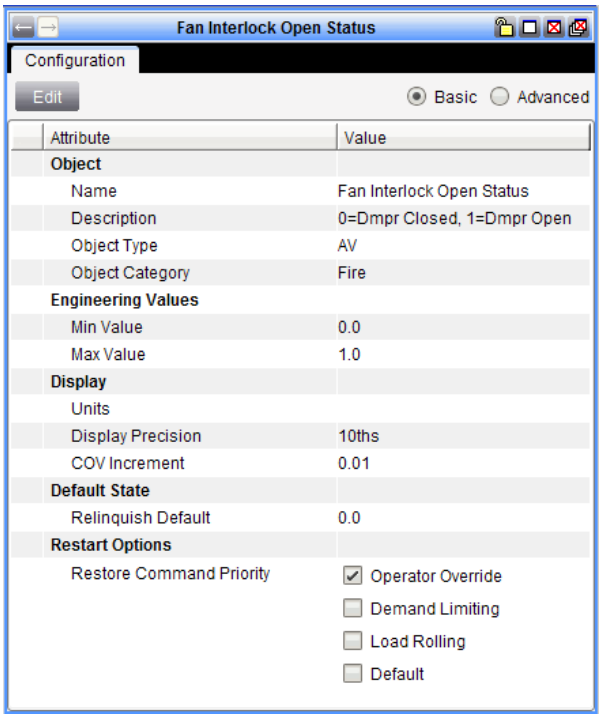

Figure 107: Fan Interlock Open Status

Vxx Fully Closed Interlock Definition

The Vxx Fully Closed Interlock Definition indicates when the VMA damper position is fully closed (Figure 108).

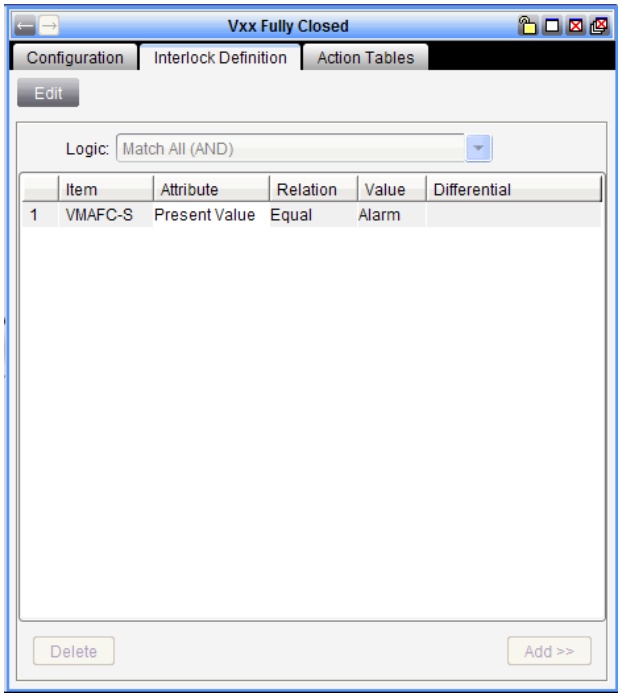

Figure 108: Vxx Fully Closed Interlock

Vxx Fully Open Interlock Definition

The Vxx Fully Open Interlock Definition indicates when the VMA damper position is fully open (Figure 109).

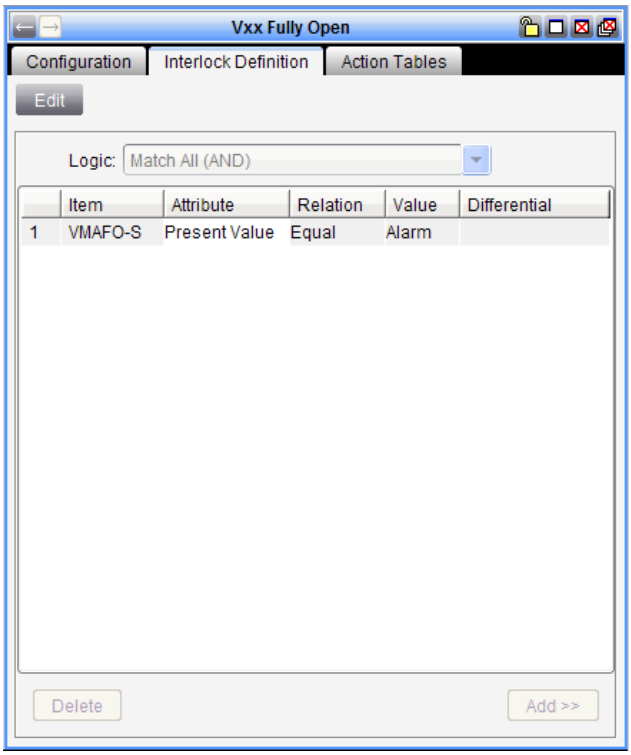

Figure 109: Vxx Fully Open Interlock

Vxx Cmd Status Close Interlock Definition

The Vxx Cmd Status Close Interlock Definition indicates that the VMA damper has been commanded fully closed (Figure 110).

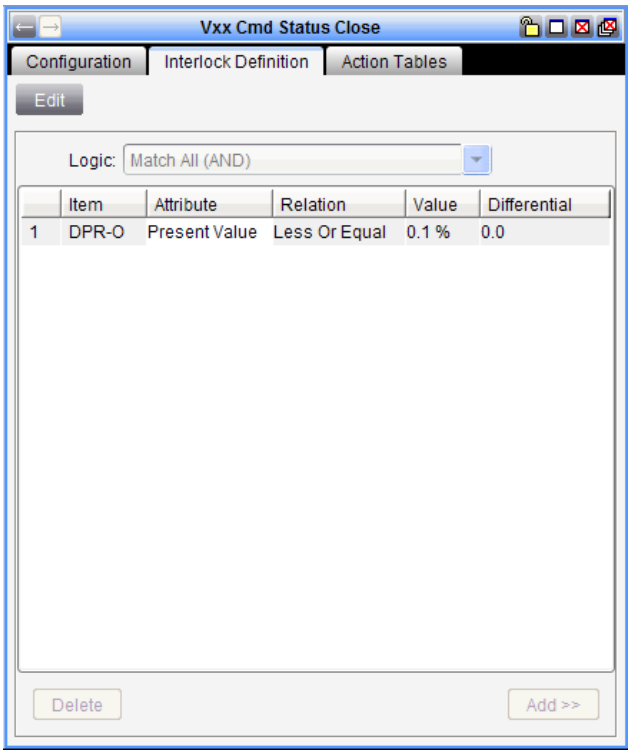

Figure 110: Vxx Cmd Status Close Interlock Definition

Vxx Cmd Status Open Interlock Definition

The Vxx Cmd Status Open Interlock Definition indicates that the VMA damper has been commanded fully open (Figure 111).

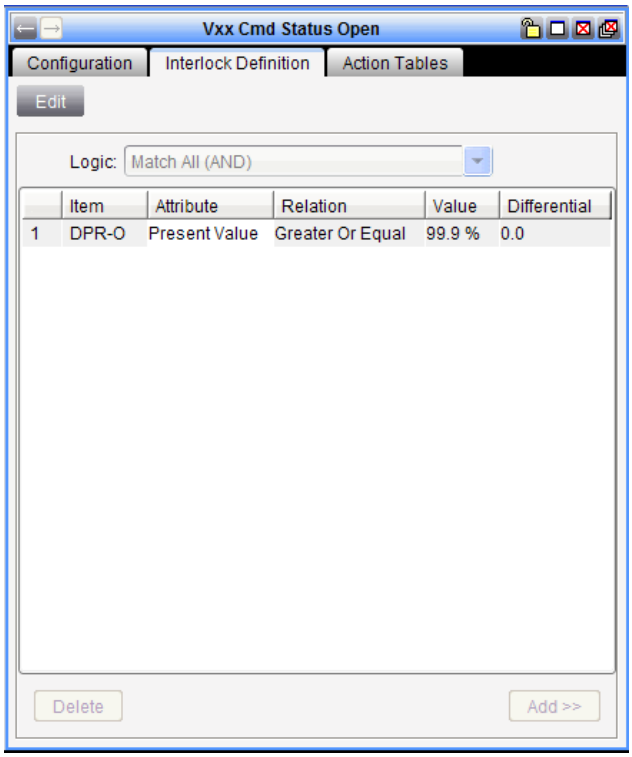

Figure 111: Vxx Cmd Status Open Interlock Definition

Vxx Fan Start Interlock

The Vxx Fan Start Interlock allows the supply fan to start when the damper position is greater than 10% and fully closed status is false (Figure 112).

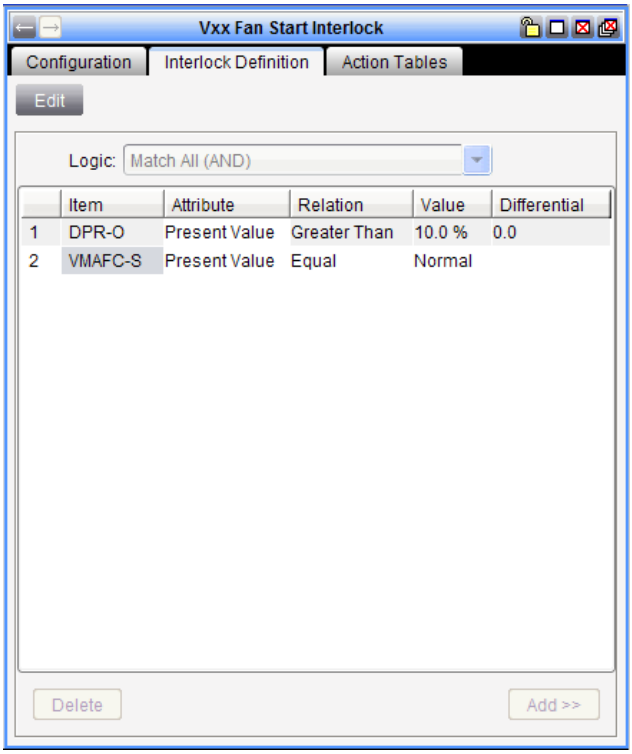

Figure 112: Vxx Fan Start Interlock

Vxx FSCS Block

The Vxx's FSCS block controls the LEDs on the FSCS panel and commands the field controller (Figure 113).

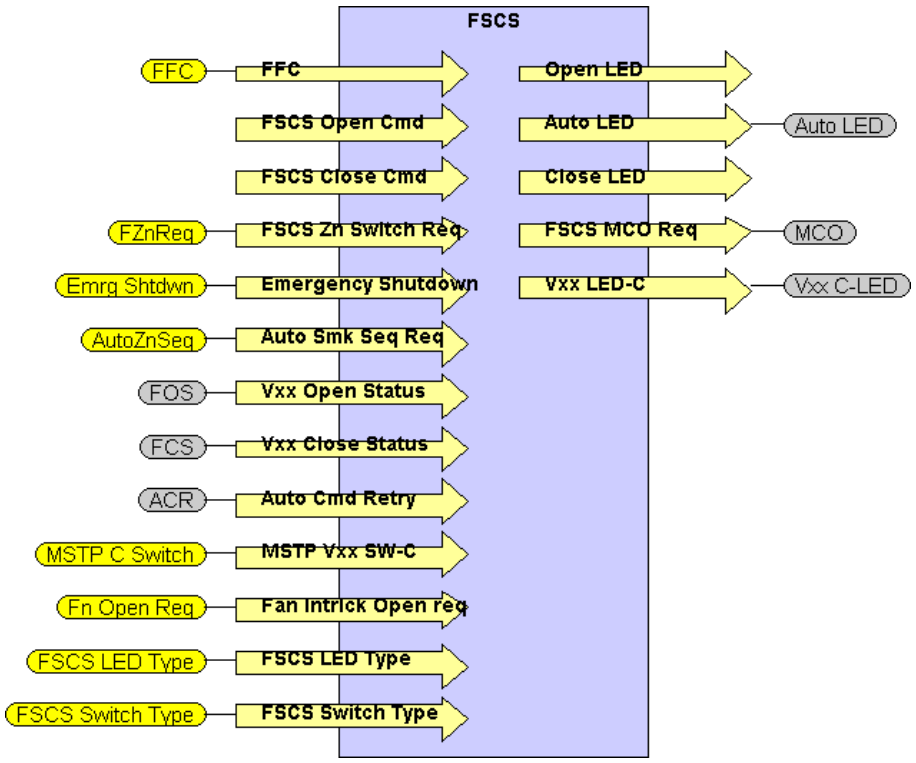

Figure 113: Vxx FSCS Block

Figure 113 shows the Vxx FSCS block logic.

- The Vxx Open LED is turned on only if the FSCS is in Firefighter Control and the Vxx is fully open.
- The Vxx Close LED is turned on only if the FSCS is in Firefighter Control and the Vxx is fully closed.
- The Vxx Auto LED is turned on only if the toggle switch is not in the Open or Closed setting.
- If the Firefighter Control Key is off, the FSCS Request is set to 0.
- If the Firefighter Control Key is on, the FSCS Request is set to the Table 42 values depending on the position of the Vxx's toggle switch.

Table 42: Vxx Toggle Switch FSCS Request Value

FSCS Vxx Toggle Switch Position	FSCS Request State Value	Smoke Control Action
Open	1	Vxx Fully Open
Auto	0	Automatic Smoke Control
Close	2	Vxx Fully Closed

Vxx FSCS Block Inputs

Table 43: Vxx FSCS Block Inputs

Inputs	Label	Description
FFC	FFC	Status of the FSCS MS/TP field controller's **Firemans Key**
FSCS Open Cmd	VxxOpnCmd	This input is active when **FSCS Switch Type Selection** is set to **selection 0**. The actual status of the Fan FSCS binary input for the Open Command.
FSCS Close Cmd	VxxCloCmd	This input is active when **FSCS Switch Type Selection** is set to **selection 0**. The actual status of the Fan FSCS binary input for the Close Command.
FSCS Zn Switch Req	FZnReq	Status of the FSCS Zone Switch folder's **FSCS Zn Request** point
Emergency Shutdown	Emrg Shtdwn	Interlock to do an emergency shutdown of the AHU **States:** 0 = Emergency run enable 1 = Emergency AHU shutdown
Auto Smk Seq Req	AutoZnSeq	Auto smoke control request **States:** 0 = Normal 1 = Pressurize 2 = De-Pressurize
Vxx Open Status	FOS	Status of the Vxx Profile block's output - **Fully Opened Status**
Vxx Closed Status	DCS	Status of the Vxx Profile block's output - **Fully Closed Status**
Auto Cmd Retry	ACR	Status of the Vxx Trouble block's output - **Auto Cmd Retry**
MSTP Vxx SW-C	MSTP C Switch	Status of the Vxx FSCS MS/TP controller's **Vxx Control Switch** point
Fan Intrlck Open Req	FN Open Req	Status of the Supply Fan FSCS folder's **Intrlck Dmpr Opn Req** point
FSCS LED Type Selection	FSCS LED Type	FSCS LED Configuration 0 = Individual LED 1 = Ganged 3 LED 2 = Ganged 2 LED
FSCS Switch Type Selection	FSCS Switch Type	FSCS Switch Configuration 0 = Individual Switch 1 = 3 Ganged Switch 2 = 2 Ganged Switch

Vxx FSCS Block Outputs

Table 44: Vxx FSCS Block Outputs

Outputs	Label	Description
Open LED	N/A	(Future)
Auto LED	N/A	(Future)
Close LED	N/A	(Future)
FSCS MCO Req	MCO	Vxx MCO command to the field controller 0 = Auto (AHU in Automatic Control) 1 = Open (Fully Open Damper) 2 = Close (Fully Close Damper) 3 = Emergency Shutdown (HVAC Emergency Command to Shutdown) 4 = Emergency Shutdown (HVAC Emergency Command to Pressurize) 5 = Emergency Shutdown(HVAC Emergency Command to De-Pressurize) 6 = Emergency Shutdown (HVAC Emergency Command to Purge) 7 = Pressurize (Auto Smoke Sequence) 8 = De-pressurize (Auto Smoke Sequence)
Vxx LED-C	Vxx C-LED	FSCS LED indication for the Vxx **States:** 0 = No request 1 = Request interlocked Vxx(s) to open

Vxx FSCS Block Logic

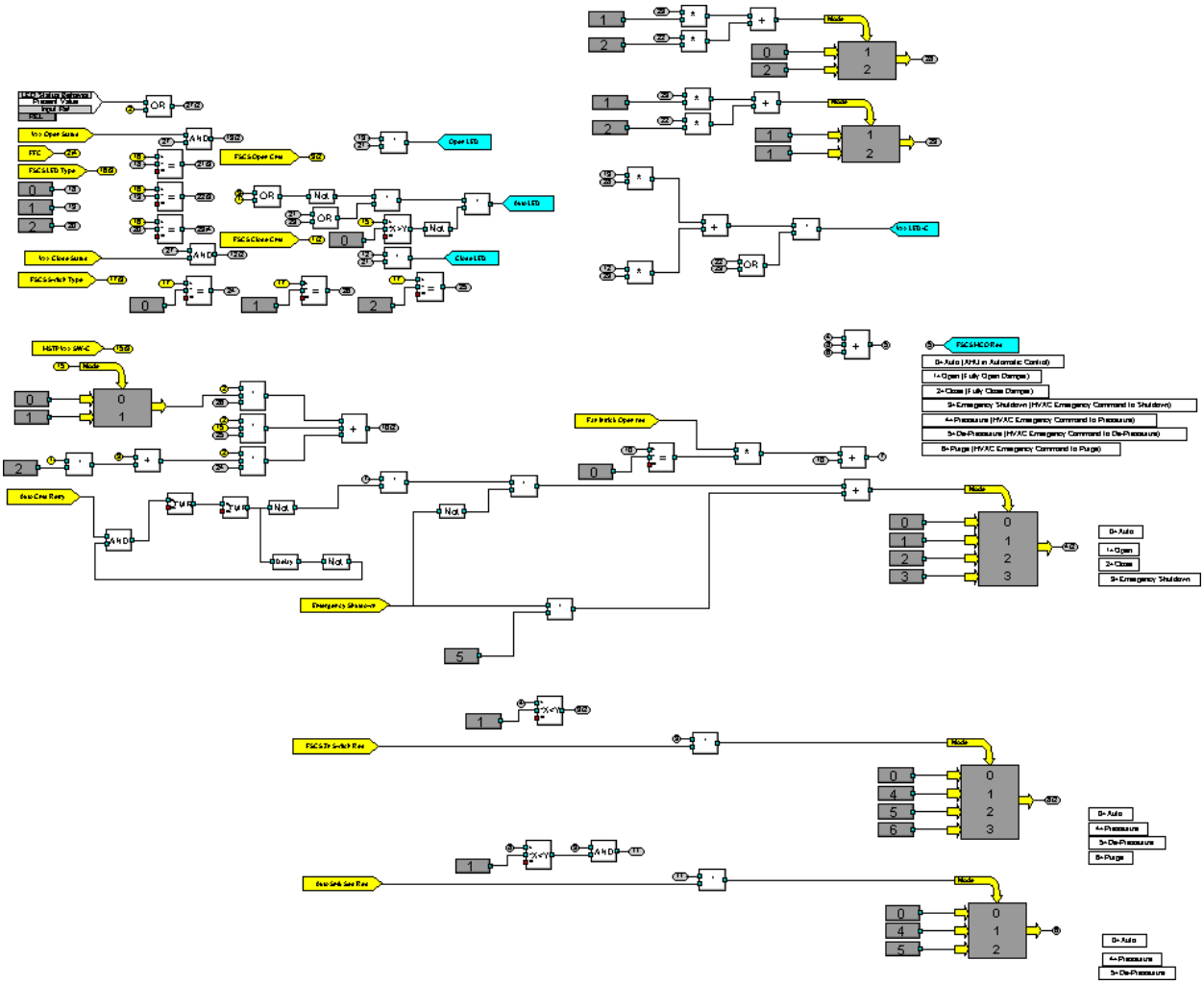

Figure 114: Vxx's FSCS Block Logic

Vxx Trouble Block

The Vxx's Trouble block sets the FSCS's Vxx Trouble LED.

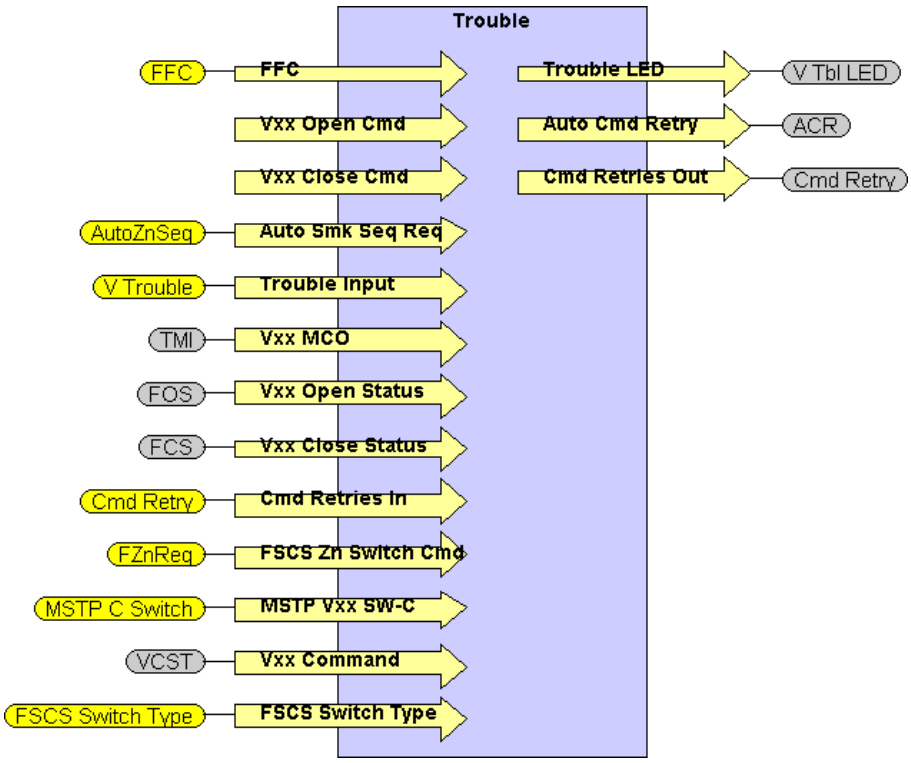

Figure 115: FSCS Vxx Trouble Block

Vxx Trouble Block Inputs

Table 45: Vxx Trouble Block Inputs

Inputs	Label	Description
FFC	FFC	Status of the FSCS MS/TP field controller's **Firemans Key**
Vxx Open Cmd	VxxOpnCmd	This input is active when **FSCS Switch Type Selection** is set to **selection 0**. The actual status of the Vxx FSCS binary input for the Open Command
Vxx Close Cmd	VxxCloCmd	This input is active when **FSCS Switch Type Selection** is set to **selection 0**. The actual status of the Vxx FSCS binary input for the Close Command
Auto Smk Seq Req	AutoZnSeq	Status of the FSCS Zone Switch folder's **Auto Smoke Seq Req** point
Trouble Input	V Trouble	Status of the Vxx Trouble block folder's **Vxx Trouble** point
Vxx MCO	TMI	Status of the Vxx Profile block's output - **Trouble MCO Input**
Vxx Open Status	FOS	Status of the Vxx Profile block's output - **Vxx Fully Open**
Vxx Close Status	FCS	Status of the Vxx Profile block's output - **Vxx Fully Closed**
Cmd Retries In	Cmd Retry	Status of the Vxx Trouble folder's **CMD Retries** point
FSCS Zn Switch Cmd	FZnReq	Status of the FSCS Zone Switch folder's **FSCS Zn Request** point
MSTP Vxx SW-C	MSTP C Switch	Status of the Vxx FSCS MS/TP field controller's **Vxx Control Switch** point
Vxx Command	VCST	Status of the Vxx Profile block's output - **Vxx Cmd Status Trbl**
FSCS Switch Type Selection	FSCS Switch Type	Status of the FSCS folders FSCS Switch Type Selection Point 0 = Individual Switch 1 = 3 Ganged Switch 2 = 2 Ganged Switch

Vxx Trouble Block Outputs

Table 46: Vxx Trouble Block Outputs

Outputs	Label	Description	Output
Trouble LED	V Tbl LED	FSCS's Trouble LED indication for the Vxx **States:** 0 = Off 1 = On 2 = Slow blink 3 = Fast blink	Commanded value of the Vxx FSCS MS/TP field controller's **Vxx Trouble LED Indicator** point
Auto Cmd Retry	ACR	When a Vxx command fails, this retries the command until the command succeeds or the condition that required the command is no longer active.	Commanded value of the Vxx Trouble block's output - **Auto Cmd Retry**
Cmd Retries Out	Cmd Retry	Increments the value of the Accumulator for the number of command retries. Value clears when the command is satisfied or the condition requiring the command is no longer active.	Increments the value of the Vxx Trouble folder's **Cmd Retries** point

Vxx Trouble Logic

Figure 116 shows the Vxx Trouble block logic. The Trouble LED is turned on if the Vxx is in smoke control and the damper has not reached its desired setpoint within 75 seconds. A Vxx is in smoke control if either the field controller is in pressurize or depressurize mode, or the Firefighter Control Key is on and the FSCS Vxx toggle switch is set to Open or Close. If a Vxx does not reach its commanded state and goes into Trouble, the Auto Retry Command logic retries the command every 60 seconds.

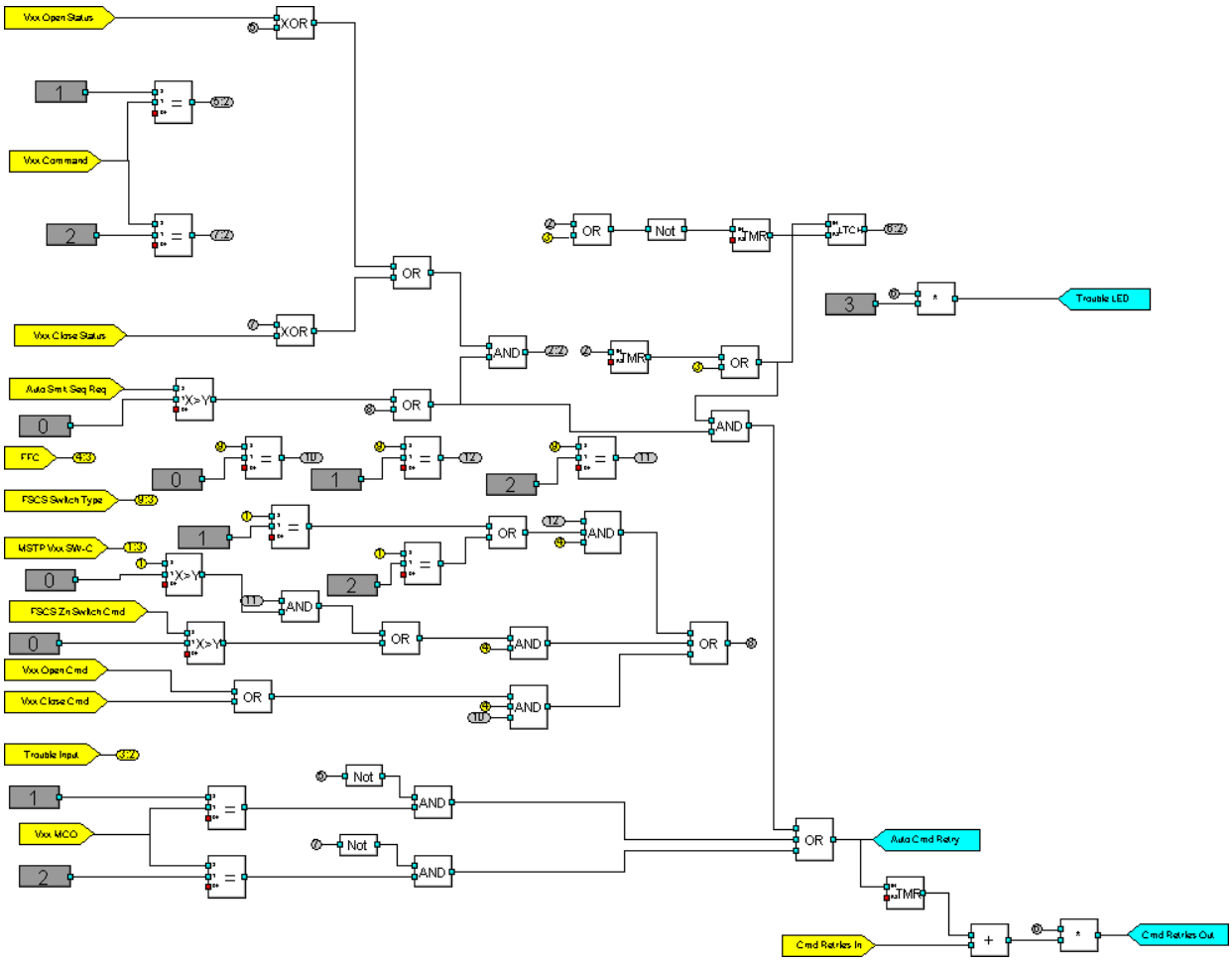

Figure 116: Vxx Trouble Control Block Logic

Cmd Retries

When a fan or damper trouble is locked in, the analog value sends the command every 60 seconds until the fan reaches its intended position or the smoke event is cleared and the logic is reset (Figure 117).

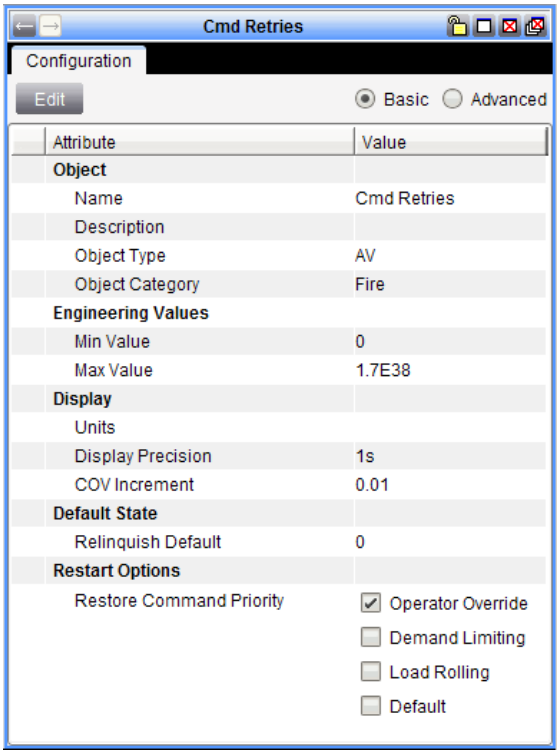

Figure 117: Cmd Retries

Vxx Trouble Interlock Definition

The Vxx Trouble Interlock Definition sets the values that, when reached, triggers an FSCS Vxx Trouble alarm (Figure 118). The definition triggers an FSCS Vxx Trouble alarm if the Supply Air Damper goes into a trouble state or if an offline or communication disabled status is reported for either the Vxx or the differential pressure sensor used to monitor airflow.

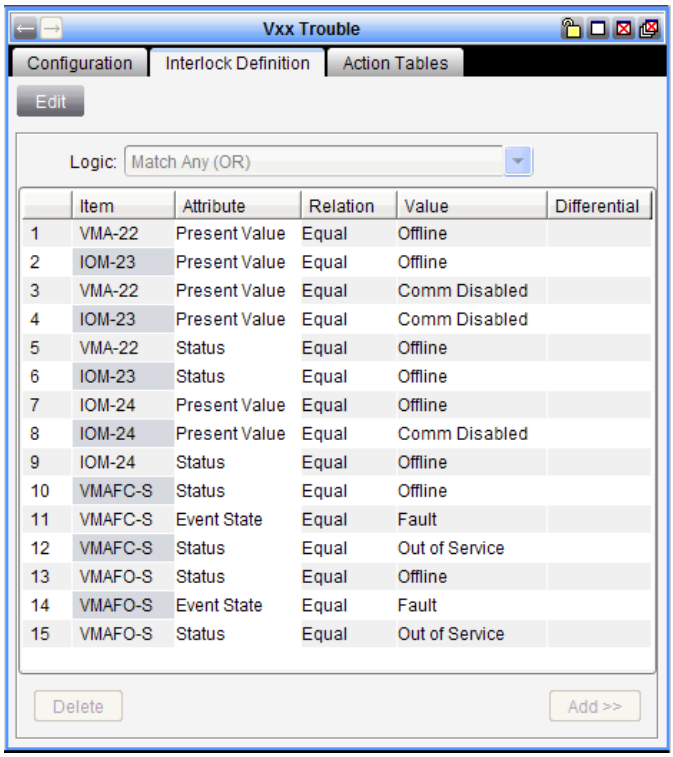

Figure 118: Vxx Trouble Interlock Definition

Vxx Outputs

Table 47: Vxx Output Connections

Control System Block	Control System Block Output	Label	Damper Output	Description	Output Destination
FSCS	Vxx Auto LED	Auto LED	**VMA Auto LED**	FSCS Auto LED indication for the Vxx **States:** 0 = Off 1 = On	Commanded value of the Vxx FSCS MS/TP field controller's **Vxx Auto LED Indicator** point
FSCS	FSCS MCO Req	MCO	**Vxx MCO**	Vxx MCO command to field controller **States:** 0 = Auto 1 = On CV 2 = Off - CV or 2 Speed 3 = VFD 100% 4 = VFD 0% 5 = Emergency Shutdown 6 = Pressurize 7 = De-Pressurize 8 = Purge 9 = WDT Fan On 10 = WDT Fan Off 11 = 2 Speed Fan Slow 12 = 2 Speed Fan Fast	Commanded value of the Vxx FSCS folder's **Vxx MCO** point
FSCS	Vxx Open Close LEDs	Vxx C-LED	**VMA Ind**	FSCS LED indication for the Vxx **States:** 0 = Auto 1 = Open 2 = Close	Commanded value of the Vxx FSCS MS/TP field controller's **Vxx Banked LED Indicator** point
Trouble	Vxx Fault LED	V Tbl LED	**VMA Trouble Ind**	Vxx Trouble condition met **States:** 0 = Off 1 = On (Not used) 2 = Slow flash (Acknowledged) 3 = Fast flash (Unacknowledged)	Commanded value of the Vxx FSCS MS/TP field controller's **Vxx Trouble LED Indicator** point
Trouble	Cmd Retries Out	Cmd Retry	**Cmd Retries**	Accumulator for the number of command retries. Value clears when the command is satisfied or the condition requiring the command is no longer active.	Commanded value of the Vxx Trouble folder's **Cmd Retries** point
Profile	Fan Intrlck Opn Stat	Fn Intlck Stat	**Fan Interlock Open Status**	Interlocked Vxx Open request prior to starting the fan. Vxx must reach its Open setpoint before the fan can start. **States:** 0 = Normal 1 = Damper Open request	Commanded value of the Vxx Profile folder's **Fan Interlock Open Status** point

Multi-Story Building Automatic Smoke Control

Figure 119 shows the FSCS and MS/TP field device connections. The field controllers in this example are MS/TP controllers. You can use any combination of controllers as required by the physical devices installed at the smoke control site.

Multi-Story Building Field Device Connections

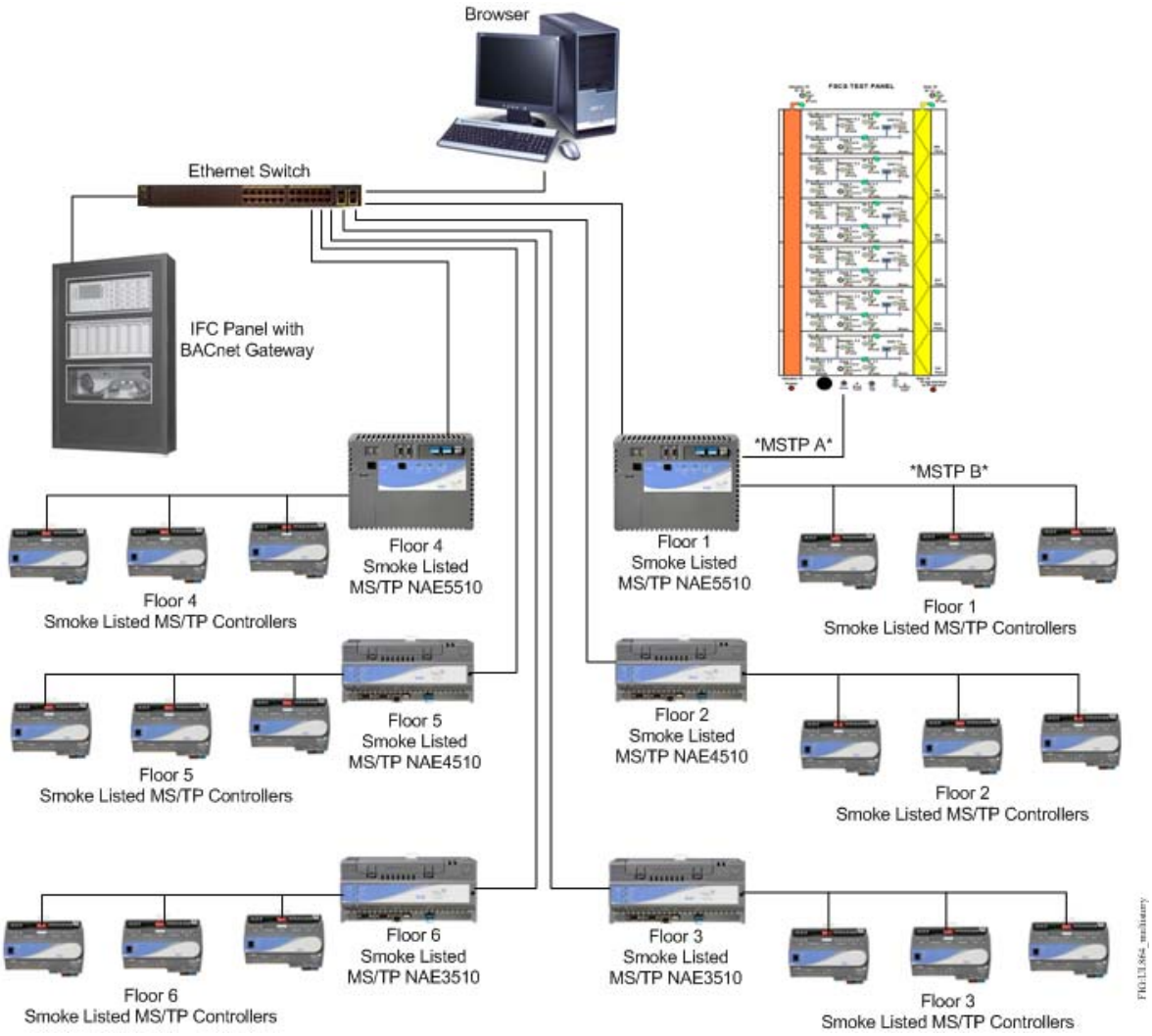

Figure 119: Multi-Story Building Field Device Connections

Building Overview

The building in this application is a six-story building with elevator and stairwell pressurization fans. For better detail visibility, only Floor 3 through Floor 6 are shown (Figure 120).

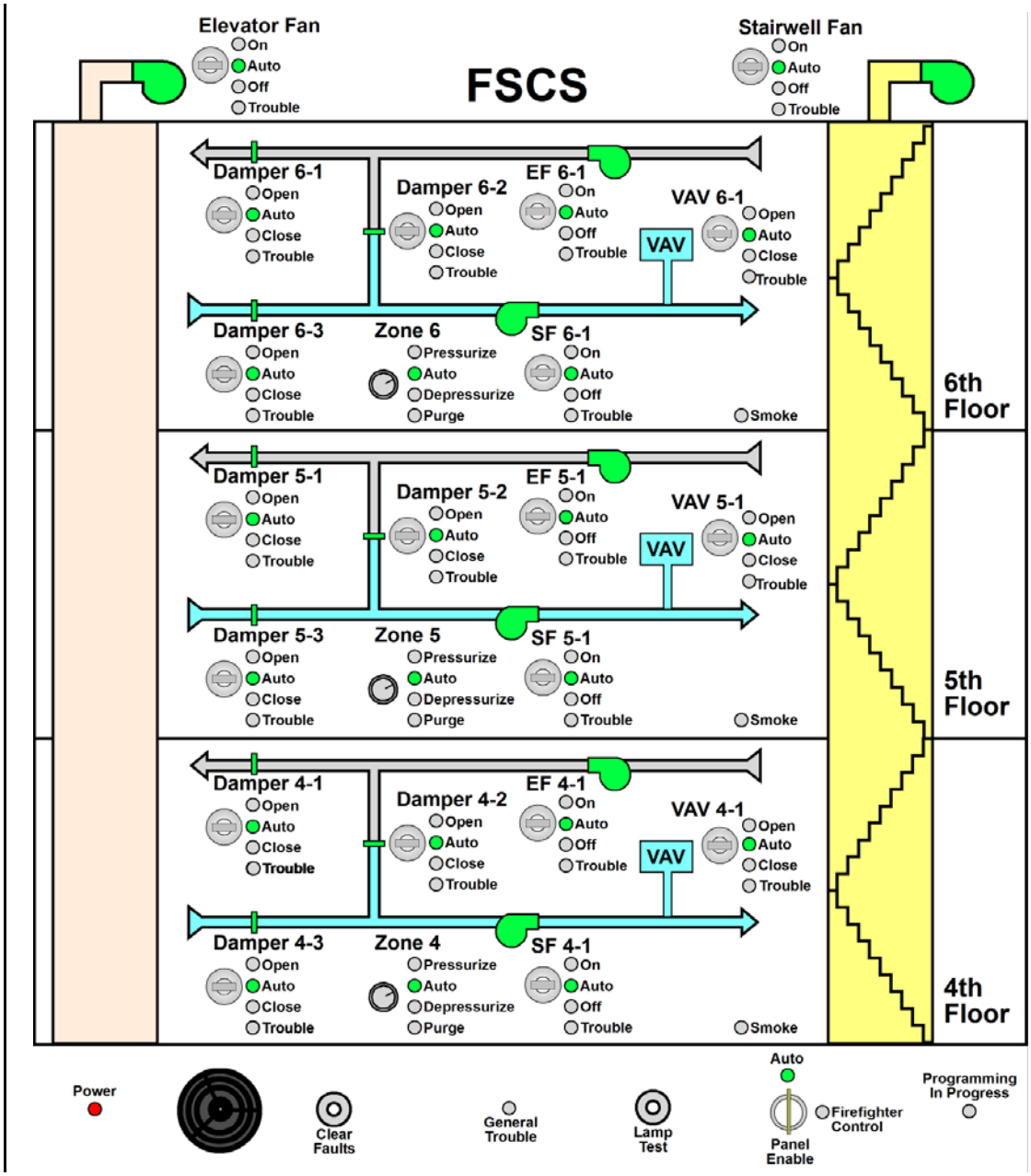

Figure 120: Multi-Story Building

Multi-Story Building Alarm Example

Figure 121 shows the floor above/floor below pressurization as a result of the auto smoke control being activated by a smoke detector on Floor 3.

A smoke alarm, detected by an automatic smoke detector on Floor 3, starts the process to depressurize Floor 3 and pressurize Floor 2 and Floor 4. The Elevator fan and Stairwell fan both turn on to pressurize the elevator shaft and stairwell. Subsequent alarms and subsequent action are locked out, except for manual override from the FSCS.

The system only returns to the pre-smoke control configuration when all automatic alarm/smoke control initiating devices return to the normal condition, and the manual override switches on the FSCS are returned to the Auto position.

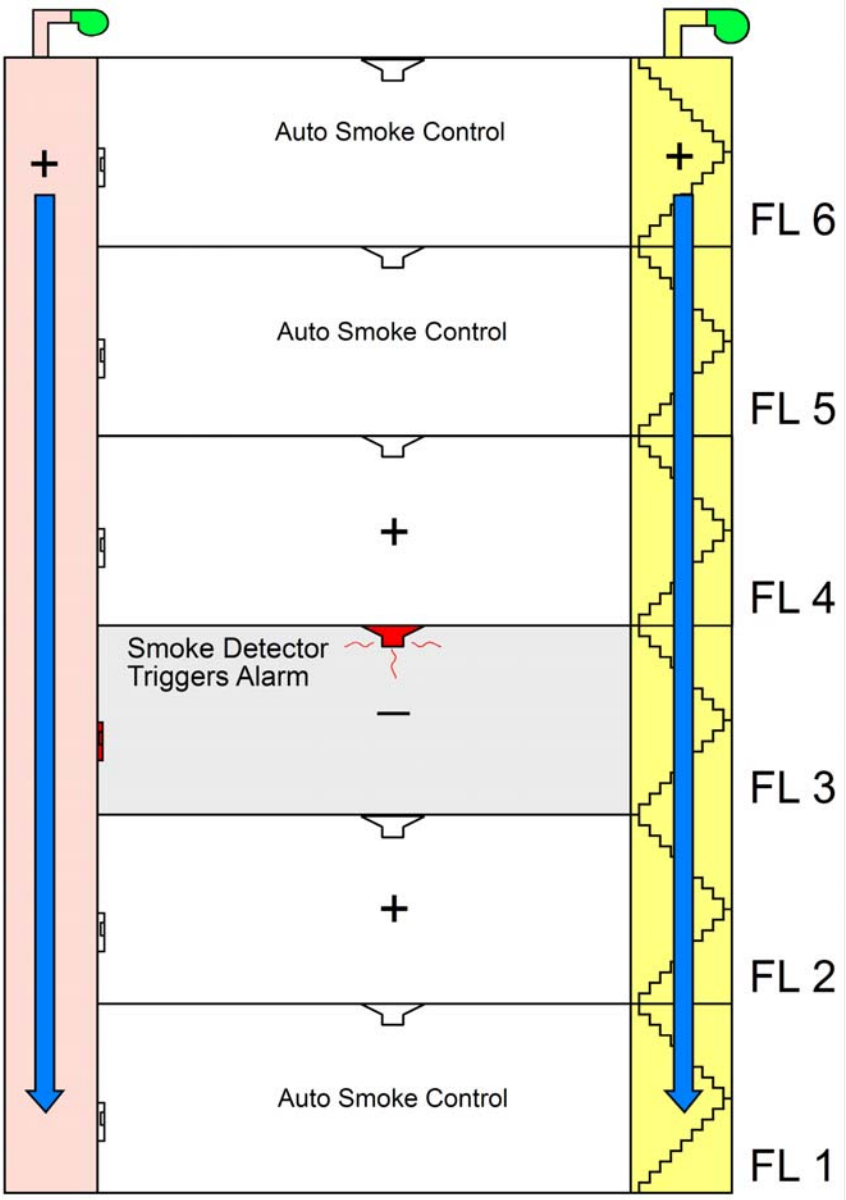

Figure 121: Multi-Story Building Floor Above/Floor Below Pressurization (+)

Auto Smoke Control Folder

Figure 122 shows the Auto Smoke Control folder and tree for one floor of the Multi-Story Building.

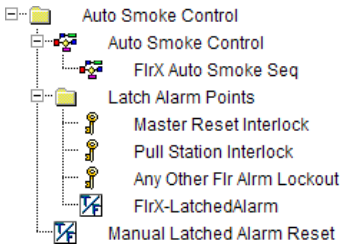

Figure 122: Multi-Story Building Auto Smoke Control Folder and Tree

Auto Smoke Control Logic

Auto Smoke Control for the Multi-Story Building application uses the FlrX Auto Smoke Seq Block and its inputs and outputs to implement its automatic smoke control. All six floors use the same logic except Floor 1, which adds a Floor Below latched alarm input point, and Floor 6, which adds a Floor Above latched alarm input point (Figure 123).

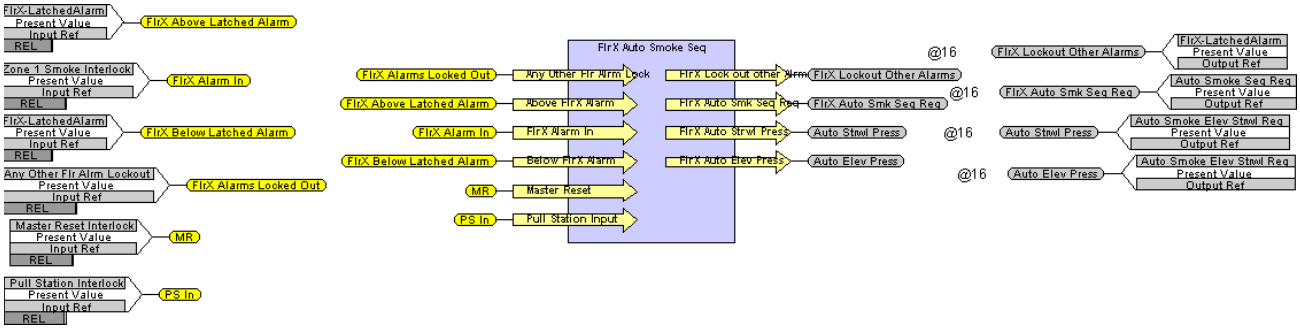

Figure 123: Automatic Smoke Control Main Logic

Auto Smoke Control Inputs

The **FlrX Below Latched Alarm** input only appears in the Floor 1 logic and the **FlrX Above Latched Alarm** input only appears in the Floor 6 logic

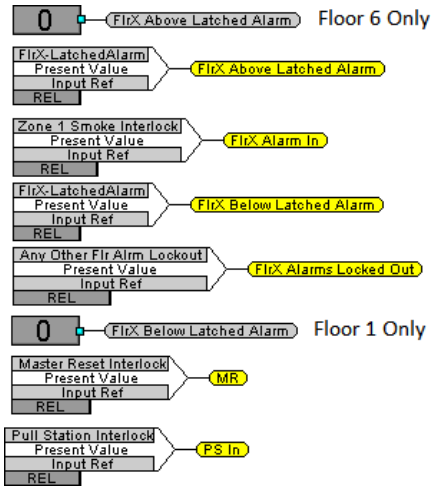

Figure 124: Automatic Smoke Control Inputs

Table 48: Auto Smoke Control Inputs

Input Source	Automatic Smoke Control Inputs	Label
Latched Alarm Points Folder	FlrX Latched Alarm	FlrX Above Locked Alarm
Fire System Inputs Folder of the Same Floor	Zone 1 Smoke Interlock	Flrx Alarm In
Latched Alarm Points Folder	FlrX-Latched Alarm	FlrX Below Locked Alarm
	Any Other Flr Alrm Lockout	FlrX Alarms Locked Out
	Master Reset Interlock	MR
Latched Alarm Points Folder	Pull Station Interlock	PS In

FlrX Auto Smoke Seq Control Block

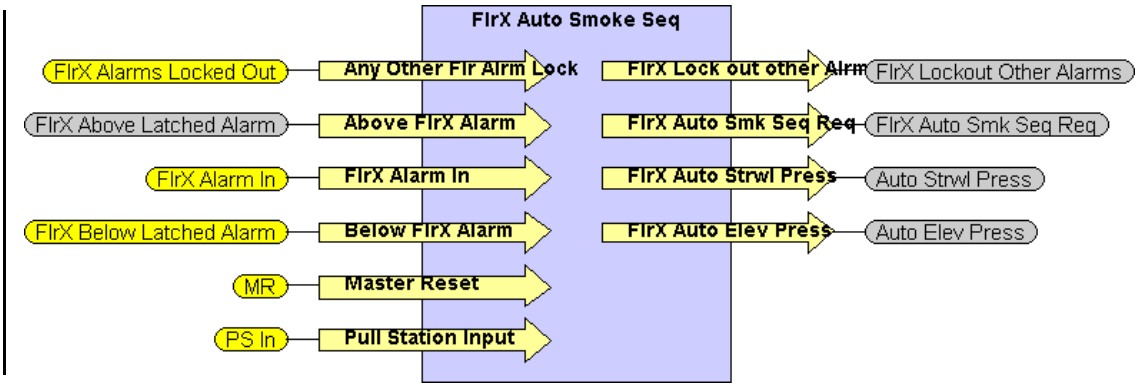

Figure 125: FlrX Auto Smoke Seq Control Block

FlrX Auto Smoke Seq Control Block Inputs and Outputs

Table 49: FlrX Auto Smoke Seq Block Inputs and Outputs

Input Label	FlrX Auto Smoke Seq Block Inputs	FlrX Auto Smoke Seq Block Outputs	FlrX Auto Smoke Seq Block Output Labels	Auto Smoke Control Outputs
FlrX Alarms Locked Out	**Any Other Flr Alrm Lockout**	**FlrX Lock Out Other Alrm**	FlrX Lockout Other Alarms	FlrX Latched Alarm
FlrX Above Latched Alarm	**Above FlrX Alarm**	**FlrX Auto Smk Seq Req**	FlrX Auto Smk Seq Req	Auto Smoke Seq Req
FlrX Alarm In	**FlrX Alarm In**	**FlrX Auto Strwl Press**	Auto Strwl Press	Auto Smoke Elev Strwl Press
FlrX Below Locked Alarm	**Below FlrX Alarm**	**FlrX Auto Elev Press**	Auto Elev Press	Auto Smoke Elev Strwl Press
MR	**Master Reset**			
PS In	**Pull Station Input**			

Auto Smoke Control Outputs

Figure 126 shows the Automatic Smoke Control logic outputs.

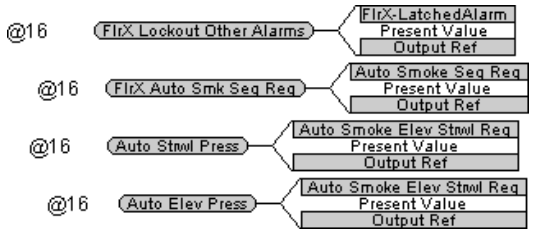

Figure 126: Automatic Smoke Control Field Outputs

Table 50: Auto Smoke Control Logic Outputs

Output Label	Output	Description
FlrX LatchedAlarm	**FlrX Latched Alarm**	Locks out other floors alarms
FlrX Auto Seq Req	**Auto Smoke Seq Req**	Starts the automatic smoke control process
Auto Strwl Press	**Auto Smoke Elev Strwl Req**	Starts the stairwell pressurization fans
Auto Elev Press	**Auto Smoke Elev Strwl Req**	Starts the elevator pressurization fans

Expanded FlrX Auto Smoke Seq Control Block Logic

Figure 127 shows the FlrX Auto Smoke Seq Block expanded logic.

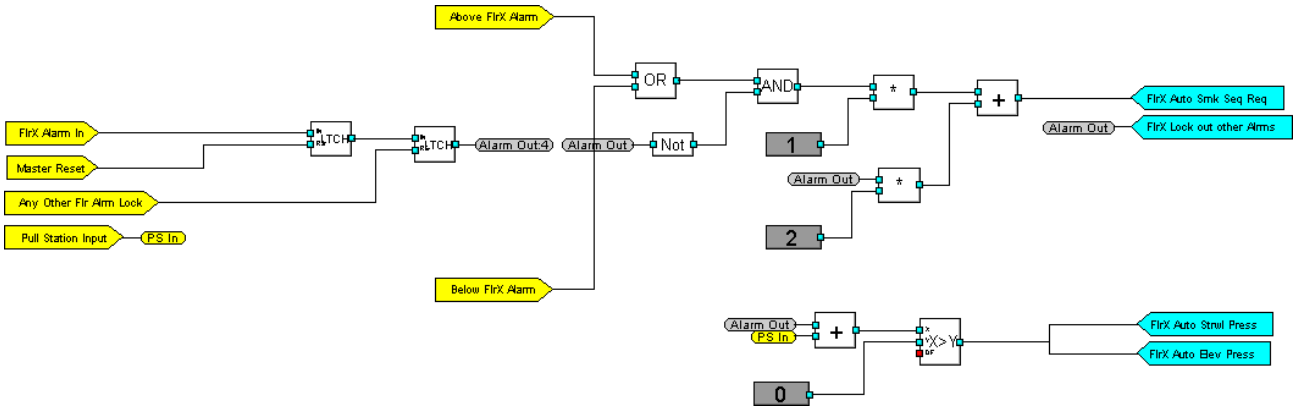

Figure 127: Auto Smoke Control FlrX Auto Smoke Seq Block Expanded Logic

Latch Alarm Points Folder

Pull Station Interlock

The Pull Station Interlock Definition only turns on the stairwell and elevator pressurization fans (Figure 128).

Note: Pull stations do not start the Auto Smoke Control process.

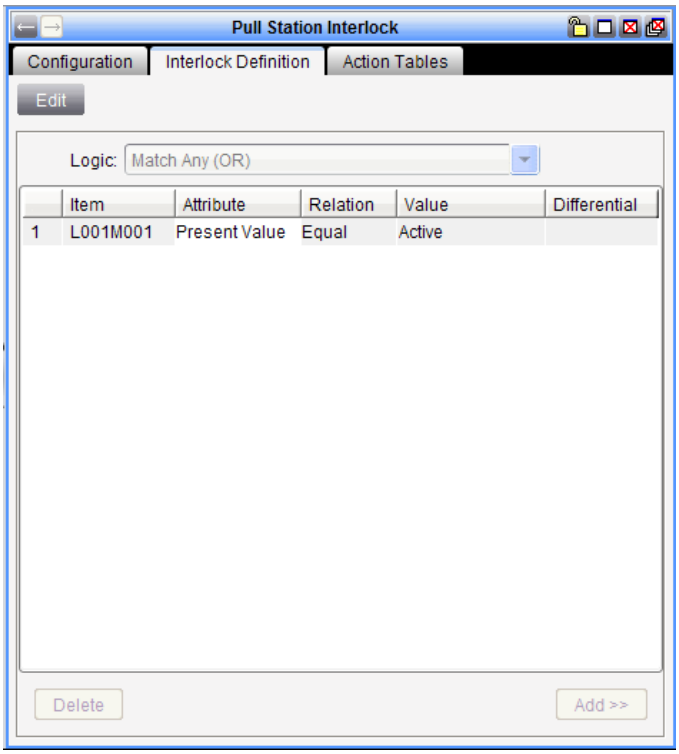

Figure 128: Pull Station Interlock Definition

Master Reset Interlock Definition

The Master Reset Interlock Definition (Figure 129) releases the locked alarms when commanded by the IFC fire panel Reset button or the Manual Latched Alarm Reset located in the Auto Smoke Control folder is commanded to active.

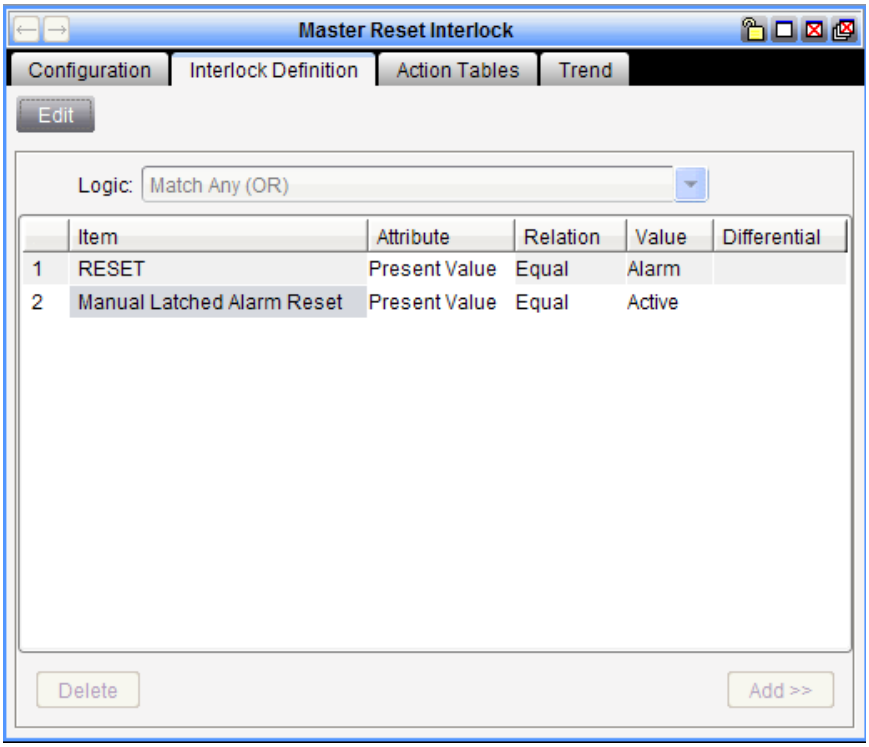

Figure 129: Master Reset Interlock Definition

Master Reset Interlock Action Table

The Master Reset Interlock Action Table sets the Manual Latched Alarm Reset to inactive after 60 seconds, to allow the auto smoke control logic to return to normal operation (Figure 130).

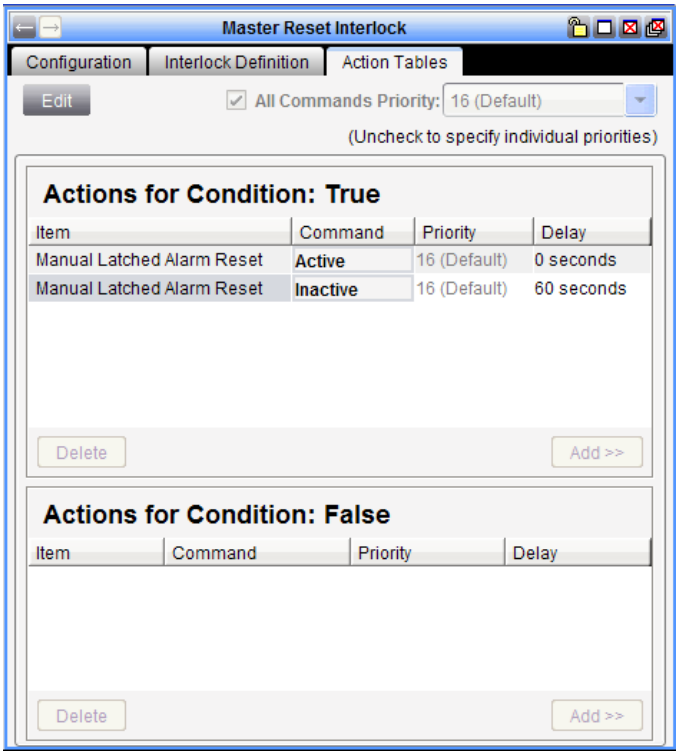

Figure 130: Master Reset Interlock Action Table

Any Other Flr Alarm Lockout

The Any Other Flr Alarm Lockout Interlock Definition (Figure 131) locks out all floors except for the floor that initiated the first smoke alarm.

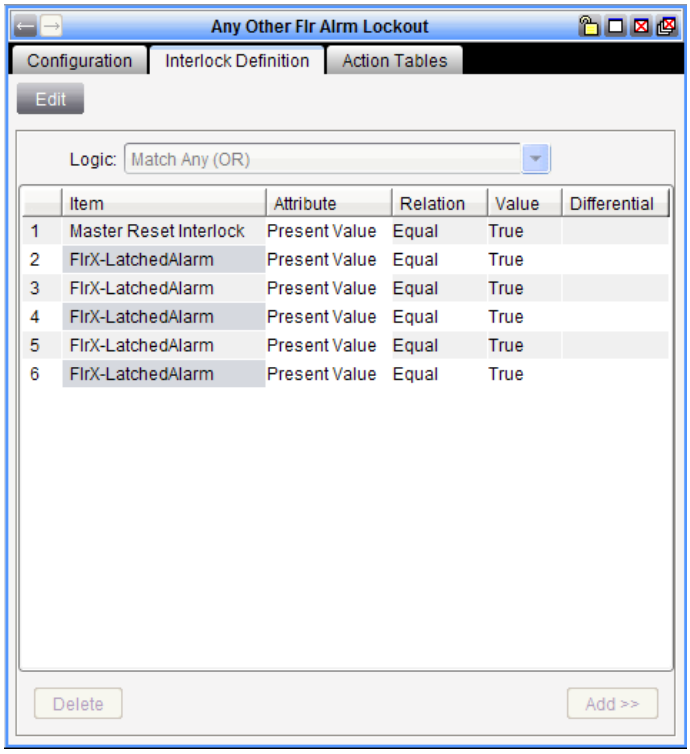

Figure 131: Any Other Floor Lockout Interlock Definition

FlrX Latched Alarm Point

The FlrX Latched Alarm Point (Figure 132) is used in the Any Other Flr Alrm Lockout Interlock.

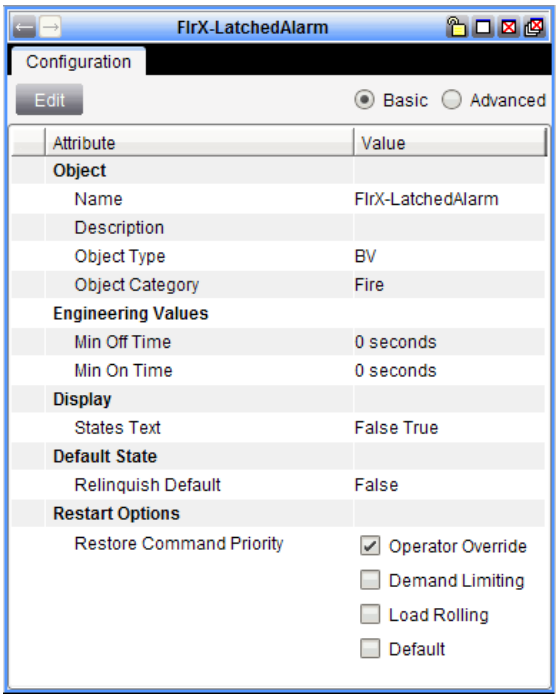

Figure 132: FlrX Latched Alarm Configuration Point

Manual Latched Alarm Reset Point

The Manual Latched Alarm Reset point (Figure 133) is used to manually reset the automatic smoke control logic.

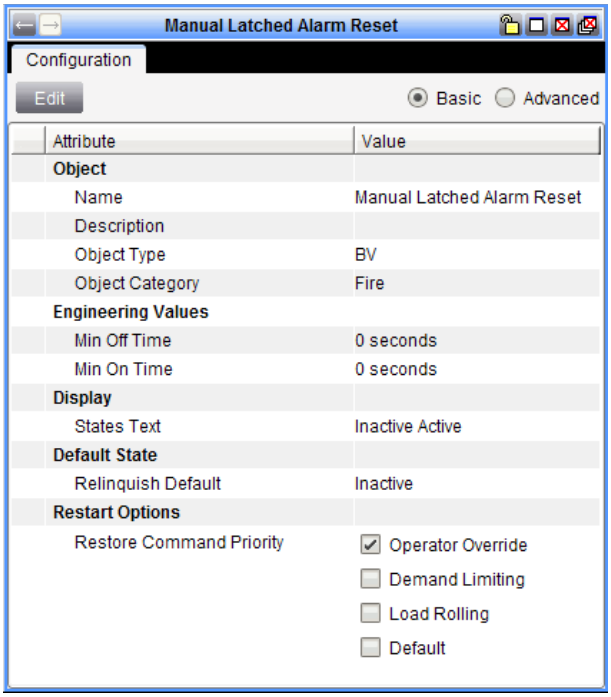

Figure 133: Manual Latched Alarm Reset Point

Warehouse Auto Smoke Control Application

Warehouse Field Device Connections

Figure 134 shows the FSCS and MS/TP field device connections. The field controllers in this example are MS/TP controllers. You can use any combination of controllers as required by the physical devices installed at the smoke control site.

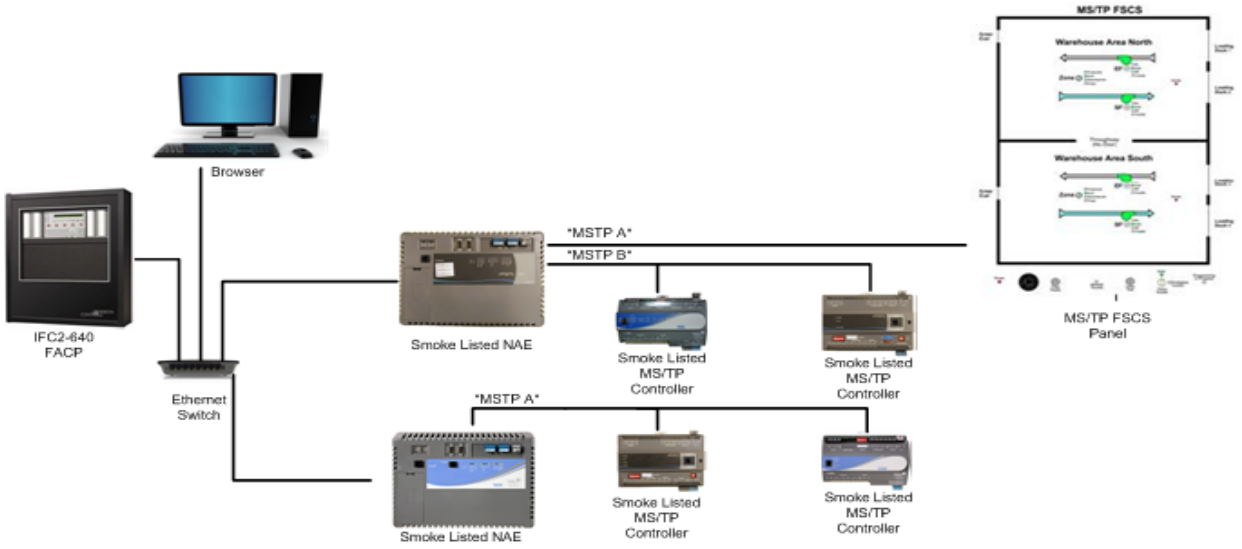

Figure 134: Warehouse MS/TP Field Device Connections

Building Overview

The single-story warehouse in this application example (Figure 135) is treated as a single area having two zones, each controlled by its own smoke detector, rooftop unit, and exhaust fan.

IMPORTANT: The rooftop unit is only being used to demonstrate the warehouse application. Johnson Controls equipment is **not** suitable for use in a rooftop unit. It is rated for indoor, dry environments only.

Johnson Controls equipment can only control a rooftop if the controller is installed in an indoor, dry environment and wired to a rooftop unit.

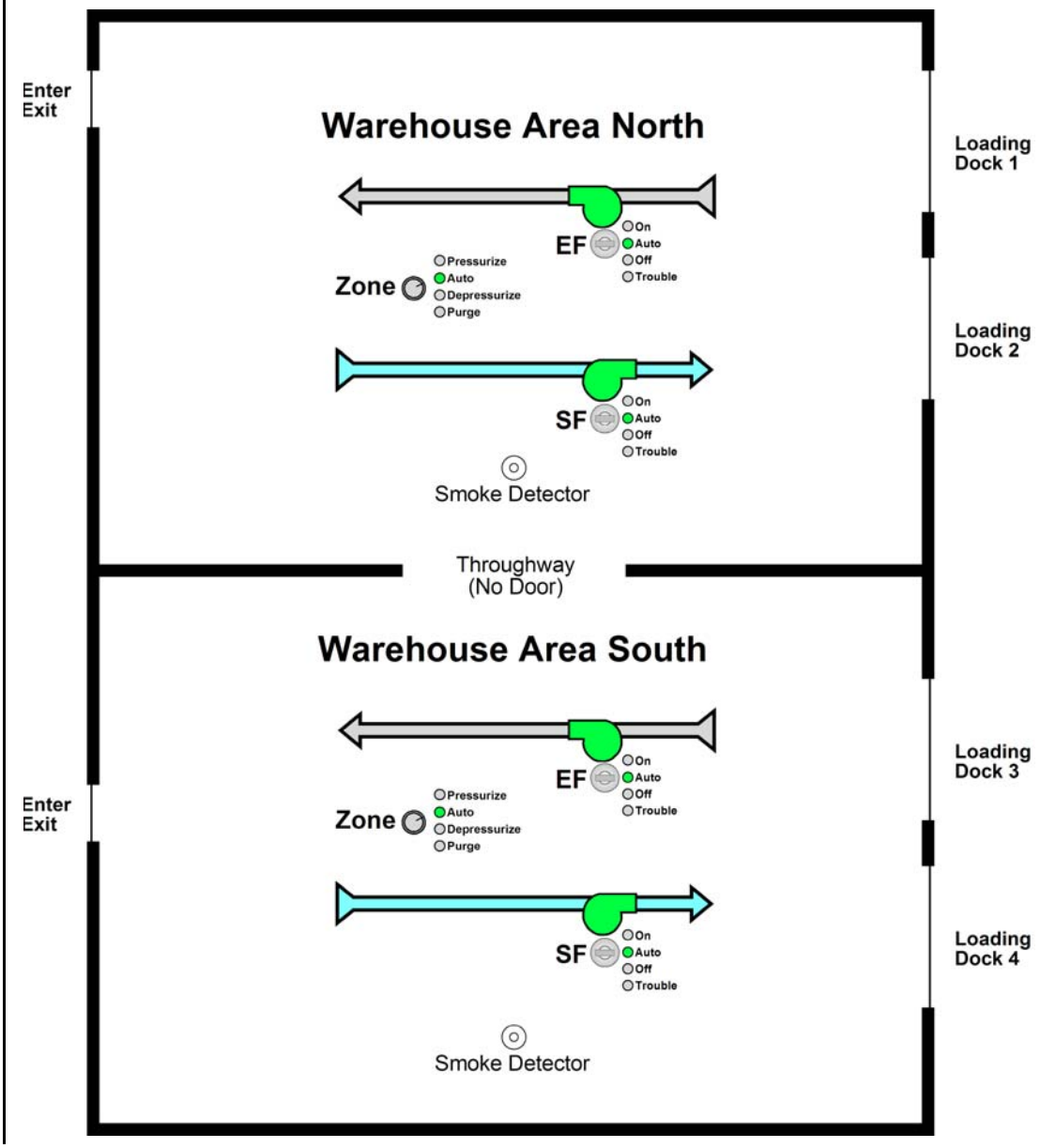

Figure 135: Single-Story Warehouse

Warehouse Smoke Alarm Example

A smoke alarm, detected by an automatic smoke detector in the South warehouse area (Figure 136), starts the Auto Smoke Control process to depressurize the warehouse. The warehouse North and warehouse South exhaust fans turn on and the warehouse North and South supply fans turn off. This operation creates a negative pressure in the warehouse. Subsequent alarms and actions are locked out, except for manual override from the FSCS.

The smoke control system only returns to its normal smoke control operation after all automatic alarm/smoke control initiating devices return to the normal condition, and the manual override switches on the FSCS are returned to the Auto position.

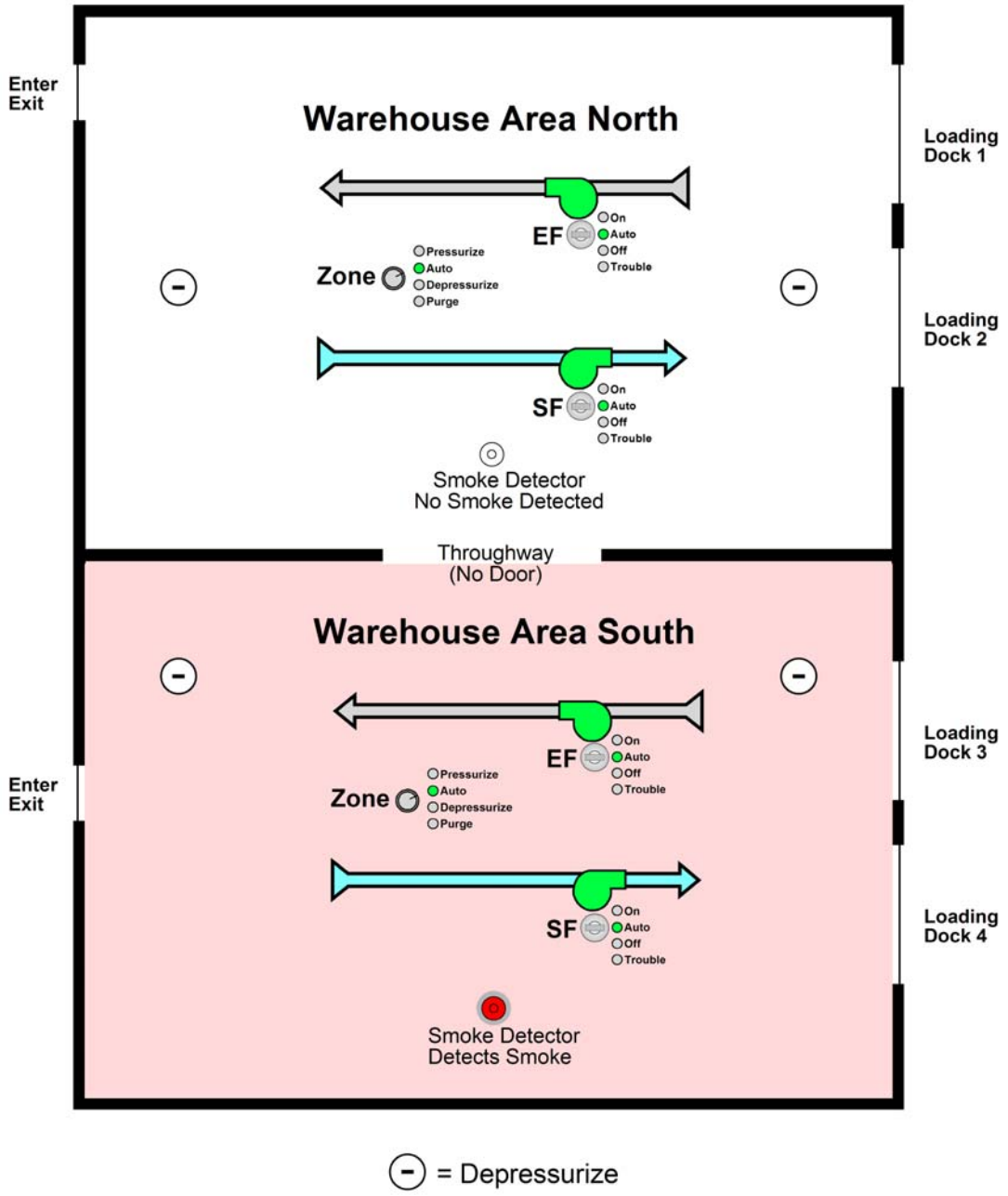

Figure 136: Smoke Detected in the Warehouse

This process has a manual reset, which re-enables alarm processing after **all** alarms have been cleared. The reset is issued using the smoke control NxE to command the manual reset input to On.

The manual reset sends a release command to all pressurization and exhaust outputs and the Sonalert® alarm. Then, turn off the manual reset to return the smoke control system to normal operation.

Auto Smoke Control Folder

Figure 137 shows the Auto Smoke Control folder and tree for the Warehouse.

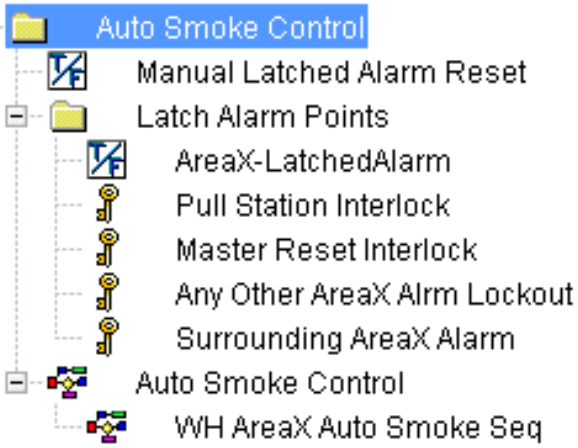

Figure 137: Warehouse Auto Smoke Control Folder and Tree

Auto Smoke Control Logic

Auto Smoke Control for the Warehouse uses the WH AreaX Auto Smoke Seq Block and its inputs and outputs (Figure 138) to implement its automatic smoke control. It evaluates inputs from the fire alarm panel and the master reset command from the FSCS to activate all exhaust fans and deactivate all supply fans when a smoke event occurs.

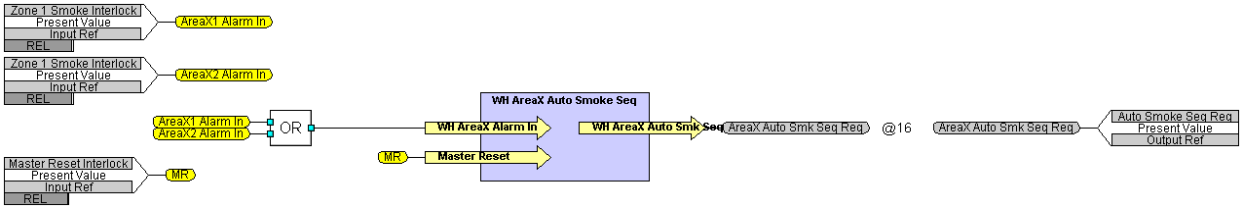

Figure 138: Auto Smoke Control Main Logic

Auto Smoke Control Inputs

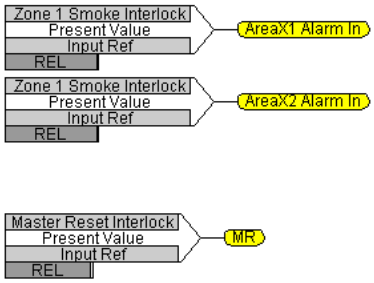

Figure 139: Auto Smoke Control Inputs

Table 51: Auto Smoke Control Inputs

Input Source	Label	Label
Fire System Input folders (from both areas)	**Zone 1 Smoke Interlock**	AreaX1 Alarm In
	Zone 1 Smoke Interlock	AreaX2 Alarm In
Latch Alarm Points	**Master Reset Interlock**	MR

WH AreaX Auto Smoke Seq Control Block

The WH AreaX Auto Smoke Seq control block (Figure 140) controls the warehouse auto smoke control process.

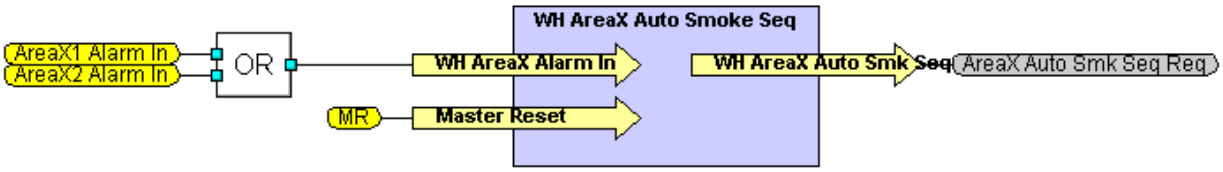

Figure 140: WH AreaX Auto Smoke Seq Block

Auto Smoke Control Output

The output of the WH AreaX Auto Smk Seq control block is Auto Smoke Seq Req which is a request, once a smoke condition is detected, to start the auto smoke control process.

Expanded Wh AreaX Smoke Seq Block Logic

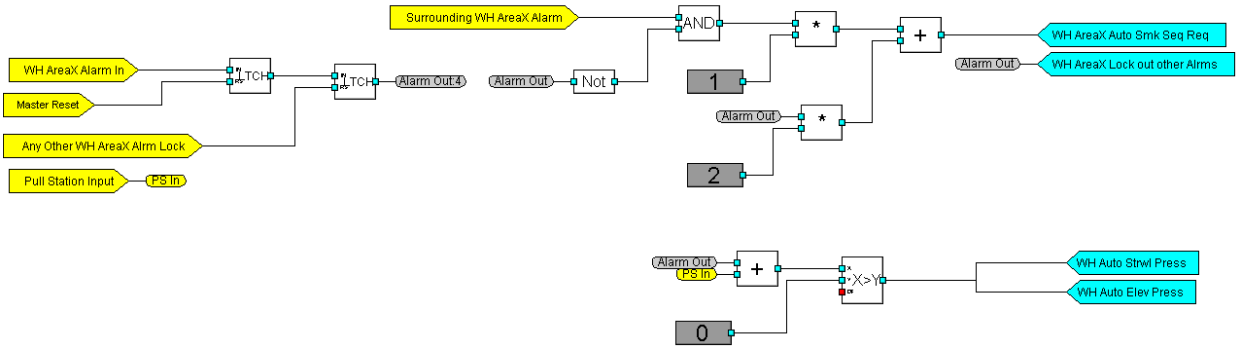

Figure 141: Expanded WH AreaX Auto Smoke Seq Block

Manual Latched Alarm Reset Point

The Manual Latched Alarm Reset point (Figure 142) is used to manually reset the automatic smoke control logic.

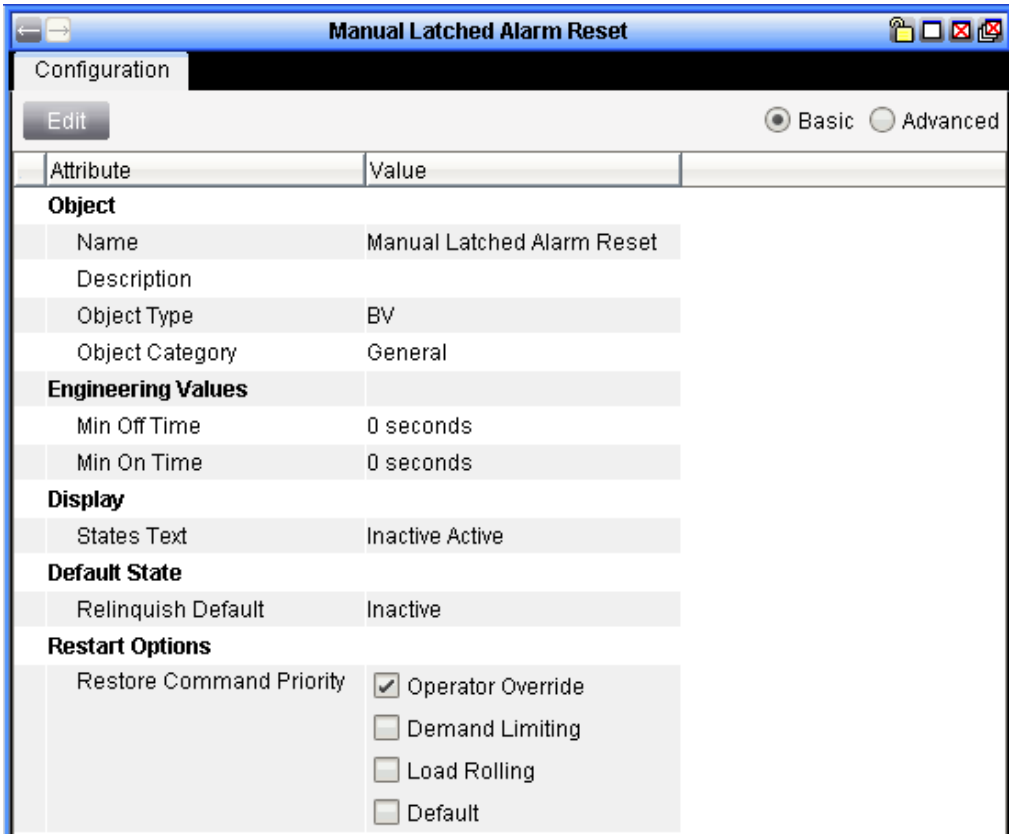

Figure 142: Manual Latched Alarm Reset Point

Latch Alarm Points Folder

AreaX Latched Alarm Interlock Definition

The AreaX Latched Alarm Point (Figure 143) is used in the Any Other AreaX Alrm Lockout Interlock.

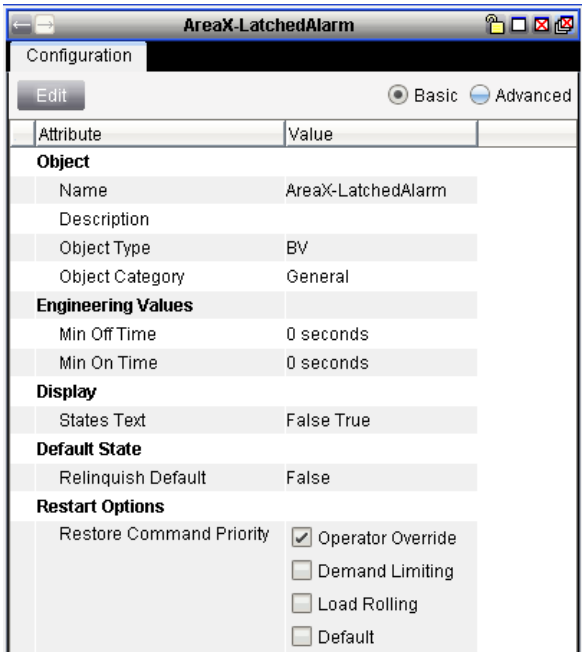

Figure 143: AreaX Latched Alarm Point

Pull Station Interlock

The Pull Station Interlock Definition (Figure 144) control is only used to turn on stairwell and elevator pressurization fans when there is an **enclosed** stairwell or **enclosed** elevator in the warehouse.

Note: Pull stations do not initiate the Auto Smoke Control process.

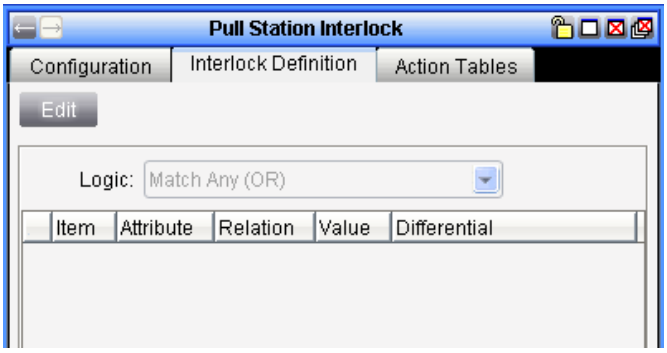

Figure 144: Pull Station Interlock Definition

Master Reset Interlock Definition

The Master Reset Interlock Definition (Figure 145) releases the locked alarms when commanded by the IFC fire panel Reset button or the **Manual Latched Alarm Reset** located in the Auto Smoke Control folder is commanded to active.

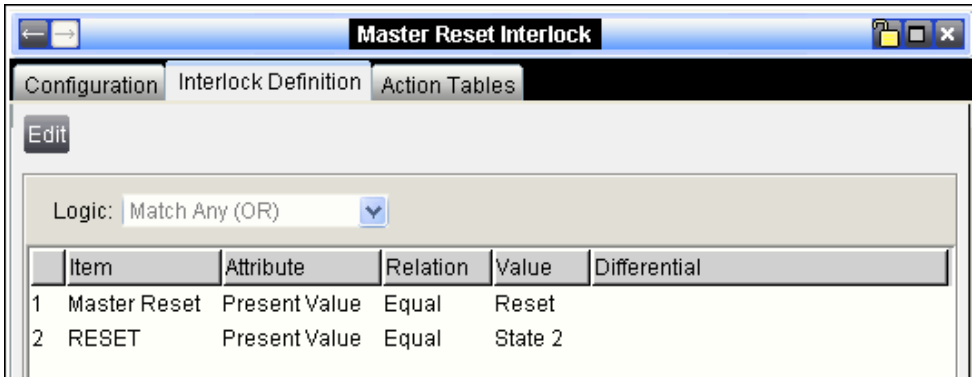

Figure 145: Master Reset Interlock Definition

Master Reset Interlock Action Table

The Master Reset Interlock Action Table (Figure 146) sets the Manual Latched Alarm Reset to inactive after 60 seconds, to allow the auto smoke control logic to return to normal operation.

Figure 146: Master Reset Interlock Action Table

Any Other AreaX Alrm Lockout

The Any Other AreaX Alrm Lockout Interlock Definition (Figure 147) locks out all areas except for the area that initiated the first smoke alarm. This function is only used in a site where two or more **isolated** areas require different smoke control actions to protect a single building.

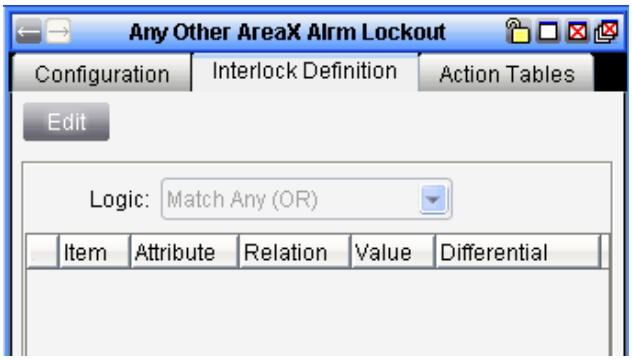

Figure 147: Any Other AreaX Alrm Lockout Interlock Definition

Surrounding AreaX Alarm Interlock Definition

The Surrounding AreaX Alarm Interlock Definition (Figure 148) locks out all areas except for the area that initiated the first smoke alarm. This function is only used in a site where two or more **isolated** areas require different smoke control actions to protect a single building.

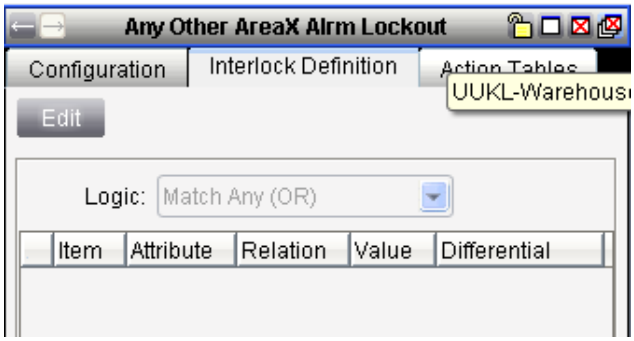

Figure 148: Surrounding AreaX Alarm Interlock Definition

Single-Story Mall Smoke Control Application

Figure 149 shows the FSCS and MS/TP field device connections. The field controllers in this example are MS/TP controllers. You can use any combination of controllers as required by the physical devices installed at the smoke control site.

Mall Field Device Connections

Figure 149 shows the Mall MS/TP field device connections.

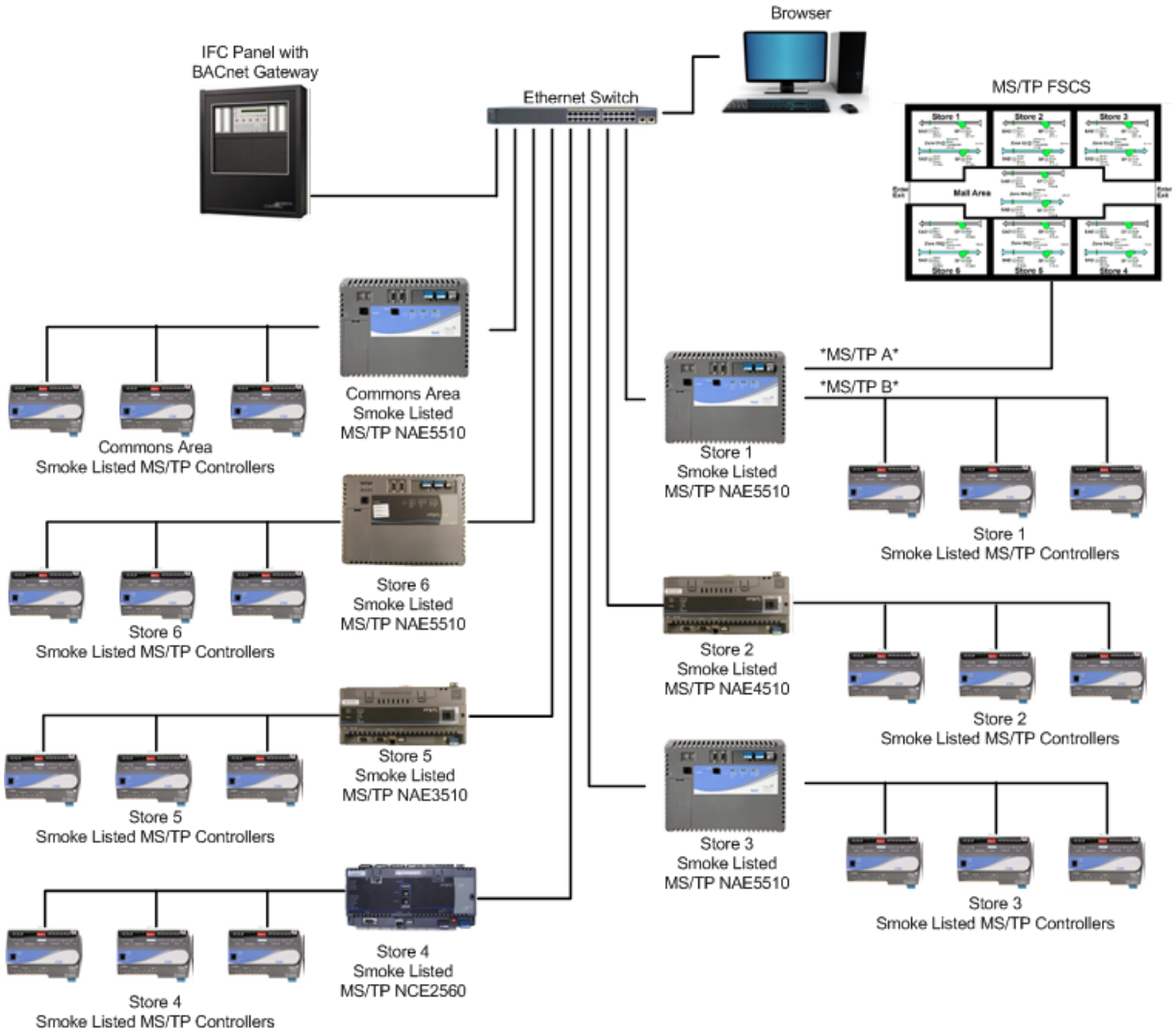

Figure 149: Mall MS/TP Field Device Connections

Building Overview

The single-story mall in this application example has a common area and six stores (Figure 150). The common area is treated as a single zone being controlled by a smoke detector, rooftop unit, and exhaust fan. Each store is treated as a single zone, with each store being controlled by its own smoke detector, rooftop unit, and exhaust fan.

IMPORTANT: The rooftop unit is only being used to demonstrate the Single-Story Mall application. Johnson Controls equipment is **not** suitable for use in a rooftop unit. It is rated for indoor, dry environments only.

Johnson Controls equipment can only control a rooftop if the controller is installed in an indoor, dry environment and wired to a rooftop unit.

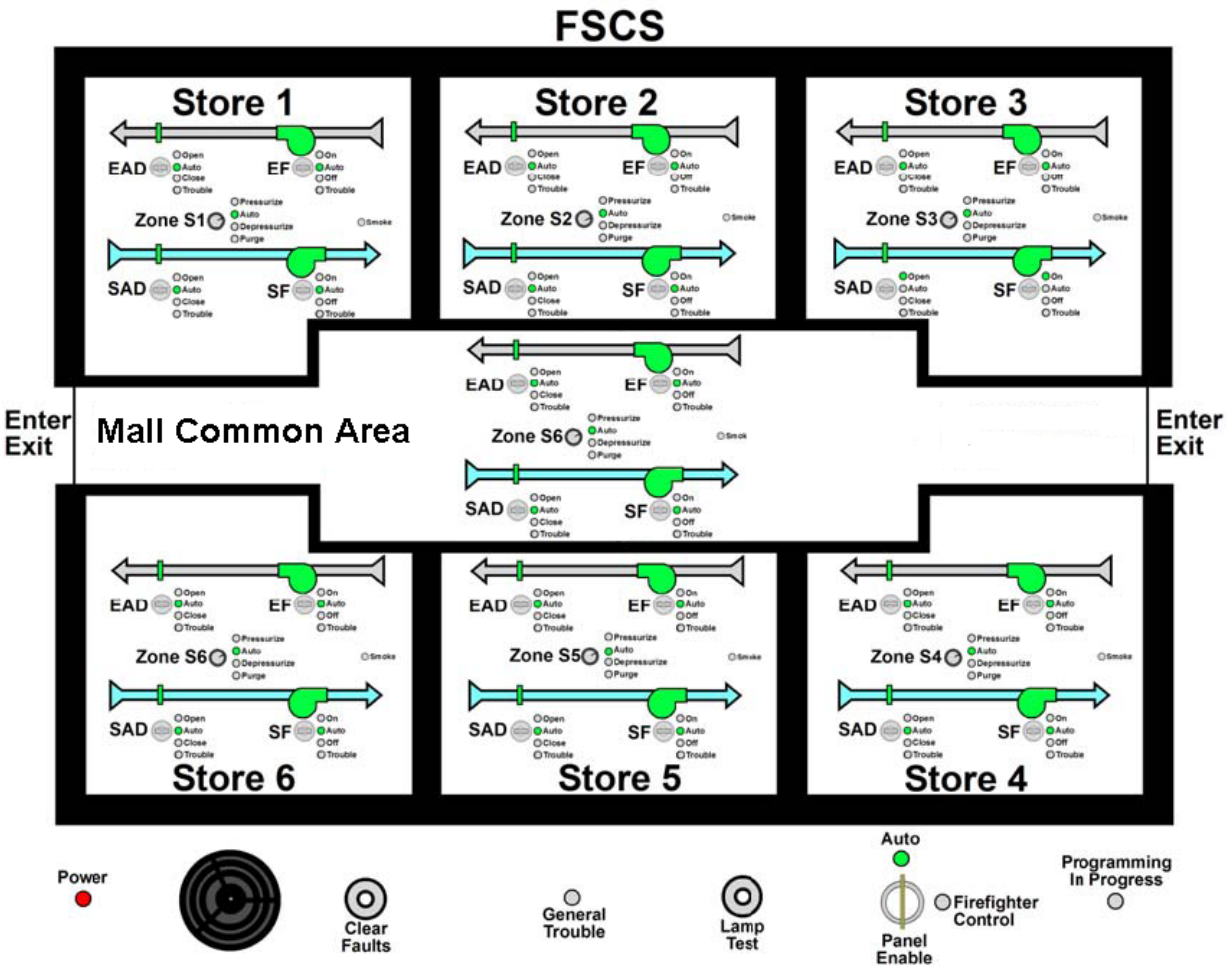

Figure 150: Mall FSCS

Mall Smoke Alarm Example

In this example, a smoke alarm is detected by an automatic smoke detector in the Mall Common area. This alarm starts the Auto Smoke Control process to depressurize the Mall Common Area. The North Common and South Common exhaust fans turn on and the North Common and South Common supply fans turn off. This operation creates a negative pressure in the Mall Common areas. At the same time, all stores surrounding the Mall Common areas are pressurized. Subsequent alarms and subsequent action is locked out, except for a manual override from the FSCS.

The system only returns to its pre-smoke control configuration when all automatic alarm/smoke control initiating devices return to their normal condition, and the manual override switches on the FSCS are returned to the Auto position. This process has a manual reset, which re-enables alarm processing after **all** alarms have been cleared. The reset is issued using the smoke control NxE to command the manual reset input to On or by resetting the fire system at the Fire Alarm panel.

The manual reset sends a release command to all pressurization and exhaust outputs.

Figure 151 shows a smoke alarm in the Mall Common Area. Whenever the Mall Common Area detects a smoke alarm, the area is depressurized and all surrounding stores are pressurized.

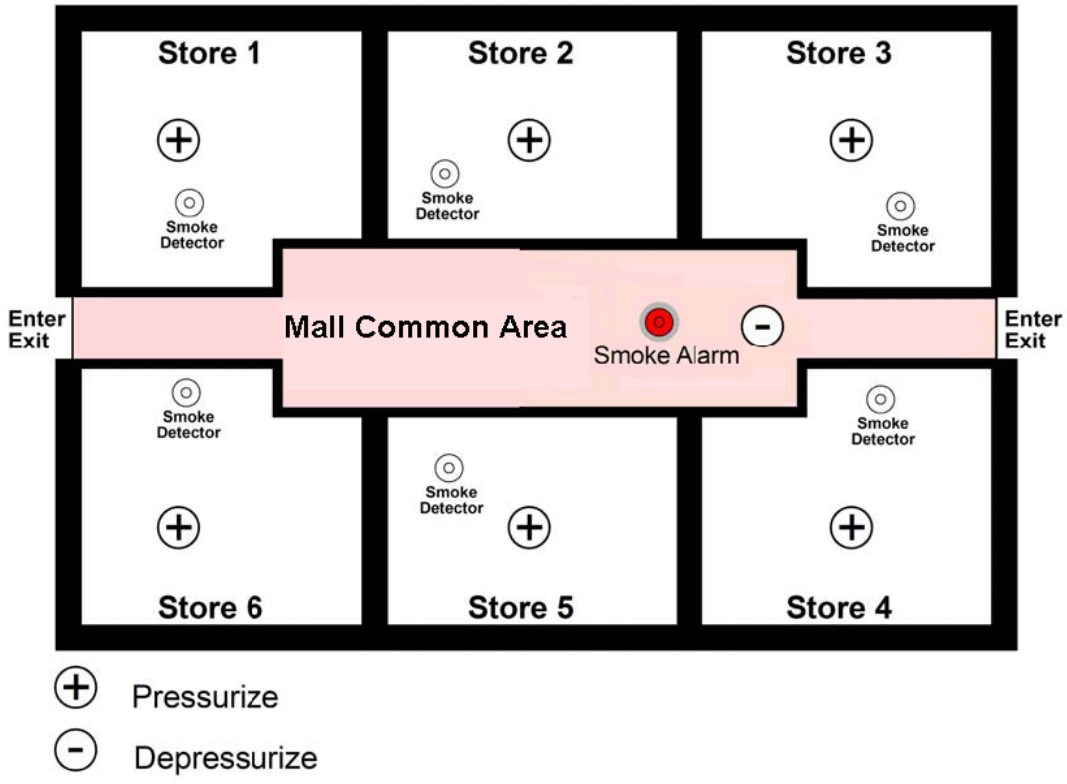

Figure 151: Single-Story Mall - Mall Common Area Alarm

Figure 152 shows a smoke alarm, detected by an automatic smoke detector in the Store 4 starts the Auto Smoke Control process to depressurize Store 4. The Store 4 exhaust fan turns on and the Store 4 supply fan turns off. This creates a negative pressure in Store 4. At the same time, all stores surrounding the Store common areas are pressurized. Subsequent alarms and subsequent action is locked out, except for a manual override from the FSCS.

The system only returns to its pre-smoke control configuration when all automatic alarm/smoke control initiating devices return to their normal condition, and the manual override switches on the FSCS are returned to the Auto position. This process has a manual reset, which re-enables alarm processing after **all** alarms have been cleared. The reset is issued using the smoke control NxE to command the manual reset input to On or by resetting the fire system at the Fire Alarm panel.

The manual reset sends a release command to all pressurization and exhaust outputs.

Figure 152 shows a smoke alarm in Store 4 which then depressurizes and the adjacent Store 5 and Mall Common Area pressurize.

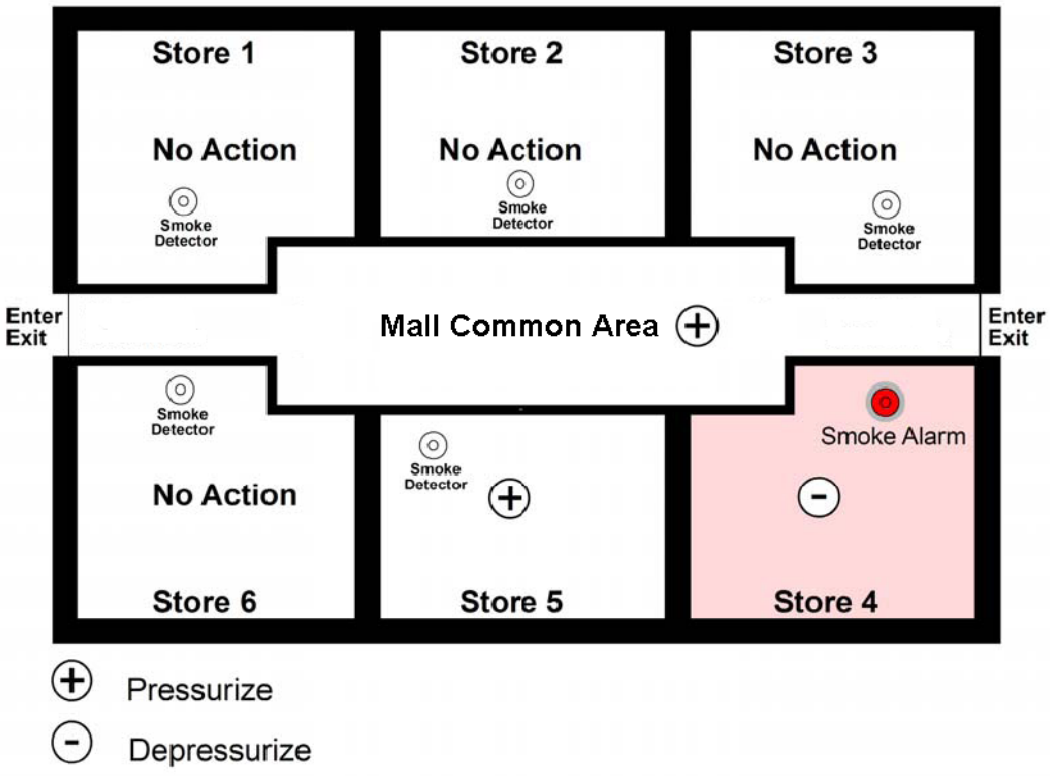

Figure 152: Single-Story Mall - Store 4 Alarm

Auto Smoke Control Folder

Figure 153 shows the Auto Smoke Control folder and tree for the Mall.

Figure 153: Mall Auto Smoke Control Folder and Tree

Auto Smoke Control Logic

Auto Smoke Control for the Mall uses the StoreX Auto Smoke Seq Block and its inputs and outputs to implement its automatic smoke control (Figure 154). It evaluates inputs from the fire alarm panel and the master reset command from the FSCS to activate all exhaust fans and deactivate all supply fans when a smoke event occurs.

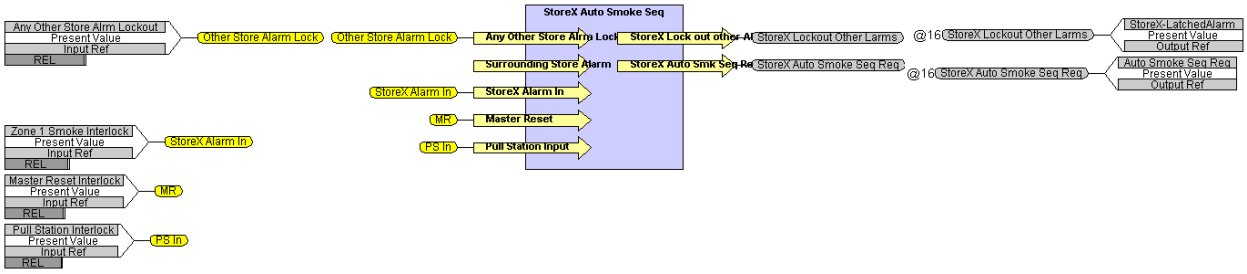

Figure 154: Auto Smoke Control Main Logic

Auto Smoke Control Inputs

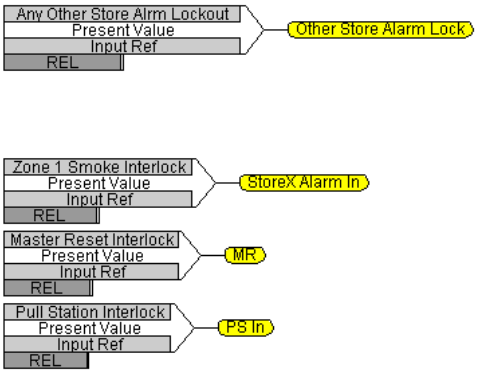

Figure 155: Mall Auto Smoke Control Inputs

Table 52: Auto Smoke Control Inputs

Input Source	Input	Input Label
Latch Alarm Points folder	**Any Other Store Alrm Lockout**	Other Store Alarm Lock
Fire System Inputs folder	**Zone 1 Smoke Interlock**	StoreX Alarm In
Latch Alarm Points folder	**Master Reset Interlock**	MR
	Pull Station Interlock	PS In

StoreX Auto Smoke Seq Control Block

The StoreX Auto Smoke Seq control block and Outputs are shown in Figure 156.

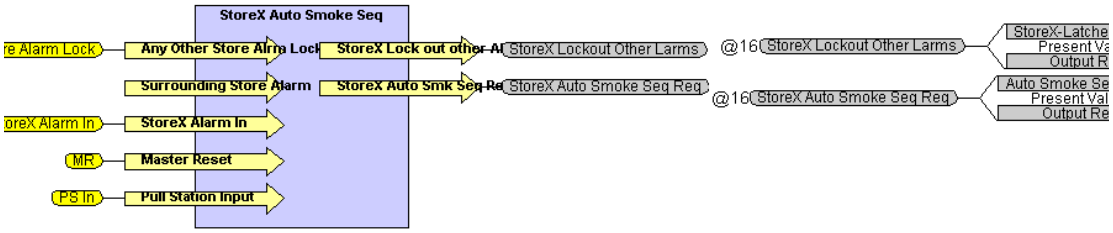

Figure 156: StoreX Control Block and Outputs

StoreX Auto Smoke Seq Control Block Inputs and Outputs

Table 53: StoreX Auto Smoke Seq Block Inputs and Outputs

Input Source Location	Input Label	StoreX Auto Smoke Seq Block Inputs	StoreX Auto Smoke Seq Block Outputs	StoreX Auto Smoke Seq Block Output Labels
Latch Alarm Points folder	Other Store Alarm Lock	**Any Other Store Alrm Lock**	**StoreX Lock out other Alrm**	StoreX Lockout Other Alarms
	Latch Alarm Points Folder	**Surrounding Store Alarm**		
Fire System Inputs folder	StoreX Alarm In	**Zone 1 Smoke Interlock**	**StoreX Auto Smk Seq Req**	StoreX Auto Smk Seq Req
Latch Alarm Points folder	MR	**Master Reset**		
	PS In	**Pull Station Input**		

Auto Smoke Control Outputs

Figure 157 shows the Automatic Smoke Control logic outputs.

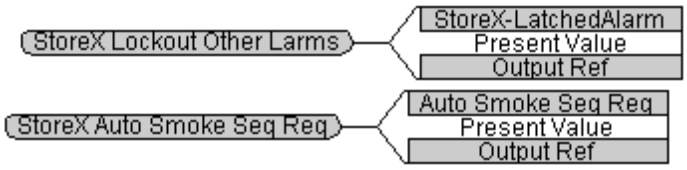

Figure 157: Automatic Smoke Control Field Outputs

Table 54: Auto Smoke Control Logic Outputs

Output Label	Output	Description
StoreX Lockout Other Alarms	**StoreX Latched Alarm**	Locks out other floors alarms
StoreX Auto Smoke Seq Req	**Auto Smoke Seq Req**	Starts the automatic smoke control process
Auto Strwl Press	**Auto Smoke Elev Strwl Req**	Starts the stairwell pressurization fans
Auto Elev Press	**Auto Smoke Elev Strwl Req**	Starts the elevator pressurization fans

The expanded Mall Auto Smoke Control logic is shown in Figure 158.

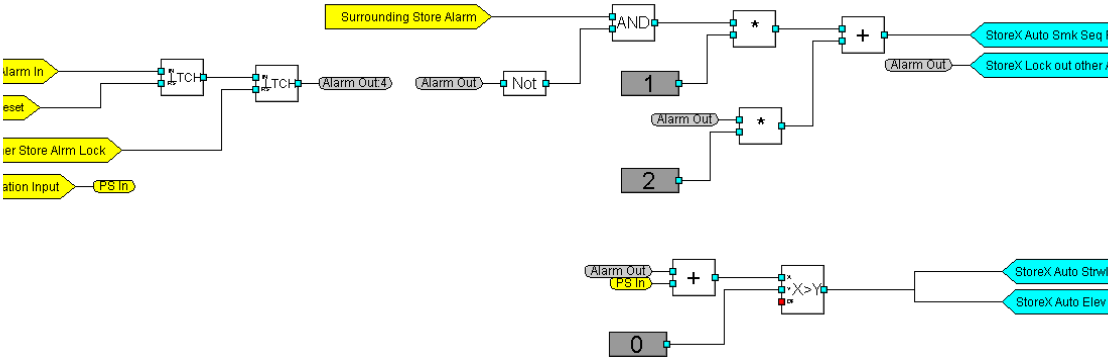

Figure 158: Mall Auto Smoke Control Expanded Logic

Manual Latched Alarm Reset Point

The Manual Latched Alarm Reset point (Figure 159) re-enables alarm processing after **all** alarms have been cleared. The reset is issued using the smoke control NxE to command the manual reset input to On.

The manual reset sends a release command to all pressurization and exhaust outputs. Then, turn off the manual reset to return the smoke control system to normal operation.

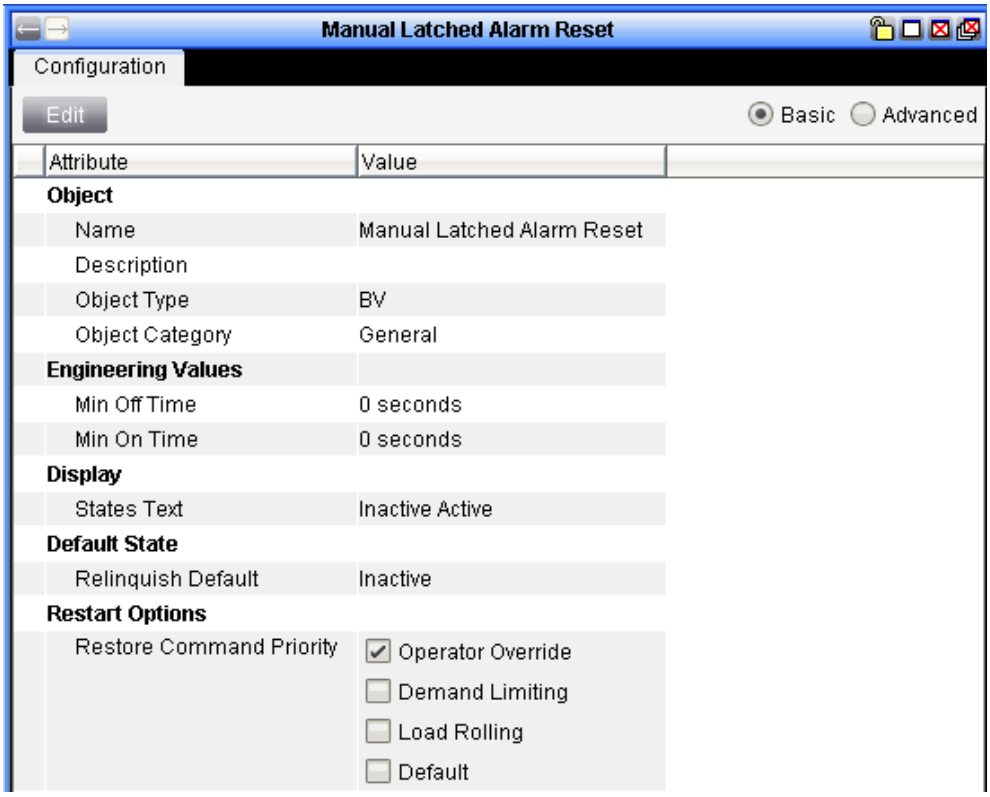

Figure 159: Manual Latched Alarm Reset Point

Latch Alarms Folder

Pull Station Interlock

The Pull Station Interlock Definition (Figure 160) control is only used to turn on stairwell and elevator pressurization fans when there is an **enclosed** stairwell or **enclosed** elevator in the mall.

Note: Pullstations do not initiate the Auto Smoke Control process.

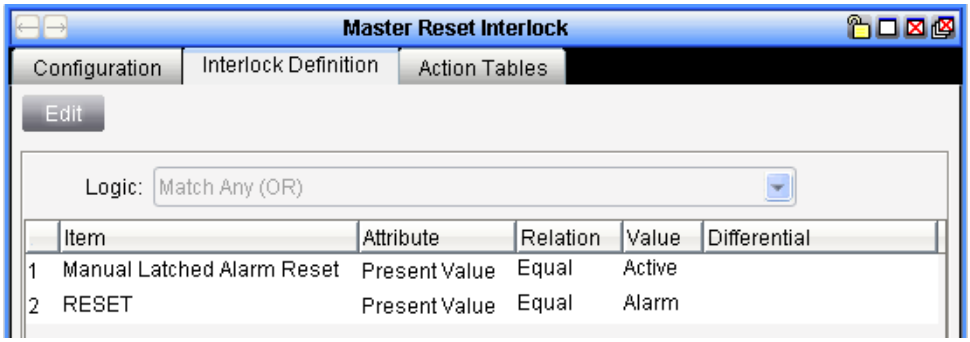

Figure 160: Pull Station Interlock Definition

Master Reset Interlock Definition

The Master Reset Interlock Definition (Figure 161) releases the locked alarms when commanded by the IFC fire panel Reset button or the **Manual Latched Alarm Reset** located in the Auto Smoke Control folder is commanded to active.

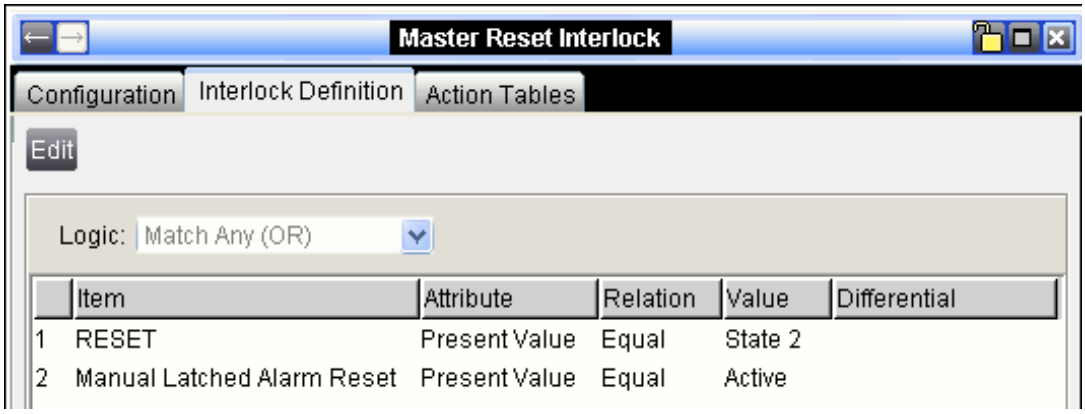

Figure 161: Master Reset Interlock Definition

Master Reset Interlock Action Table

The Master Reset Interlock Action Table (Figure 162) sets the Manual Latched Alarm Reset to inactive after 60 seconds, to allow the auto smoke control logic to return to normal operation.

Figure 162: Master Reset Interlock Action Table

Any Other Store Alarm Lockout

The Any Other Store Alarm Lockout Interlock Definition (Figure 163) locks out all stores except for the store or common area that initiated the first smoke alarm.

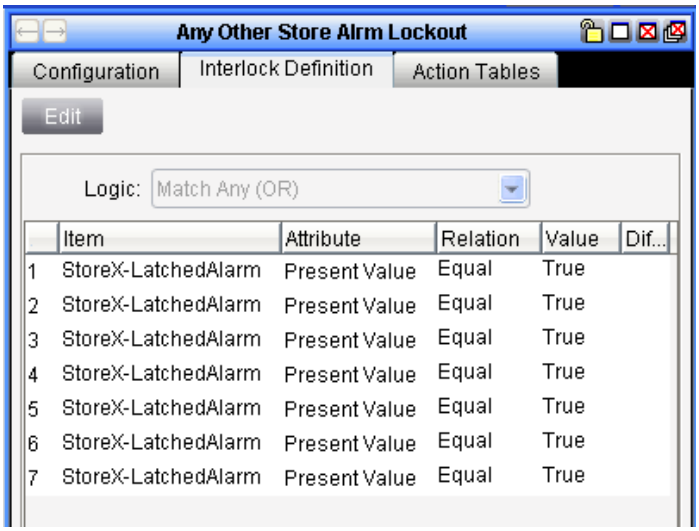

Figure 163: Any Other Store Lockout Interlock Definition

StoreX Latched Alarm

The StoreX Latched Alarm Point (Figure 164) is used in the Any Other StoreX Alrm Lockout Interlock.

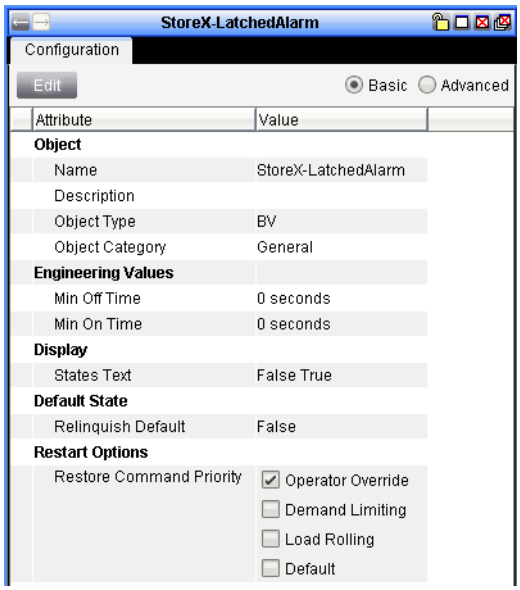

Figure 164: StoreX Latched Alarm Point

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