



STRENGTH

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WELCOME

Strong on Smoke Control

Jerry Harris

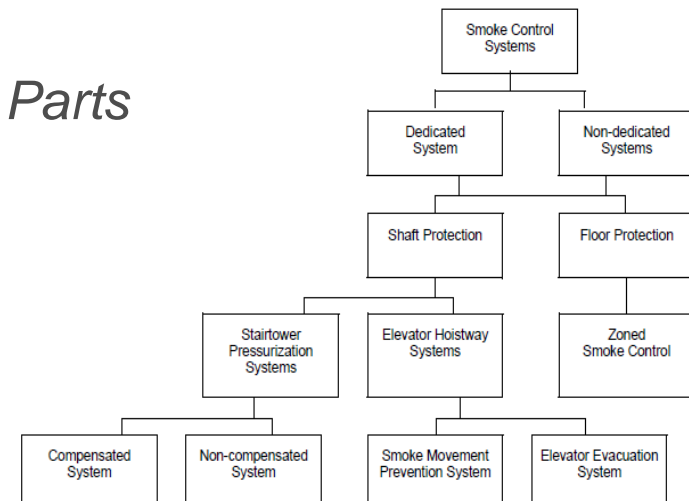
Course Outline – Basics and Estimating

❖ *Applicable Codes*

❖ *Definitions*

❖ *Which Notifier panels are acceptable?*

❖ *Smoke Control Panel – Estimating Parts*



Course Outline – Super-Tech Section

- ❖ New Programming features v.21 and up
- ❖ Organizing your data
- ❖ Example 1 – Zoned Pressurization and Exhaust
- ❖ Example 2 – Networked + Zoned = Proof of Concept

INSTRUMENT LABEL	SYSTEM LABEL	FIDUCIAL MARKUP	Module Addresses					E9A1 E1	A2LW1	A2LW3	A2LW6	E2	E9A1-E1	A2	E2	E9A1-E1	A2	E2	
			ADDRESS	CONTROL CODE	CONTROL CODE	ADDRESS	CONTROL CODE												
A2 LW 1 SMK EXH PAN LO	A2 LW 1 50N (SHARED)	SMK EXH PAN	N001	000008	N001	000008	N001	000008	N001	000008	N001	N001	000008	N001	000008	N001	000008	N001	000008
A2 LW 1 SMK EXH PAN H	E9A1 E1 500N	SMK EXH PAN	N001	000009	N001	000009	N001	000009	N001	000009	N001	N001	000009	N001	000009	N001	000009	N001	000009
A2 LW 2 SMK EXH PAN LO	A2 LW 2 50N (NOT 3rd RED)	SMK EXH PAN	N001	000009	N001	000010	N001	000010	N001	000010	N001	N001	000010	N001	000010	N001	000010	N001	000010
A2 LW 3 SMK EXH PAN LO	A2 LW 3 50N (SHARED)	SMK EXH PAN	N001	000010	N001	000011	N001	000011	N001	000011	N001	N001	000011	N001	000011	N001	000011	N001	000011
A2 LW 4 SMK EXH PAN H	E1 100N	SMK EXH PAN	N001	000007	N001	000008	N001	000008	N001	000008	N001	N001	000008	N001	000008	N001	000008	N001	000008
A2 LW 1 E9A1-FSD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-FSD	N001	000022	N001	000022	N001	000024	N001	000024	N001	N001	000022	N001	000022	N001	000022	N001	000022
A2 LW 1 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000023	N001	000023	N001	000024	N001	000024	N001	N001	000023	N001	000023	N001	000023	N001	000023
A2 LW 2 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000027	N001	000027	N001	000028	N001	000028	N001	N001	000027	N001	000027	N001	000027	N001	000027
A2 LW 4 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000030	N001	000030	N001	000034	N001	000034	N001	N001	000030	N001	000030	N001	000030	N001	000030
A2 LW 5 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000031	N001	000031	N001	000034	N001	000034	N001	N001	000031	N001	000031	N001	000031	N001	000031
A2 LW 3 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000032	N001	000032	N001	000034	N001	000034	N001	N001	000032	N001	000032	N001	000032	N001	000032
A2 LW 4 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000033	N001	000033	N001	000034	N001	000034	N001	N001	000033	N001	000033	N001	000033	N001	000033
A2 LW 5 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000034	N001	000034	N001	000034	N001	000034	N001	N001	000034	N001	000034	N001	000034	N001	000034
A2 LW 6 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000035	N001	000035	N001	000034	N001	000034	N001	N001	000035	N001	000035	N001	000035	N001	000035
A2 LW 7 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000036	N001	000036	N001	000034	N001	000034	N001	N001	000036	N001	000036	N001	000036	N001	000036
A2 LW 8 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000037	N001	000037	N001	000034	N001	000034	N001	N001	000037	N001	000037	N001	000037	N001	000037
A2 LW 9 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000038	N001	000038	N001	000034	N001	000034	N001	N001	000038	N001	000038	N001	000038	N001	000038
A2 LW 10 Exhaust MFD	02W-HIGH-MODE (E9-A1-E1-A2)	EXH-MFD	N001	000039	N001	000039	N001	000034	N001	000034	N001	N001	000039	N001	000039	N001	000039	N001	000039
A2 DPMPR 1	CL NVD	DP-NVD	N001	000040	N001	000040	N001	000040	N001	000040	N001	N001	000040	N001	000040	N001	000040	N001	000040
A2 DPMPR 2	CL NVD	DP-NVD	N001	000041	N001	000041	N001	000040	N001	000040	N001	N001	000041	N001	000041	N001	000041	N001	000041
A2 DPMPR 3	CL NVD	DP-NVD	N001	000042	N001	000042	N001	000040	N001	000040	N001	N001	000042	N001	000042	N001	000042	N001	000042
A2 DPMPR 4	CL NVD	DP-NVD	N001	000043	N001	000043	N001	000040	N001	000040	N001	N001	000043	N001	000043	N001	000043	N001	000043
A2 DPMPR 5	CL NVD	DP-NVD	N001	000044	N001	000044	N001	000040	N001	000040	N001	N001	000044	N001	000044	N001	000044	N001	000044
A2 DPMPR 6	CL NVD	DP-NVD	N001	000045	N001	000045	N001	000040	N001	000040	N001	N001	000045	N001	000045	N001	000045	N001	000045
A2 DPMPR 7	CL NVD	DP-NVD	N001	000046	N001	000046	N001	000040	N001	000040	N001	N001	000046	N001	000046	N001	000046	N001	000046
A2 DPMPR 8	CL NVD	DP-NVD	N001	000047	N001	000047	N001	000040	N001	000040	N001	N001	000047	N001	000047	N001	000047	N001	000047
A2 DPMPR 9	CL NVD	DP-NVD	N001	000048	N001	000048	N001	000040	N001	000040	N001	N001	000048	N001	000048	N001	000048	N001	000048
A2 DPMPR 10	CL NVD	DP-NVD	N001	000049	N001	000049	N001	000040	N001	000040	N001	N001	000049	N001	000049	N001	000049	N001	000049
A2 DPMPR 11	CL NVD	DP-NVD	N001	000050	N001	000050	N001	000040	N001	000040	N001	N001	000050	N001	000050	N001	000050	N001	000050
A2 DPMPR 12	CL NVD	DP-NVD	N001	000051	N001	000051	N001	000040	N001	000040	N001	N001	000051	N001	000051	N001	000051	N001	000051
A2 DPMPR 13	P&S FSD	P&S-FSD	N001	000052	N001	000052	N001	000052	N001	000052	N001	N001	000052	N001	000052	N001	000052	N001	000052
A2 DPMPR 14	P&S FSD	P&S-FSD	N001	000053	N001	000053	N001	000052	N001	000052	N001	N001	000053	N001	000053	N001	000053	N001	000053
A2 EXH-FAN 1	EXH-FAN	EXH-FAN	N001	000054	N001	000054	N001	000054	N001	000054	N001	N001	000054	N001	000054	N001	000054	N001	000054
A2 EXH-FAN 2	EXH-FAN	EXH-FAN	N001	000055	N001	000055	N001	000054	N001	000054	N001	N001	000055	N001	000055	N001	000055	N001	000055
A2 AHU 1	AHU-FAN	AHU-FAN	N001	000056	N001	000056	N001	000056	N001	000056	N001	N001	000056	N001	000056	N001	000056	N001	000056
A2 AHU 2	AHU-FAN	AHU-FAN	N001	000057	N001	000057	N001	000056	N001	000056	N001	N001	000057	N001	000057	N001	000057	N001	000057

Applicable Codes – Latching Lockout

- ❖ References from the 2015 Edition of NFPA 92
 - 6.4.4.1.2* - Lockout
 - 6.4.4.1.3* - Additional Zones (only Heat)

- ❖ International Building Code 909
 - 909.12 - preprogrammed weekly test sequence
 - 909.16 – required indications (white LED)

Dedicated or Non-Dedicated (per SCS Manual)

❖ Dedicated System

- A smoke control system designed for the sole purpose of controlling smoke within a building.
 - ❖ In this case, equipment is **not** linked to building HVAC controls.
 - ❖ This is accomplished by forming a system of air movement that is separate and distinct from the building's HVAC system and only operates to control smoke.

❖ Non-Dedicated System

- A smoke control system that shares components with other air moving equipment. When the smoke control mode is activated, the operating of the building's air moving equipment changes in order to accomplish the objectives of the smoke control design.

Smoke Control Definitions

❖ Pressurization

- Pressurization is employed by creating pressure differences across partitions that separate the smoke zone from other areas. This can be accomplished by making pressure in the area surrounding the smoke zone higher than pressure in the smoke zone itself (refer to Figure 2.4). Airflow through construction and door cracks prevents the movement of smoke to the high-pressure side. The pressure difference must be sufficient to contain the smoke in the smoke zone and at the same time allow doors leading to exit routes to be opened.

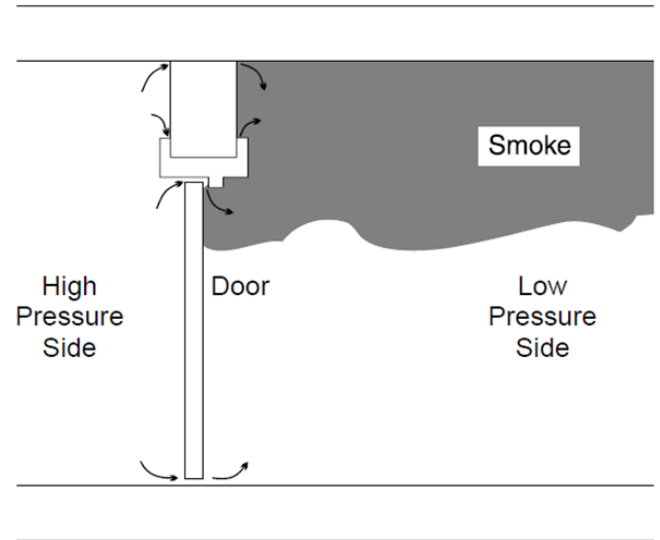


Figure 2.4 Pressurization

Smoke Control Definitions

❖ Smoke Purge / Exhaust / Evacuation

- Smoke that has entered a protected space can be purged or diluted by supplying outside air to the space. Purging is employed through the use of an exhaust inlet, usually located near the ceiling, and a supply outlet, usually located near the floor. The supply and exhaust points must be placed far enough apart to prevent the supply air from blowing directly into the exhaust. If the supply and exhaust points are placed too close, the purging operation will not function properly.
- While the process of purging is not an acceptable method of smoke control on its own, it can be used as a supplement to airflow or pressurization.

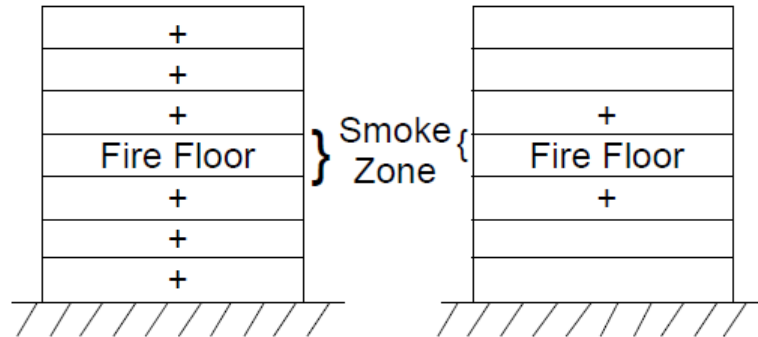
Smoke Control Definitions

❖ Zoned Smoke Control Systems

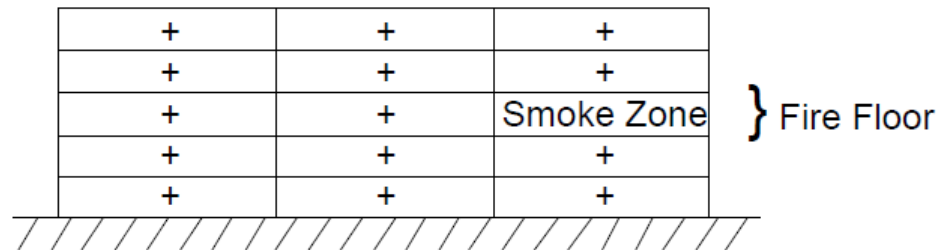
- Buildings can usually be divided into a number of smoke control zones where each zone can be separated from the smoke zone to prevent the movement of smoke.
- The smoke control zone boundaries are usually partitions, floors, and doors that can be closed. Often each floor of a building is chosen as a smoke control zone boundary.
- However, a smoke control zone can consist of more than one floor, or a floor can contain more than one zone. Also, all non-smoke zones can be pressurized, or just those surrounding the smoke zone.

Smoke Control Definitions – Examples

Smoke Control Zone Every Floor



Three Smoke Control Zones Per Floor



Smoke Control Definitions - Examples

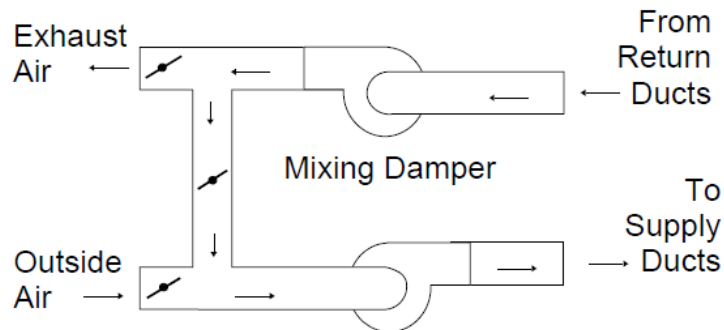


Figure 2.22a Normal Mode

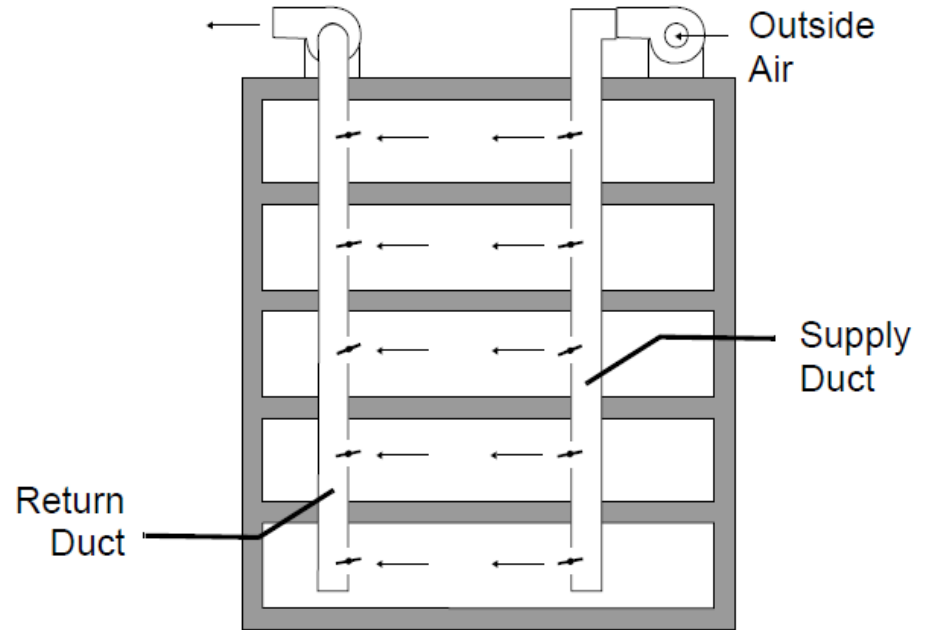
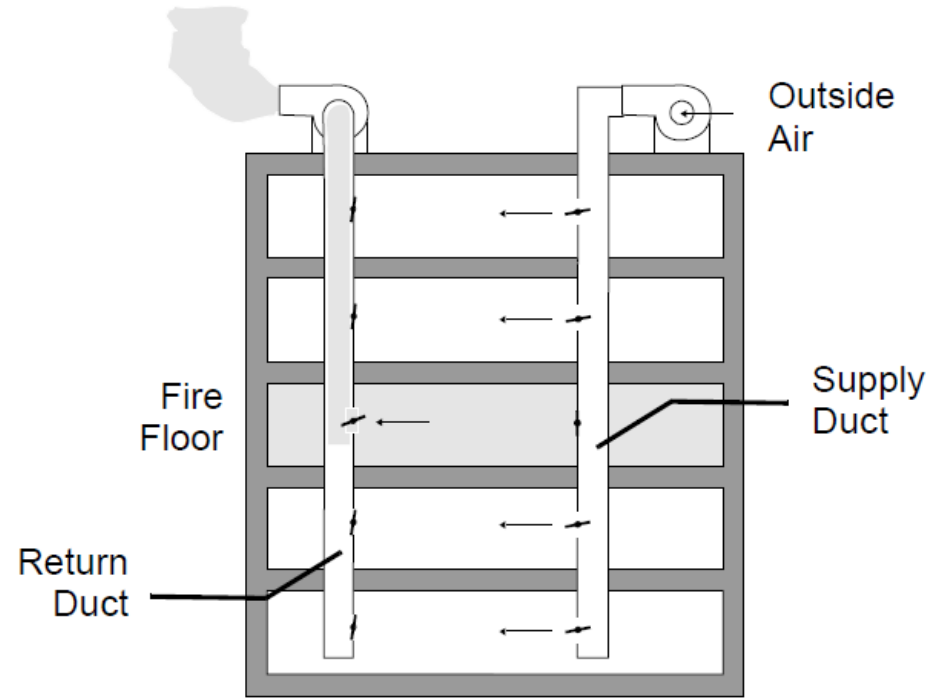
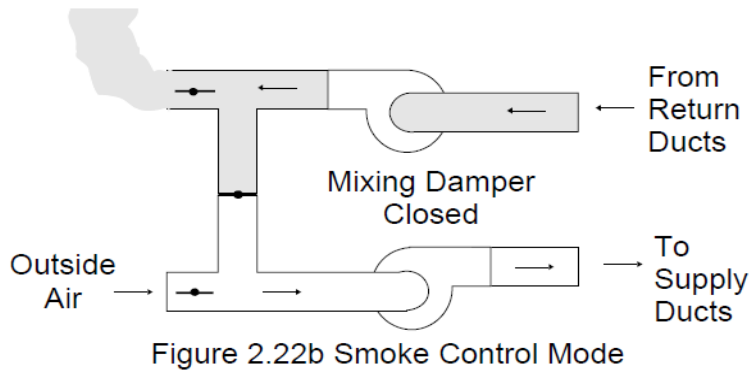


Figure 2.21a

Smoke Control Definitions - Examples



Notifier Panels with Smoke Control Capability

Regardless of panel selection, the SCS Series boards must be included for UUKL applications

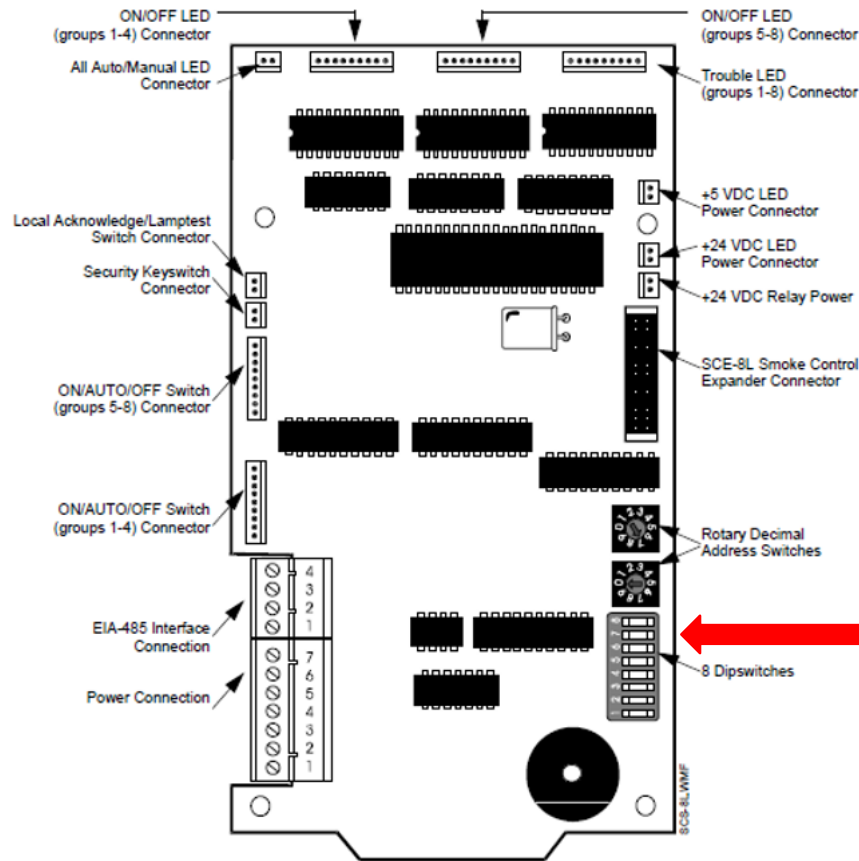
❖ ONYX Series

- NFS2-3030
- NCA-2

Must have NFS2-3030 v.21 or higher for Complex Zoned systems

Smoke Control Panel - Interface Cards

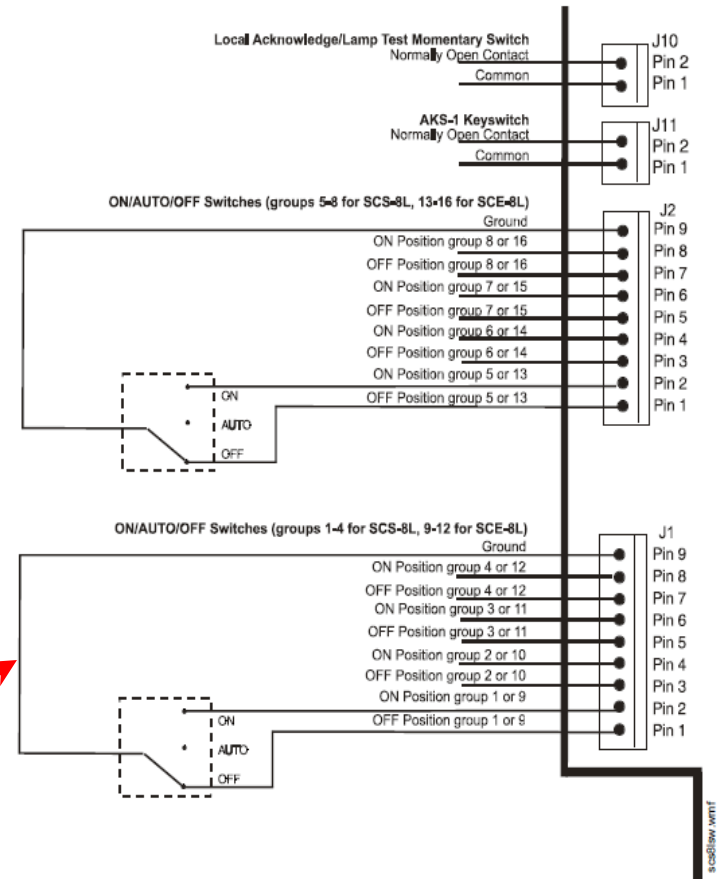
- SCS-8L
 - SCE-8L (Expander Card)



**FOR SETTING
MODES OF
OPERATION –
MUST MATCH
PROGRAM**

Smoke Control Panel - Interface Cards (Switches)

- ❖ Monitors eight (8) 3-position switches
 - ON, AUTO (null), OFF
 - Switch inputs 1-4 share a ground
 - Switch inputs 5-8 share a ground
- ❖ Monitors one (1) N.O. contact for lamp-test /Acknowledge
- ❖ Monitors one (1) N.O. contact for enable/disable all switch inputs

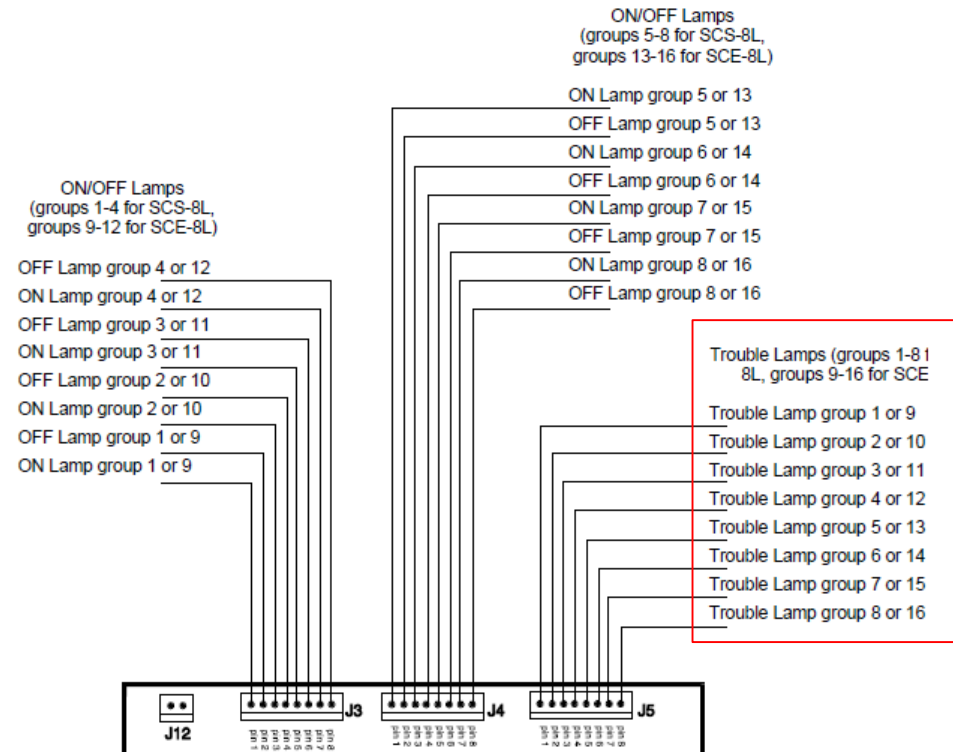


What happens if you break this wire?

Smoke Control Panel - Interface Cards (LED Outputs)

❖ Provides 24 LED drivers

- For eight switches
 - On (green), Off (red), and Trouble (yellow)
- On & Off drivers are grouped by switch
- Trouble drivers only provide pre-programmed fault/trouble output
 - (not user programmable)
 - **Note:** LDM card outputs are programmable



Smoke Control Panel - Interface Cards

❖ Software options

- “B” = Boston
- Upgrade to 4.0 or higher chips if you have v.21 or higher CPU (c. 2015)

Where most projects fall

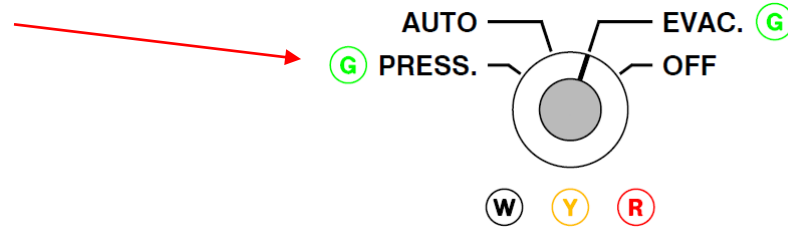
Table 3.2 SCS Features: V2.84 vs V4.0

Panel Feature (V21.0)	FSCS Mode A**		FSCS Mode B**
	SCS-8/8L V2.84	SCS-8/8L V4.0	SCS-8/8L V4.0
Independent Switch-group Operation (See Appendix C.2, "Mode B Operation")	No	No	Yes
Multiple Smoke Control Station	No	Yes	Yes
Pairing	No	Yes	No
Programmable Trouble Timer*	No	Yes	Yes
SCS Logic Equation Operators*	No	Yes	Yes
Enhanced Trouble Reporting*	No	Yes	Yes

*See NFS2-3030/NCA-2 documentation.
**See NFS2-3030/NCA-2 documentation for mode setting.

Smoke Control Panel - Interface Cards (Switches)

WATCH OUT FOR THIS!



- ❖ Special application
 - 2 modes = 2 SCS switches
 - ❖ Custom wiring and switch

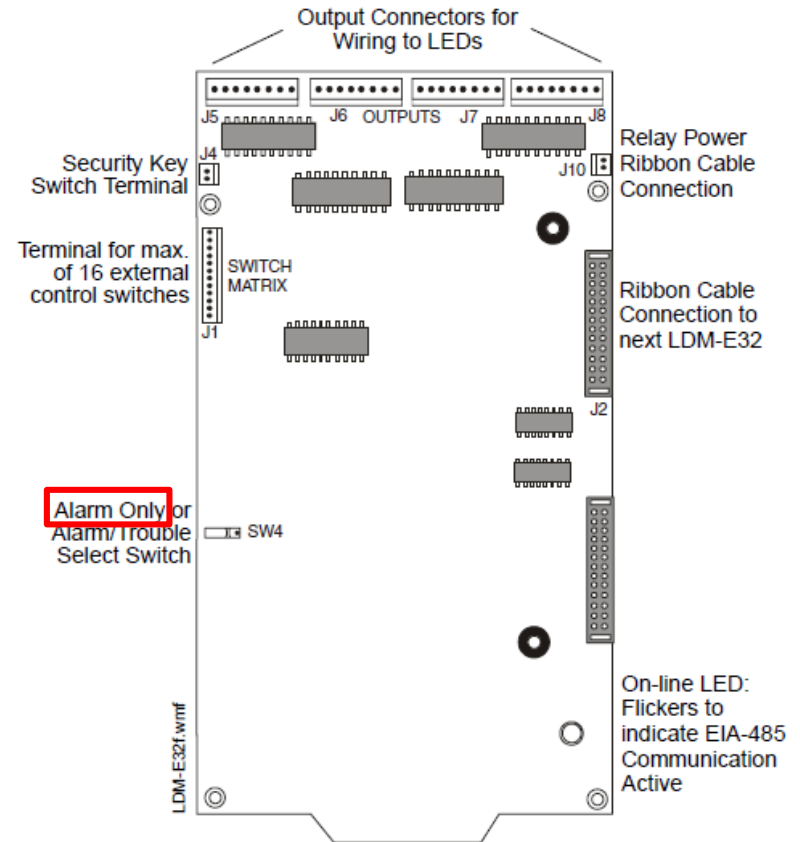
- ❖ Think about conflicts
 - Can the two modes be active at the same time?
 - How do we force the opposing mode off in this scenario?

- ❖ Needs to be coordinated closely with graphic manufacturer or it will likely arrive wrong.

SCS#4	1	ZONE HG2 EXHAUST	J1P2	J1P1	J3P1	J3P2	SHARED PRESS/EXH SWITCHES + LEDS FOR OFF,AUTO, & FAULT
	2	ZONE HG1 EXHAUST	J1P4	J1P3	J3P3	J3P4	
	3	ZONE HB EXHAUST	J1P6	J1P5	J3P5	N/C	
	4	ZONE HB PRESSURIZE	J1P8	J1P7	J3P7	N/C	
	5	ZONE H1 EXHAUST	J2P2	J2P1	J4P1	N/C	
	6	ZONE H1 PRESSURIZE	J2P4	J2P3	J4P3	N/C	
	7	ZONE H2 EXHAUST	J2P6	J2P5	J4P5	N/C	
	8	ZONE H2 PRESSURIZE	J2P8	J2P7	J4P7	N/C	
SCS#4	9	ZONE H3 EXHAUST	J1P2	J1P1	J3P1	N/C	
	10	ZONE H3 PRESSURIZE	J1P4	J1P3	J3P3	N/C	
	11	ZONE H4 EXHAUST	J1P6	J1P5	J3P5	N/C	
	12	ZONE H4 PRESSURIZE	J1P8	J1P7	J3P7	N/C	
	13	ZONE H5 EXHAUST	J2P2	J2P1	J4P1	N/C	
	14	ZONE H5 PRESSURIZE	J2P4	J2P3	J4P3	N/C	
	15	ZONE H6 EXHAUST	J2P6	J2P5	J4P5	N/C	
	16	ZONE H6 PRESSURIZE	J2P8	J2P7	J4P7	N/C	
SCS#5	1	ZONE H7 EXHAUST	J1P2	J1P1	J3P1	N/C	
	2	ZONE H7 PRESSURIZE	J1P4	J1P3	J3P3	N/C	
	3	ZONE H8 EXHAUST	J1P6	J1P5	J3P5	N/C	
	4	ZONE H8 PRESSURIZE	J1P8	J1P7	J3P7	N/C	
	5	ZONE H9 EXHAUST	J2P2	J2P1	J4P1	N/C	
	6	ZONE H9 PRESSURIZE	J2P4	J2P3	J4P3	N/C	
	7	ZONE H10 EXHAUST	J2P6	J2P5	J4P5	N/C	
	8	ZONE H10 PRESSURIZE	J2P8	J2P7	J4P7	N/C	

Smoke Control Panel - Interface Cards (LED's)

- ❖ LDM-32 (Alarm Only mode)
 - LDM-E32 (Expander Card)
 - 32 fully programmable LED Drivers
 - ❖ 64 with LDM-E32 expander
- (Maximum of 1 expander per LDM-32)
- Used for
 - ❖ Normal LED (White)
 - ❖ Trouble/Fault LED (Yellow)



Smoke Control Panel – Identify your Equipment

❖ How many....

- Dedicated Fans (typically 1 Relay, 1 Monitor)
 - ❖ Only turn on for smoke control mode
- Non-Dedicated Fans (typically 2 Relay, 1 Monitor)
 - ❖ Controlled by BMS when not in smoke control mode
- Dedicated Dampers (typically 1 Relay, 2 Monitor)
 - ❖ Only Open/Close in smoke control mode
- Non-Dedicated Dampers (typically 2 Relay, 2 Monitor)
 - ❖ Controlled by BMS when not in smoke control mode

**Avoid mixing different equipment on the same SCS
(or paired SCS boards)**

Smoke Control Panel – Identify your Equipment

❖ What about complex zoned smoke control?

- **Treat as switch group type 8 or 9 FSCS**
 - ❖ **Group Type 8 = 2 Control – 1 Monitor (On)**
 - ❖ **Group Type 9 = 2 Control – 2 Monitors**

- **Use NFS2-3030 General Zones for Control On and Control Off**

- **Use Logic Zones for Monitor On (and Monitor Off - if required)**
 - ❖ **When Group Type 8 is used, OFF status is assumed when not ON**

Smoke Control Panel Interface Cards – Estimating SCS

Note: THIS ONLY APPLIES TO STANDARD 3 POSITION ON-AUTO-OFF SWITCH CONFIGURATIONS.

- ❖ To determine the quantity of SCS boards:
 - # of (a) Dedicated Fans requiring manual control (only operate in alarm)
 - Divide by 8 switches per SCS (and round up)= total cards
 - Divide by 2 (and round up) for total SCS-8L cards
 - Subtract the # of total cards from the number of SCS-8L cards for the number of SCE-8L cards

Example -

17 dedicated fans / 8 = 2.125 or 3 total cards,

3 total cards / 2 = 1.5 or 2 SCS-8L cards

3 total cards – 2 SCS-8L cards = 1 SCE-8L card

- ❖ Follow the same process for (b) non-dedicated fans, (c) dedicated dampers, (d) non-dedicated dampers, and (e) zones of equipment to be controlled

Smoke Control Panel Interface Cards – Estimating LDM

To determine the quantity of LDM boards:

- ❖ Count total LEDs required for the graphic
 - Subtract two LEDs for each manual switch required above
(ON/OPEN and OFF/CLOSED included with SCS)
 - Divide by 32 for total cards
 - Divide by 2 for LDM-32 cards
 - Subtract the total LDM-32 cards from the Total cards for the number of LDM-E32 cards

Example -

88 LEDs required – (10 switches x 2 = 20) = 68 LEDs

68 LEDs / 32 = 2.125 or 3 total cards

3 total cards / 2 = 1.5 or 2 LDM-32 cards

3 Total cards – 2 LDM-32 cards = 1 LDM-E32 card

5 Minute Water-Cooler Break and Questions

(The course will soon become more complicated - Now is your chance to ask your questions and then escape ☺)

Smoke Control - New Programming Features of v.21

- ❖ SCS Pairing
- ❖ Multiple Command Stations
- ❖ Programming Enhancements
 - Zone Precedence
- ❖ Read Status Enhancements
- ❖ Trouble Reporting Enhancements
- ❖ History Printout Enhancements

Smoke Control - New Programming Features of v.21

❖ SCS Pairing

- Pairing (SCS Mode A) allows SCS modules to be “grouped” so that more than one FSCS module will act as a single FSCS module (in regards to activation and lockout).
- All paired FSCS modules will enter manual mode when any toggle switch is used to enter manual mode.
 - ❖ Paired modules must be configured for FSCS mode.
 - ❖ For CBE lockout, program points 65-96 on the first FSCS module only.

Smoke Control - New Programming Features of v.21

❖ AUTO, NORM, SCSDIS Operators

▪ AUTO

- ❖ $\text{OR}(\text{AUTO}(A1))$ ← active when all switches on SCS address A1 are in their AUTO position
- ❖ $\text{OR}(\text{AUTO}(A1G2))$ ← active when the 2nd switch on SCS address A1 is in the AUTO position

▪ NORM

- ❖ $\text{OR}(\text{NORM}(A1))$ ← active when all switches on SCS address A1 are not in a fault condition
- ❖ $\text{OR}(\text{NORM}(A1G2))$ ← active when the 2nd switch on SCS address A1 is not in a fault condition

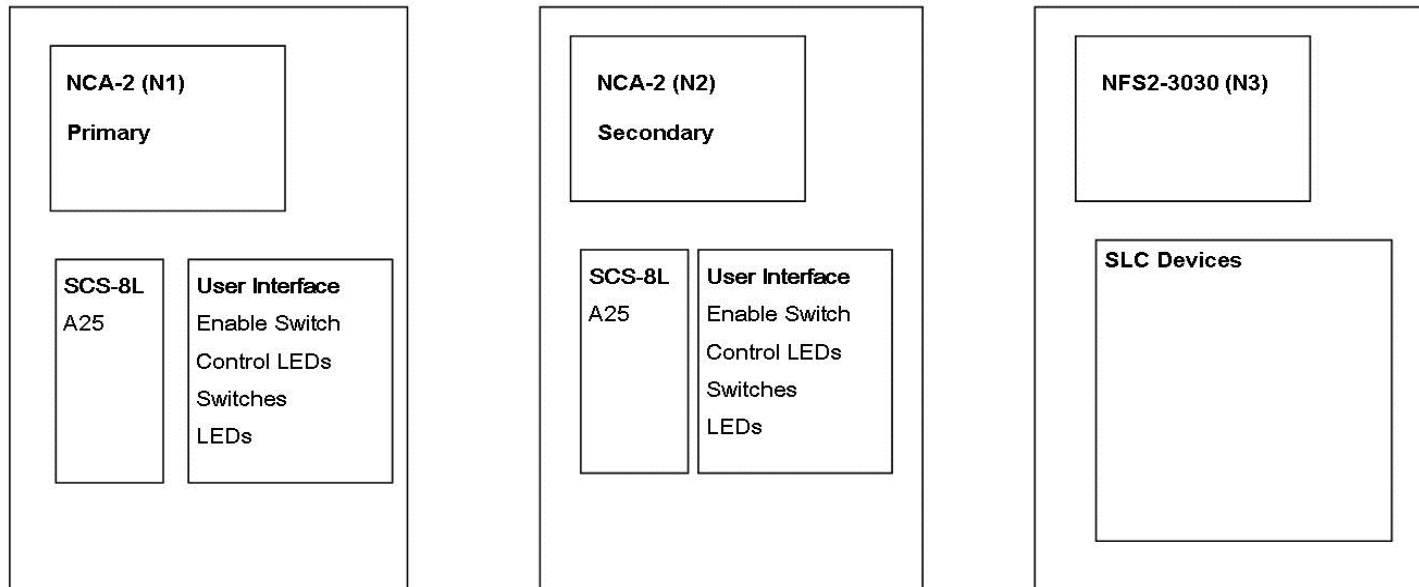
▪ SCSDIS

- ❖ $\text{OR}(\text{SCSDIS}(A1))$ ← active when the enable key-switch contacts on SCS address A1 is shorted

Smoke Control - New Programming Features of v.21

❖ Multiple Smoke Control Stations (MSCS)

- Provides the ability to choose to control from multiple duplicate interface panels



Primary Panel—
Normally in Control—
Enabled.

Secondary Panel—
Highest Priority—
Normally Disabled

Smoke Control - New Programming Features of v.21

- ❖ Multiple Smoke Control Stations (MSCS) continued....
 - Primary Panel - Normally in Control

Programming	Visual Indicators	Notes
ZL498 = OR(SCSDIS(A25),NOT(N2ZL498))	Primary SCS Disabled	ZL498 will be active when the primary's enable/disable switch is disabled and the secondary NCA-2 SCS is enabled/disabled.
ZL499 = OR(AUTO(A25))	--	Required for Multiple Smoke Control Systems applications; monitors the Auto status of the SCS-8L (designated as A25 in this example). Logic zone address must be lower than that of the MSCS Control Zone.
ZL500 = AND(NOT(SCSDIS(A25)),NOT(N2ZL500))	Primary SCS Active	ZL500 identifies the MSCS Control Zone of the primary NCA-2. This logic zone will be active when the primary's enable/disable switch is enabled and the secondary NCA-2 SCS-8L is disabled.
ZL501 = AND(ZL499,N2ZL499)	--	Required to track when the SCS-8L is in Auto; Must use the next consecutive logic zone address after the MSCS Control Zone of the primary NCA-2.
N2ZL500	Secondary SCS Active	N2ZL500 identifies the MSCS Control Zone of the secondary NCA-2.

Smoke Control - New Programming Features of v.21

- ❖ Multiple Smoke Control Stations (MSCS) continued
 - Secondary Panel – Normally disabled

Programming	Visual Indicators	Notes
ZL498 = OR(SCSDIS(A25))	Secondary SCS Disabled	ZL498 will be active when the secondary's enable/disable switch is disabled.
ZL499 = OR(AUTO(A25))	--	Required for Multiple Smoke Control Systems applications; monitors the Auto status of the SCS-8L (designated as A25 in this example). Address must be lower than that of the MSCS Control Zone.
ZL500 = NOT(SCSDIS(A25))	Secondary SCS Active	ZL500 Identifies the MSCS Control Zone of the secondary NCA-2. This logic zone will be active when the secondary's enable/disable switch is enabled.
ZL501 = AND(ZL499, N1ZL499)	--	Required to track if the SCS-8L is in Auto; Must use the next logic zone address after the MSCS Control Zone of the secondary NCA-2.
N1ZL500	Primary SCS Active	N1ZL500 identifies the MSCS Control Zone of the primary NCA-2.

Smoke Control - New Programming Features of v.21

❖ Zone Precedence (NFS2-3030 only)

System Programming - General Zones

Node: 11 (NFS2-3030)

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Local Zone	Non-Reset Control	Silenceable	Precedence Participation	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	General Alarm
0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	General Alarm
1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	E9-A1-E1 Manual On
2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A2 Manual On
3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A3 Manual On
4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A4 Manual On
5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A5 Manual On
6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A6 Manual On
7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A7 Manual On
8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A8 Manual On
9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A9 Manual On
10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	E2 Manual On
13	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	E3 Manual On
14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	E4 Manual On
15	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	E5 Manual On
16	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	E6 Manual On
17	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	E7 Manual On
18	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	E8 Manual On
19	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Smoke Control Panel – SCS Programming

❖ SCS - ACS Mapping

- 4 ACS points = 1 SCS Switch Group
- (1=CONon, 2=CONoff, 3=MONon, 4=MONoff)
 - ❖ CON points can be a module or a **NFS2-3030 General Zone** *
 - ❖ MON points can be a monitor module or a **Logic Zone**

ACS Board	Board Type	Pairing Group	Trouble Timer(Secs)	Label		
1	64 pt ACS	None	0			
2	64 pt ACS	None	0			
3	64 pt ACS	None	0			
4	64 pt ACS	None	0			
5	FSCS	1	30			
6	FSCS	1	30			

ACS Point /	Function	Source	Input	Local Zone	Switch Group / Zone
1	Control	N11Z1	N/A	1	E9-A1-E1 SWITCH GRP
2	Control	N11Z21	N/A		
3	Monitor	ZL401	N/A		
4	Monitor	ZL501	N/A		
5	Control	N11Z12	N/A	12	E2 SWITCH GROUP
6	Control	N11Z32	N/A		
7	Monitor	ZL412	N/A		
8	Monitor	ZL512	N/A		

Read Status (AxxPxx)

Primary Command Node 1
SYSTEM NORMAL

Normal
Comm Loss
DIP SW Default
Mode Config
Expander Config
External Trouble

01:36:35P MON NOV 11, 2013

===== READ ADDRESS:A25P01-04 =====

CUSTOM ACS BOARD LABEL

STATUS: NORMAL

Normal
Device Mismatch
Device Trouble
DIP SW Mismatch
Time out

CUSTOM SW GROUP LABEL

SG01 STATUS: AUTO NORMAL

Auto
On/Open
Off/Closed

P01 CON N002L03M100 OFF NORMAL

P02 CON N002L03M102 ON NORMAL

P03 MON N002L03M101 OFF NORMAL

P04 MON N002L03M103 ON NORMAL

Normal
No Answer
Invalid Response
Mismatch HDW
Type
Disabled
Open Circuit

=====

BACK

Read Status (Axx continued - FSCS)

Primary Command Node 1
SYSTEM NORMAL

01:36:46P MON NOV 11, 2013

===== READ ADDRESS:A25P01-04 =====

GROUP TYPE (1-5): 09

MODE (6): FSCS

FSCS (7): DEDICATED

DIPSWITCH SETTING: x1111110 / 7E

TROUBLE REPORTING DELAY: 030

=====

BACK

Event History for Enhanced Troubles

Available on (local) panel connected to the SCS:

TROUBLE	ANNUN 25 TROUBLE
ACS BOARD LABEL MODE CONFIG	09:04:09A WED NOV 13, 2013 N003
TROUBLE	ANNUN 25 TROUBLE
SG CUSTOM LABEL SG01 TIME OUT	09:10:10A WED NOV 13, 2013 N003

Smoke Control - Programming Zoned SC (Example 1)

- ❖ The following would represent a 3-zone system where only one zone could be in Exhaust mode at a time automatically.
- ❖ The Logical Players:
 - **Automatic**
 - ❖ AUTOMATIC EXH Z1 - (N1Z100)
 - ❖ AUTOMATIC EXH Z2 - (N1Z200)
 - ❖ AUTOMATIC EXH Z3 - (N1Z300)

 - **Manual**
 - ❖ MANUAL EXH Z1 - (N1Z1=ON, N1Z11=OFF)
 - ❖ MANUAL EXH Z2 - (N1Z2=ON, N1Z12=OFF)
 - ❖ MANUAL EXH Z3 - (N1Z3=ON, N1Z13=OFF)
 - ❖ MANUAL PRESS Z1 - (N1Z21=ON, N1Z31=OFF)
 - ❖ MANUAL PRESS Z2 - (N1Z22=ON, N1Z32=OFF)
 - ❖ MANUAL PRESS Z3 - (N1Z23=ON, N1Z33=OFF)

*DON'T FORGET PRECEDENCE MODE AND NON-RESET

Smoke Control - Programming Zones SC (Example 1)

❖ LOCKOUT ZL IN A SEPARATE NODE

- $N2ZL200 = OR(N1ZL101, N1ZL102, N1ZL103^*)$

* INCLUDE ALL ZONES WHICH WILL REQUIRE LOCKOUT ONCE ACTIVATED

Smoke Control - Programming Zones SC (Example 1)

- ❖ WRITE **ONE** ZL FOR AUTOMATIC OPERATION FOR EACH ZONE FOR PRESSURIZE AND EXHAUST MODES
- ❖ EXHAUST ON EQUATIONS (ONLY ONE ZONE ALLOWED TO EXHAUST AT ANY GIVEN TIME)
 - $N1ZL101 = OR(AND(OR(AND(Z100,NOT(N2ZL200))),ZL101),NOT(Z11),NOT(Z21),NOT(ZF14)),Z1''$)
 - $N1ZL102 = OR(AND(OR(AND(Z200,NOT(N2ZL200))),ZL102),NOT(Z12),NOT(Z22),NOT(ZF14)),Z2''$)
 - $N1ZL103 = OR(AND(OR(AND(Z300,NOT(N2ZL200))),ZL103),NOT(Z13),NOT(Z23),NOT(ZF14)),Z3''$)

Smoke Control - Programming Zones SC (Example 1)

- ❖ WRITE **ONE** ZL FOR AUTOMATIC OPERATION FOR EACH ZONE FOR PRESSURIZE AND EXHAUST MODES
- ❖ EXHAUST ON EQUATIONS (ONLY ONE ZONE ALLOWED TO EXHAUST AT ANY GIVEN TIME)
 - $N1ZL101 = OR(AND(OR(AND("AUTOMATIC EXH Z1", NOT("LOCKOUT ZL FROM A SEPARATE NODE")), "ZL101"), NOT("MANUAL EXH OFF Z1"), NOT("MANUAL PRESS Z1")), NOT(ZF14)), "MANUAL EXH Z1")$ -- Note: ZF14 = PANEL RESET--
 - $N1ZL102 = OR(AND(OR(AND("AUTOMATIC EXH Z2", NOT("LOCKOUT ZL FROM A SEPARATE NODE")), "ZL102"), NOT("MANUAL EXH OFF Z2"), NOT("MANUAL PRESS Z2")), NOT(ZF14)), "MANUAL EXH Z2")$
 - $N1ZL103 = OR(AND(OR(AND("AUTOMATIC EXH Z3", NOT("LOCKOUT ZL FROM A SEPARATE NODE")), "ZL103"), NOT("MANUAL EXH OFF Z3"), NOT("MANUAL PRESS Z3")), NOT(ZF14)), "MANUAL EXH Z3")$

Smoke Control - Programming Zones SC (Example 1)

- ❖ PRESSURIZE ON EQUATIONS (IF ALL ZONES PRESSURIZE WHEN THEY ARE NOT IN EXHAUST MODE)
 - N1ZL111 = AND(OR(ZL102,ZL103,"MANUAL PRESS Z1"),NOT("MANUAL EXH Z1"))
 - N1ZL112 = AND(OR(ZL101,ZL103,"MANUAL PRESS Z2"),NOT("MANUAL EXH Z2"))
 - N1ZL113 = AND(OR(ZL101,ZL102,"MANUAL PRESS Z3"),NOT("MANUAL EXH Z3"))

- ❖ PRESSURIZE ON EQUATIONS (IF ONLY ZONES ABOVE AND BELOW PRESSURIZE)
 - N1ZL111 = AND(OR(ZL102,"MANUAL PRESS Z1"),NOT("MANUAL EXH Z1"))
 - N1ZL112 = AND(OR(ZL101,ZL103,"MANUAL PRESS Z2"),NOT("MANUAL EXH Z2"))
 - N1ZL113 = AND(OR(ZL102,"MANUAL PRESS Z3"),NOT("MANUAL EXH Z3"))

* The zone will not clear after being switched “on” by simply returning the switch to normal. The panel must be reset or the switch moved to the “off” position to clear the zone.

Each output ZL used must reference the above core Logic Zones in order to have a single point of reference and avoid circular logic.

Smoke Control - Programming – Zones SC (Example 1)

- ❖ PRESSURIZE ON EQUATIONS (IF ALL ZONES PRESSURIZE WHEN THEY ARE NOT IN EXHAUST MODE)
 - $N1ZL111 = \text{AND}(\text{OR}(ZL102, ZL103, Z21), \text{NOT}(Z1))$
 - $N1ZL112 = \text{AND}(\text{OR}(ZL101, ZL103, Z22), \text{NOT}(Z2))$
 - $N1ZL113 = \text{AND}(\text{OR}(ZL101, ZL102, Z23), \text{NOT}(Z3))$

- ❖ PRESSURIZE ON EQUATIONS (IF ONLY ZONES ABOVE AND BELOW PRESSURIZE)
 - $N1ZL111 = \text{AND}(\text{OR}(ZL102, Z21), \text{NOT}(Z1))$
 - $N1ZL112 = \text{AND}(\text{OR}(ZL101, ZL103, Z22), \text{NOT}(Z2))$
 - $N1ZL113 = \text{AND}(\text{OR}(ZL102), \text{NOT}(Z3))$

* The zone will not clear after being switched “on” by simply returning the switch to normal. The panel must be reset or the switch moved to the “off” position to clear the zone.

Each output ZL used must reference the above core Logic Zones in order to have a single point of reference and avoid circular logic.

Smoke Control - Programming – Zones SC (Example 2)

❖ Example 2

- 9 Office Pods (Open office space) – A areas
 - ❖ 6 sub-zones (w/ independent automatic operation)
 - ❖ Sub-zones do not lock out others in same Pod
 - ❖ No subsequent alarms are to reconfigure the system
 - ❖ Once a Pod is active, all subsequent alarms (from other areas) are locked out
 - ❖ Manual switch controls all sub-zones as 1 smoke zone (SZ)

- 9 Entry/Exit Atriums – E areas
 - ❖ Atrium smoke exhausted through use of shared fans in Office Pods
 - ❖ Manual activation of an E area overrides a manual activation of an A area for only the shared equipment

- Honeywell FSG engaged for Proof-of-Concept (POC)

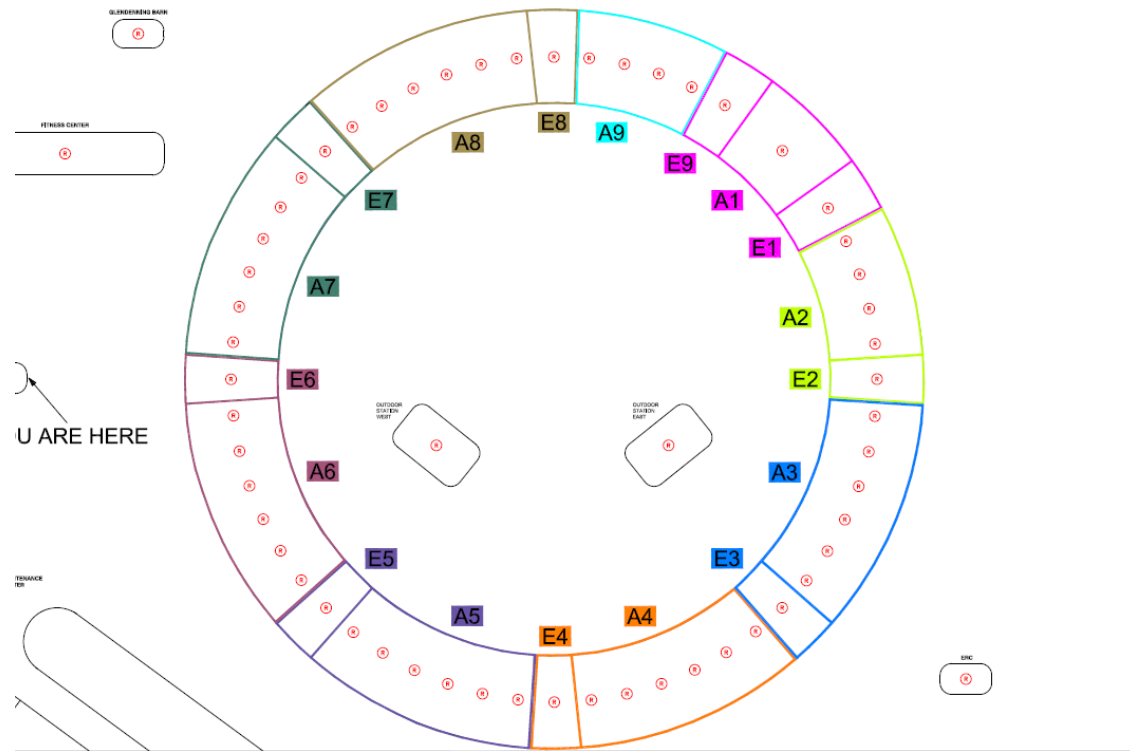
Smoke Control - Programming – Zones SC (Example 2)

❖ 16 Switches

- $16 / 8 = 2$ Cards
- $2 / 2 = 1$ SCS-8L
- $2 - 1 = 1$ SCE-8L

❖ 64 LEDs

- $64 - (16 \times 2) = 32$ LEDs
- $32 / 32 = 1$ LDM-32
- $1 - 1 = 0$ LDM-E32



Smoke Control - Programming – Zones SC (Example 2)

❖ Step 1 – Established Manual Control Zones

- Map Annunciator points to NFS2-3030 General Zones

SCS-Group #	General Zone	Smoke Zone	Template Information
SCS1 Group 1	N11Z009	A9	<A9 Manual On>
SCS1 Group 1	N11Z029	A9	<A9 Manual Off>
SCS1 Group 2	N11Z002	A2	<A2 Manual On>
SCS1 Group 2	N11Z022	A2	<A2 Manual Off>
SCS1 Group 3	N11Z003	A3	<A3 Manual On>
SCS1 Group 3	N11Z023	A3	<A3 Manual Off>
SCS1 Group 4	N11Z004	A4	<A4 Manual On>
SCS1 Group 4	N11Z024	A4	<A4 Manual Off>
SCS1 Group 5	N11Z005	A5	<A5 Manual On>
SCS1 Group 5	N11Z025	A5	<A5 Manual Off>
SCS1 Group 6	N11Z006	A6	<A6 Manual On>
SCS1 Group 6	N11Z026	A6	<A6 Manual Off>
SCS1 Group 7	N11Z007	A7	<A7 Manual On>
SCS1 Group 7	N11Z027	A7	<A7 Manual Off>
SCS1 Group 8	N11Z008	A8	<A8 Manual On>
SCS1 Group 8	N11Z028	A8	<A8 Manual Off>
SCS2 Group 1	N11Z001	E9-A1-E1	<E9-A1-E1 Manual On>
SCS2 Group 1	N11Z021	E9-A1-E1	<E9-A1-E1 Manual Off>
SCS2 Group 2	N11Z012	E2	<E2 Manual On>
SCS2 Group 2	N11Z032	E2	<E2 Manual Off>
SCS2 Group 3	N11Z013	E3	<E3 Manual On>
SCS2 Group 3	N11Z033	E3	<E3 Manual Off>
SCS2 Group 4	N11Z014	E4	<E4 Manual On>
SCS2 Group 4	N11Z034	E4	<E4 Manual Off>
SCS2 Group 5	N11Z015	E5	<E5 Manual On>
SCS2 Group 5	N11Z035	E5	<E5 Manual Off>
SCS2 Group 6	N11Z016	E6	<E6 Manual On>
SCS2 Group 6	N11Z036	E6	<E6 Manual Off>
SCS2 Group 7	N11Z017	E7	<E7 Manual On>
SCS2 Group 7	N11Z037	E7	<E7 Manual Off>
SCS2 Group 8	N11Z018	E8	<E8 Manual On>
SCS2 Group 8	N11Z038	E8	<E8 Manual Off>

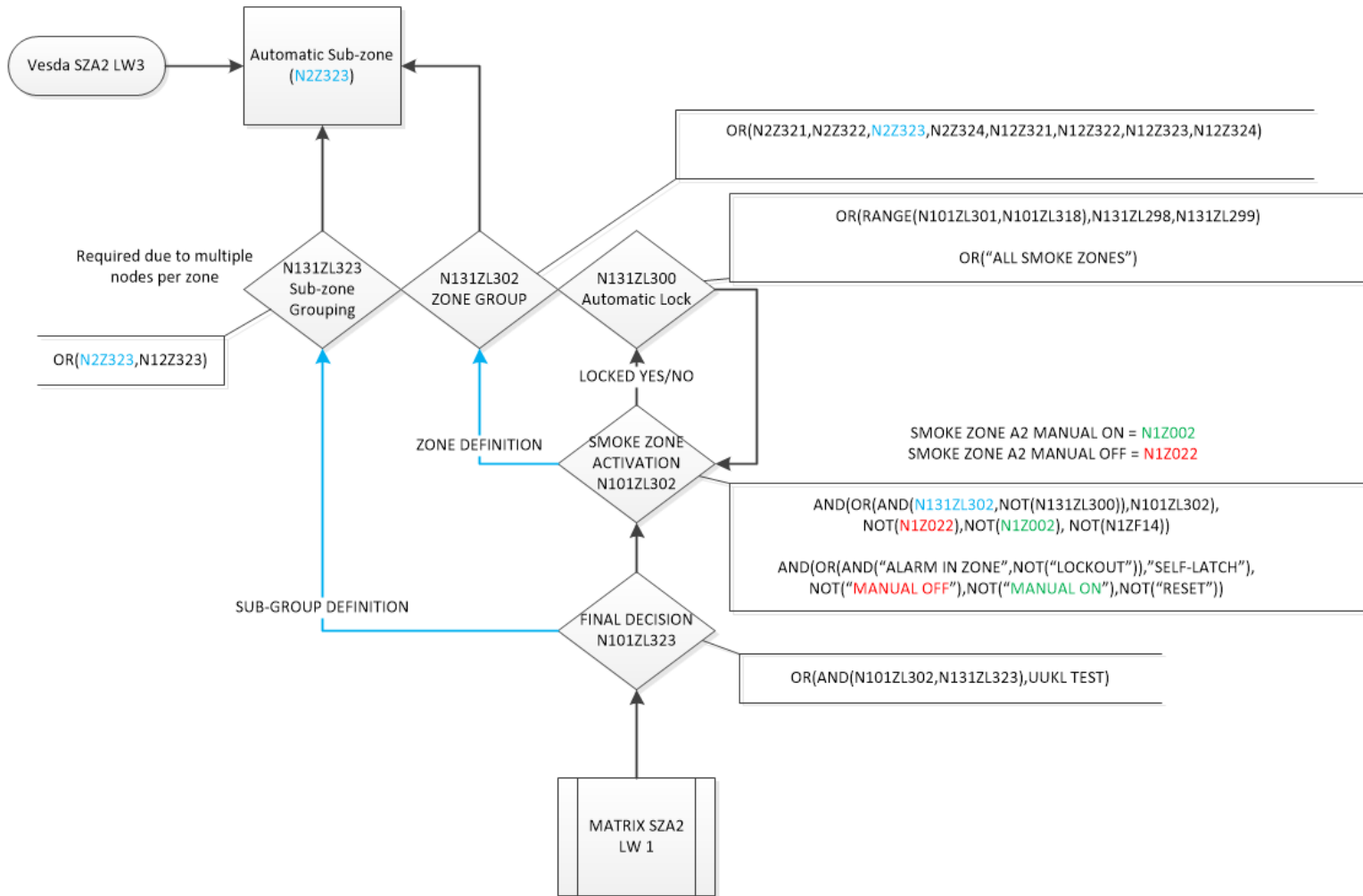
Smoke Control - Programming – Zones SC (Example 2)

❖ Step 2 – Established Automatic Control Zones

E9-A1-E1 SMOKE ZONE ALARM	OR(N1Z390,N1Z301,N1Z300)
E2 SMOKE ZONE ALARM	OR(N2Z320,N12Z320)
E3 SMOKE ZONE ALARM	OR(N3Z330,N13Z330)
E4 SMOKE ZONE ALARM	OR(N4Z340,N14Z340)
E5 SMOKE ZONE ALARM	OR(N5Z350,N15Z350)
E6 SMOKE ZONE ALARM	OR(N6Z360,N16Z360)
E7 SMOKE ZONE ALARM	OR(N7Z370,N17Z370)
E8 SMOKE ZONE ALARM	OR(N8Z380,N18Z380)
A2 LW 1 ALARM	OR(N2Z321,N12Z321)
A2 LW 2 ALARM	OR(N2Z322,N12Z322)
A2 LW 3 ALARM	OR(N2Z323,N12Z323)
A2 LW 4 ALARM	OR(N2Z324,N12Z324)
A3 LW 1 ALARM	OR(N3Z331,N13Z331)
A3 LW 2 ALARM	OR(N3Z332,N13Z332)
A3 LW 3 ALARM	OR(N3Z333,N13Z333)
A3 LW 4 ALARM	OR(N3Z334,N13Z334)
A3 LW 5 ALARM	OR(N3Z335,N13Z335)
A3 LW 6 ALARM	OR(N3Z336,N13Z336)
A4 LW 1 ALARM	OR(N4Z341,N14Z341)
A4 LW 2 ALARM	OR(N4Z342,N14Z342)
A4 LW 3 ALARM	OR(N4Z343,N14Z343)
A4 LW 4 ALARM	OR(N4Z344,N14Z344)
A4 LW 5 ALARM	OR(N4Z345,N14Z345)
A4 LW 6 ALARM	OR(N4Z346,N14Z346)

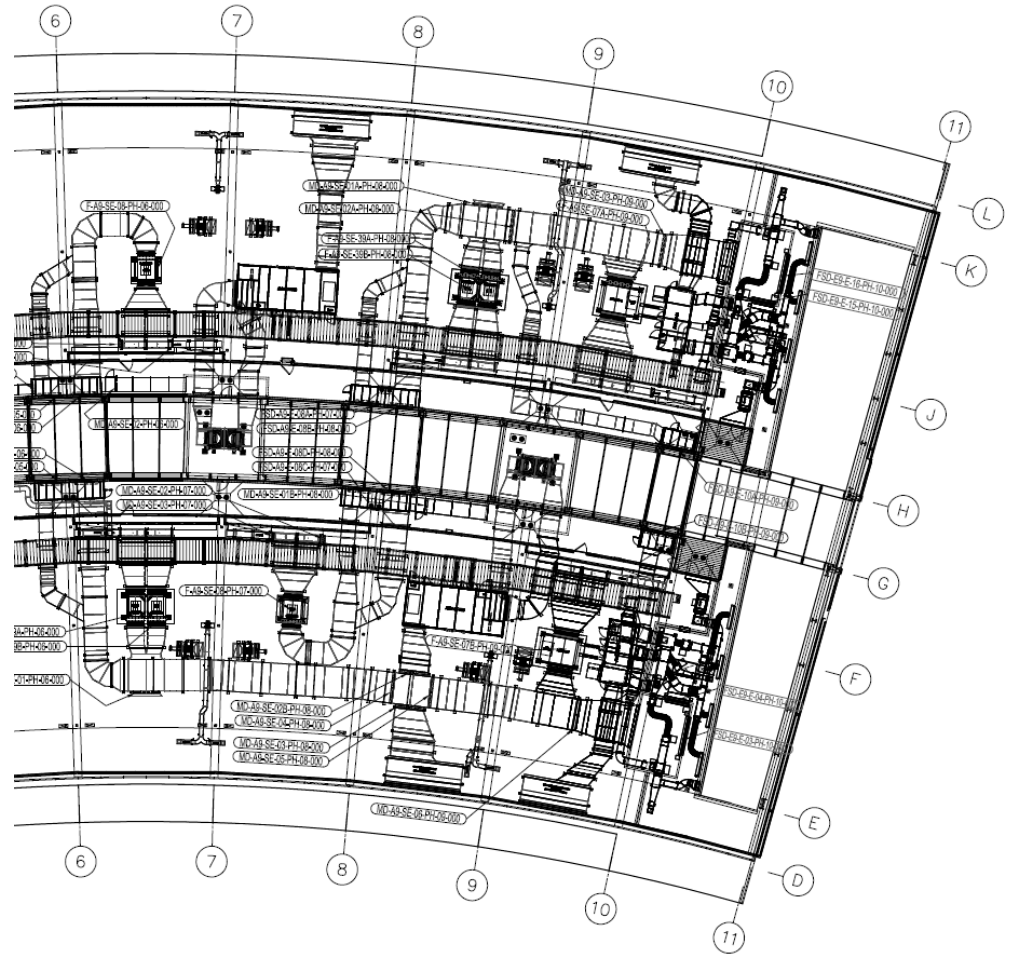
Smoke Control - Programming – Zones SC (Example 2)

❖ Step 3 – Established Logical Conditions



Smoke Control - Programming – Zones SC (Example 2)

- ❖ Step 4 – Reviewed Associated Mechanical Equipment and Required Functions



Smoke Control - Programming – Zones SC (Example 2)

❖ Step 5 – Created Minimum POC System and Operational Matrix

FAN/DAMPER LABEL	EXTENDED LABEL	FEEDBACK GROUP	Module Addresses			Module Addresses			ON DEPENDANCY	OFF DEPENDANCY	E9 A1 E1	A2 LW1	A2 LW3	A2 LW4	E2	E9-A1-E1	A2	E2	E9-A1-E1	A2	E2
			CONTROL NODE	CONTROL ON/OPEN	CONTROL OFF/CLOSED	FEEDBACK NODE	MONITOR ON/OPEN	MONITOR OFF/CLOSED			N101ZL301	N101ZL321	N101ZL323	N101ZL324	N101ZL312	N01Z001	N01Z002	N01Z012	N01Z021	N01Z022	N01Z032
A2 LW 1 SMK EXH FAN LO	A2 LW 1 50% (SHARED)	SMK EXH FAN	N001	L01M001	L01M003	N001	L01M002	L01M004	N111M022,N111M026,N111M036	NOT(N01Z001),NOT(N01Z002)	N	O	X	X	N	N	O	N	N	X	N
A2 LW 1 SMK EXH FAN HI	E9 A1 E1 100%	SMK EXH FAN	N001	L01M005		N001	L01M006		N111M024,N111M026,N111M034		O	N	N	N	O	N	N	N	N	N	
A2 LW 3 SMK EXH FAN LO	A2 LW 2 50% (NOT SHARED)	SMK EXH FAN	N001	L01M009	L01M011	N001	L01M010	L01M012			N	X	O	X	N	O	N	N	N	X	N
A2 LW 4 SMK EXH FAN LO	A2 LW 3 50% (SHARED)	SMK EXH FAN	N001	L01M019	L01M015	N001	L01M014	L01M016	N111M042,N111M038,N111M048	NOT(N01Z002),NOT(N01Z012)	N	X	X	O	N	O	N	N	N	X	N
A2 LW 4 SMK EXH FAN HI	E2 100%	SMK EXH FAN	N001	L01M007		N001	L01M008		N111M044,N111M038,N111M046		N	N	N	N	O	N	N	O	N	N	
A2 LW 1 EXH FSD*	LOW/HIGH MODE (E9-A1-E1/A2)	EXH FSD	N001	L01M021	L01M023	N001	L01M022	L01M024	NOT(N01Z001)		X	O	N	N	N	X	O	N	N	N	N
A2 LW 1 Exhaust MD	LOW/HIGH MODE (E9-A1-E1/A2)	EXH MD	N001	L01M025		N001	L01M026				O	O	N	N	N	O	O	N	N	N	N
A2 LW 1 Relief MD	LOW/HIGH MODE (E9-A1-E1/A2)	RELIEF MD	N001		L01M027	N001		L01M028			X	X	N	N	N	X	X	N	N	N	N
A2 LW 1 Separation DMPR*	LOW/HIGH MODE (E9-A1-E1/A2)	SEPERATION DMPR	N001	L01M033	L01M035	N001	L01M034	L01M036		NOT(N01Z001)	O	X	N	N	N	O	X	N	N	N	N
A2 LW 3 EXHAUST MD/FSD	LOW MODE ONLY (A2)	FAN CNFG DAMPERS	N001	L01M029		N001	L01M030				N	N	O	N	N	N	O	N	N	N	N
A2 LW 3 RELIEF MD	LOW MODE ONLY (A2)	RELIEF MD	N001		L01M031	N001		L01M032			N	N	X	N	N	N	X	N	N	N	N
A2 LW 4 EXH FSD*	LOW/HIGH MODE (E2/A2)	EXH FSD	N001	L01M041	L01M043	N001	L01M042	L01M044	NOT(N01Z012)		N	N	N	O	X	N	O	X	N	N	N
A2 LW 4 Exhaust MD	LOW/HIGH MODE (E2/A2)	EXH MD	N001	L01M037		N001	L01M038				N	N	N	O	O	N	O	O	N	N	N
A2 LW 4 Relief MD	LOW/HIGH MODE (E2/A2)	RELIEF MD	N001		L01M039	N001		L01M040			N	N	N	X	X	N	X	X	N	N	N
A2 LW 4 Separation DMPR*	LOW/HIGH MODE (E2/A2)	SEPERATION DMPR	N001	L01M045	L01M047	N001	L01M046	L01M048		NOT(N01Z012)	N	N	N	X	O	N	X	O	N	N	N
A2 DMPR 1		PH NVD	N001	L01M049		N001	L01M050				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 2		PH NVD	N001	L01M051		N001	L01M052				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 3		L4 NVD	N001	L01M053		N001	L01M054				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 4		L4 NVD	N001	L01M055		N001	L01M056				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 5		L3 NVD	N001	L01M057		N001	L01M058				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 6		L3 NVD	N001	L01M059		N001	L01M060				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 7		L2 NVD	N001	L01M061		N001	L01M062				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 8		L2 NVD	N001	L01M063		N001	L01M064				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 9		L1 NVD	N001	L01M065		N001	L01M066				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 10		L1 NVD	N001	L01M067		N001	L01M068				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 11		CL NVD	N001	L01M069		N001		L01M070			N	X	X	X	N	N	X	N	N	N	N
A2 DMPR 12		CL NVD	N001	L01M071		N001		L01M072			N	X	X	X	N	N	X	N	N	N	N
A2 DMPR 13		PASS FSD	N001	L01M073		N001		L01M074			N	X	X	X	N	N	X	N	N	N	N
A2 DMPR 14		PASS FSD	N001	L01M075		N001		L01M076			N	X	X	X	N	N	X	N	N	N	N
A2 EXH FAN 1		EXH FAN	N001	L01M077		N001		L01M078			N	X	X	X	N	N	X	N	N	N	N
A2 EXH FAN 2		EXH FAN	N001	L01M079		N001		L01M080			N	X	X	X	N	N	X	N	N	N	N
A2 AHU 1		AHU FAN	N001	L01M081		N001		L01M082			N	X	X	X	N	N	X	N	N	N	N
A2 AHU 2		AHU FAN	N001	L01M083		N001		L01M084			N	X	X	X	N	N	X	N	N	N	N

Smoke Control - Programming – Zones SC (Example 2)

❖ Step 6 – Write Control Logic for Proof-of-Concept

FAN/DAMPER LABEL	EXTENDED LABEL	CONTROL NODE	CONTROL ON/OPEN	NODE NUMBER	ON ZL #	
A2 LW 1 SMK EXH FAN LO	A2 LW 1 50% (SHARED)	N001	L01M001	N001	ZL0301	AND(OR(N101ZL321,N01Z002),L01M022,L01M026,L01M028,L01M036)
A2 LW 1 SMK EXH FAN HI	E9 A1 E1 100%	N001	L01M005	N001	ZL0302	AND(OR(N101ZL301,N01Z001),L01M024,L01M026,L01M028,L01M034)
A2 LW 3 SMK EXH FAN LO	A2 LW 2 50% (NOT SHARED)	N001	L01M009	N001	ZL0303	OR(N101ZL323,N01Z002)
A2 LW 4 SMK EXH FAN LO	A2 LW 3 50% (SHARED)	N001	L01M013	N001	ZL0304	AND(OR(N101ZL324,N01Z002),L01M042,L01M038,L01M048,L01M040)
A2 LW 4 SMK EXH FAN HI	E2 100%	N001	L01M007	N001	ZL0305	AND(OR(N101ZL312,N01Z012),L01M044,L01M038,L01M040,L01M046)
A2 LW 1 EXH FSD*	LOW/HIGH MODE (E9-A1-E1/A2)	N001	L01M021	N001	ZL0306	AND(OR(N101ZL321,N01Z002),NOT(N01Z001))
A2 LW 1 Exhaust MD	LOW/HIGH MODE (E9-A1-E1/A2)	N001	L01M025	N001	ZL0307	OR(N101ZL301,N101ZL321,N01Z001,N01Z002)
A2 LW 1 Relief MD	LOW/HIGH MODE (E9-A1-E1/A2)	N001				
A2 LW 1 Separation DMPR*	LOW/HIGH MODE (E9-A1-E1/A2)	N001	L01M033	N001	ZL0308	OR(N101ZL301,N01Z001)
A2 LW 3 EXHAUST MD/FSD	LOW MODE ONLY (A2)	N001	L01M029	N001	ZL0309	OR(N101ZL323,N01Z002)
A2 LW 3 RELIEF MD	LOW MODE ONLY (A2)	N001				
A2 LW 4 EXH FSD*	LOW/HIGH MODE (E2/A2)	N001	L01M041	N001	ZL0310	AND(OR(N101ZL324,N01Z002),NOT(N01Z012))
A2 LW 4 Exhaust MD	LOW/HIGH MODE (E2/A2)	N001	L01M037	N001	ZL0311	OR(N101ZL324,N101ZL312,N01Z002,N01Z012)
A2 LW 4 Relief MD	LOW/HIGH MODE (E2/A2)	N001				
A2 LW 4 Separation DMPR*	LOW/HIGH MODE (E2/A2)	N001	L01M045	N001	ZL0312	OR(N101ZL312,N01Z012)
A2 DMPR 1		N001	L01M049	N001	ZL0313	OR(N101ZL321,N101ZL323,N101ZL324,N01Z002)
A2 DMPR 2		N001	L01M051	N001	ZL0313	OR(N101ZL321,N101ZL323,N101ZL324,N01Z002)
A2 DMPR 3		N001	L01M053	N001	ZL0313	OR(N101ZL321,N101ZL323,N101ZL324,N01Z002)
A2 DMPR 4		N001	L01M055	N001	ZL0313	OR(N101ZL321,N101ZL323,N101ZL324,N01Z002)
A2 DMPR 5		N001	L01M057	N001	ZL0313	OR(N101ZL321,N101ZL323,N101ZL324,N01Z002)
A2 DMPR 6		N001	L01M059	N001	ZL0313	OR(N101ZL321,N101ZL323,N101ZL324,N01Z002)
A2 DMPR 7		N001	L01M061	N001	ZL0313	OR(N101ZL321,N101ZL323,N101ZL324,N01Z002)
A2 DMPR 8		N001	L01M063	N001	ZL0313	OR(N101ZL321,N101ZL323,N101ZL324,N01Z002)
A2 DMPR 9		N001	L01M065	N001	ZL0313	OR(N101ZL321,N101ZL323,N101ZL324,N01Z002)
A2 DMPR 10		N001	L01M067	N001	ZL0313	OR(N101ZL321,N101ZL323,N101ZL324,N01Z002)

Smoke Control - Programming – Zones SC (Example 2)

❖ Step 7 – Write Feedback Logic for Proof-of-Concept

A2 SCENARIOS													
N12ZL771	AND(ZL615,N2ZL610,N2ZL625,N2ZL645,N2ZL660,ZL640,ZL650)	54	<-- THESE THINGS ALWAYS HAPPEN IN SC MODE FOR A2										
N12ZL776	AND(N11Z1,N11Z2,ZL771,ZL690,ZL741,ZL700,ZL751)	46	SCENARIO 2	A1 MNL	&	A2 MNL					A2 SCS ON FB AFFECTED	AND(N11Z1,N11Z2)	
N12ZL781	AND(N11Z1,N11Z2,N11Z12,ZL771,ZL690,ZL741)	41	SCENARIO 3	A1 MNL	&	A2 MNL	&	E2 MNL		AND(N11Z1,N11Z2,N11Z12)			
N12ZL786	AND(N101ZL321,ZL771,ZL670,ZL721)	32	SCENARIO 4	A2 LW1 AUTO						AND(N101ZL321)			
N12ZL791	AND(N101ZL322,ZL771,ZL680,ZL731)	32	SCENARIO 5	A2 LW2 AUTO						AND(N101ZL322)			
N12ZL796	AND(N101ZL323,ZL771,ZL690,ZL741)	32	SCENARIO 6	A2 LW3 AUTO						AND(N101ZL323)			
N12ZL801	AND(N101ZL324,ZL771,ZL700,ZL751)	32	SCENARIO 7	A2 LW4 AUTO						AND(N101ZL324)			
N12ZL806	AND(N11Z2,ZL771,ZL670,ZL721,ZL680,ZL731,ZL690,ZL741,ZL700,ZL751)	64	SCENARIO 8	A2 MNL						AND(N11Z2)			
N12ZL811	AND(N11Z2,N11Z12,ZL771,ZL670,ZL721,ZL680,ZL731,ZL690,ZL741)	59	SCENARIO 9	A2 MNL	&	E2 MNL				AND(N11Z2,N11Z12)			
N12ZL812		51											
N12ZL813		51											
N12ZL814													
N12ZL815	OR(ZL776,ZL781,ZL786,ZL791,ZL796,ZL801,ZL806,ZL811)	51	A2 FEEDBACK DYNAMIC ON										
N12ZL816													
N12ZL817	AND(N12L1M52,N12L1M125,N12L2M63,N12L2M56,N12L2M114)	51											
N12ZL818	AND(N12L2M107,N12L2M80,N12L2M91,N12L3M82,N12L3M108)	51											
N12ZL819		0											
N12ZL820	AND(N11Z22,ZL817,ZL818)	23	SCENARIO 10	A2 OFF						AND(N11Z22)			
N12ZL821	OR(AND(NOT(N11Z22),NOT(ZL815)),ZL820)	37	A2 FEEDBACK DYNAMIC OFF LED										
N101ZL402	OR(N12ZL815)	12	A2 ON LED										
N101ZL502	OR(N12ZL821)	12	A2 OFF LED										

Smoke Control - Programming – Zones SC (Example 2)

❖ Step 8 – Write Fault Logic for Proof-of-Concept

N101ZL609	AND(OR(ZL321,ZL322,ZL323,ZL324,N11Z2),NOT(N12ZL815))	
N101ZL610	DEL(00:01:30,**:**:***,OR(ZL609))	
N101ZL611	NOT(NORM(A5G2))	
N101ZL612	OR(ZL610,ZL611)	A2 FAULT LED

❖ Step 9 – Write Normal Logic for Proof-of-Concept

N101ZL616	AND(AUTO(A5G2),NOT(ZL612))	A2 NORMAL LED
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Smoke Control - Programming – Zones SC (Example 2)

❖ Step 10 – Test Proof-of-Concept using the matrix to confirm each function

							E9 A1 E1	A2 LW1	A2 LW3	A2 LW4	E2	E9-A1-E1	A2	E2	E9-A1-E1	A2	E2		
Module Addresses							N101ZL301	N101ZL321	N101ZL323	N101ZL324	N101ZL312	N01Z001	N01Z002	N01Z012	N01Z021	N01Z022	N01Z032		
FAN/DAMPER LABEL	CONTROL NODE	CONTROL ON/OPEN	CONTROL OFF/CLOSED	FEEDBACK NODE	MONITOR ON/OPEN	MONITOR OFF/CLOSED	ON DEPENDANCY	OFF DEPENDANCY	E9 A1 E1	A2 LIGHT WELL 1	A2 LIGHT WELL 3	A2 LIGHT WELL 4	E2	E9 A1 E1 MANUAL ON	A2 MANUAL ON	E2 MANUAL ON	E9 A1 E1 MANUAL OFF	A2 MANUAL OFF	E2 MANUAL OFF
A2 LW 1 SMK EXH FAN LO	N001	L01M001	L01M003	N001	L01M002	L01M004	N111M022,N111M026,N111M036	NOT(N01Z001),NOT(N01Z002)	N	O	X	X	N	N	O	N	N	X	N
A2 LW 1 SMK EXH FAN HI	N001	L01M005		N001	L01M006		N111M024,N111M026,N111M034		O	N	N	N	N	O	N	N	N	N	N
A2 LW 3 SMK EXH FAN LO	N001	L01M009	L01M011	N001	L01M010	L01M012			N	X	O	X	N	N	O	N	N	X	N
A2 LW 4 SMK EXH FAN LO	N001	L01M013	L01M015	N001	L01M014	L01M016	N111M042,N111M038,N111M048	NOT(N01Z002),NOT(N01Z012)	N	X	X	O	N	N	O	N	N	X	N
A2 LW 4 SMK EXH FAN HI	N001	L01M007		N001	L01M008		N111M044,N111M038,N111M046		N	N	N	N	N	N	N	O	N	N	N
A2 LW 1 EXH FSD*	N001	L01M021	L01M023	N001	L01M022	L01M024	NOT(N01Z001)		X	O	N	N	N	X	O	N	N	N	N
A2 LW 1 Exhaust MD	N001	L01M025		N001	L01M026				O	O	N	N	N	O	O	N	N	N	N
A2 LW 1 Relief MD	N001		L01M027	N001		L01M028			X	X	N	N	N	X	X	N	N	N	N
A2 LW 1 Separation DMPR*	N001	L01M033	L01M035	N001	L01M034	L01M036		NOT(N01Z001)	O	X	N	N	N	O	X	N	N	N	N
A2 LW 3 EXHAUST MD/FSD	N001	L01M029		N001	L01M030				N	N	O	N	N	N	O	N	N	N	N
A2 LW 3 RELIEF MD	N001		L01M031	N001		L01M032			N	N	X	N	N	N	X	N	N	N	N
A2 LW 4 EXH FSD*	N001	L01M041	L01M043	N001	L01M042	L01M044	NOT(N01Z012)		N	N	N	O	X	N	O	X	N	N	N
A2 LW 4 Exhaust MD	N001	L01M037		N001	L01M038				N	N	N	O	O	N	O	O	N	N	N
A2 LW 4 Relief MD	N001		L01M039	N001		L01M040			N	N	N	X	X	N	X	X	N	N	N
A2 LW 4 Separation DMPR*	N001	L01M045	L01M047	N001	L01M046	L01M048		NOT(N01Z012)	N	N	N	X	O	N	X	O	N	N	N
A2 DMPR 1	N001	L01M049		N001	L01M050				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 2	N001	L01M051		N001	L01M052				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 3	N001	L01M053		N001	L01M054				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 4	N001	L01M055		N001	L01M056				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 5	N001	L01M057		N001	L01M058				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 6	N001	L01M059		N001	L01M060				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 7	N001	L01M061		N001	L01M062				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 8	N001	L01M063		N001	L01M064				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 9	N001	L01M065		N001	L01M066				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 10	N001	L01M067		N001	L01M068				N	O	O	O	N	N	O	N	N	N	N
A2 DMPR 11	N001		L01M069	N001		L01M070			N	X	X	X	N	N	X	N	N	N	N
A2 DMPR 12	N001		L01M071	N001		L01M072			N	X	X	X	N	N	X	N	N	N	N
A2 DMPR 13	N001		L01M073	N001		L01M074			N	X	X	X	N	N	X	N	N	N	N
A2 DMPR 14	N001		L01M075	N001		L01M076			N	X	X	X	N	N	X	N	N	N	N
A2 EXH FAN 1	N001		L01M077	N001		L01M078			N	X	X	X	N	N	X	N	N	N	N
A2 EXH FAN 2	N001		L01M079	N001		L01M080			N	X	X	X	N	N	X	N	N	N	N
A2 AHU 1	N001		L01M081	N001		L01M082			N	X	X	X	N	N	X	N	N	N	N
A2 AHU 2	N001		L01M083	N001		L01M084			N	X	X	X	N	N	X	N	N	N	N

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