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WHAT FSM NEED KNOW ABOUT
ADDRESSABLE FIRE ALARM SYSTEM

Presenter : David Goh King Siang

Convener of Working Group for SS645 : 2019

Vice President of Fire Safety Managers' Association Singapore

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FSMs' Perspective?

Addressable Fire Alarm System is complicated and operated by software control, FSMs do not have the knowledge and skill to operate the system.

Better leave it to the fire maintenance contactors to handle and report on the systems function and performance.

FSMs' Perspective?

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Competency:

Addressable Fire Alarm are mostly proprietary systems, the fire systems maintenance contractors have to be authorize and train to have the required skills and knowledge to maintain the systems?

Maintenance contracts generally awarded base on 'Price' instead of 'Value'.

It resulted that FSMs did not able to maximise the advance features of the Addressable Fire Alarm Systems provided in checking the cause of false alarm, faults or trouble shoot etc.

SS645:2019 Clause 6.3 Maintenance:

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6.3.1 General

To ensure the system's continuous reliability, the owner or owner's representative should establish an agreement to carry out regular maintenance of the installation with the manufacturer or manufacturer's representative or a competent contractor. The name and telephone number of the servicing organisation should be prominently displayed at the control and indicating equipment.

Where a service contract cannot be arranged, the owner or owner's representative with suitable experience operating the fire alarm system and with special training from the manufacturers, suppliers or contractors shall carry out necessary servicing. However, this person should be instructed not to attempt to exceed the scope of such training.

The arrangements for maintenance with or without service contract shall be such as will ensure that a competent person is on call at all times, in the event of any fault that develops at the installation.

What is Addressable Fire Alarm System ?

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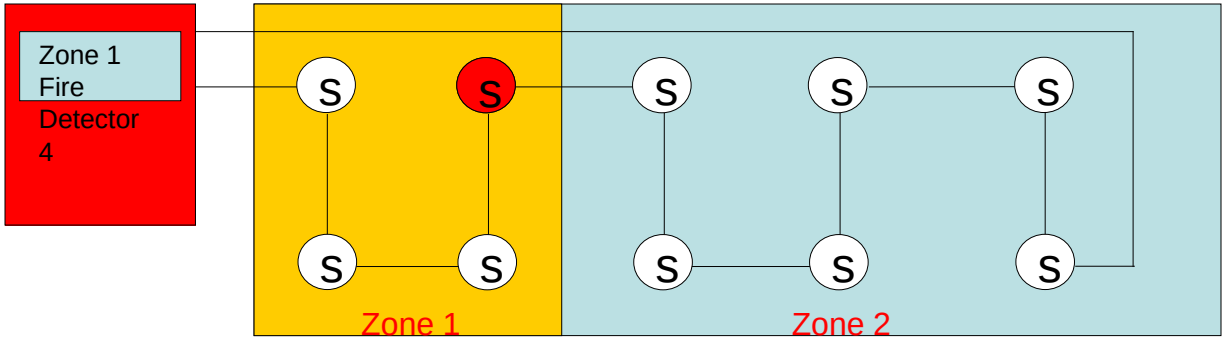
- each fire detector is provided with an address
- wiring by number of loops instead of zones
- identification of detectors and alarm status by zone and by address with programming
- fire detectors indicates various condition such as smoke level, temperature etc.
- indicates and records system events with printing features



Range Of addressable Detectors and Accessories

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1. Optical smoke detector

2. Heat detector (rate of rise / fixed temperature type)

3. Multi-sensor detectors:
   a. Single optical with heat
   b. Dual optical
   c. Dual optical with heat
   c. Dual optical with heat and carbon monoxide

4. Detector base with loop powered sounders

5. Interface input signal module

6. Interface output control module

7. Conventional detectors / call points interface module

8. Bells / strobe output control module with line supervision

Typical Addressable Fire Alarm System Configuration

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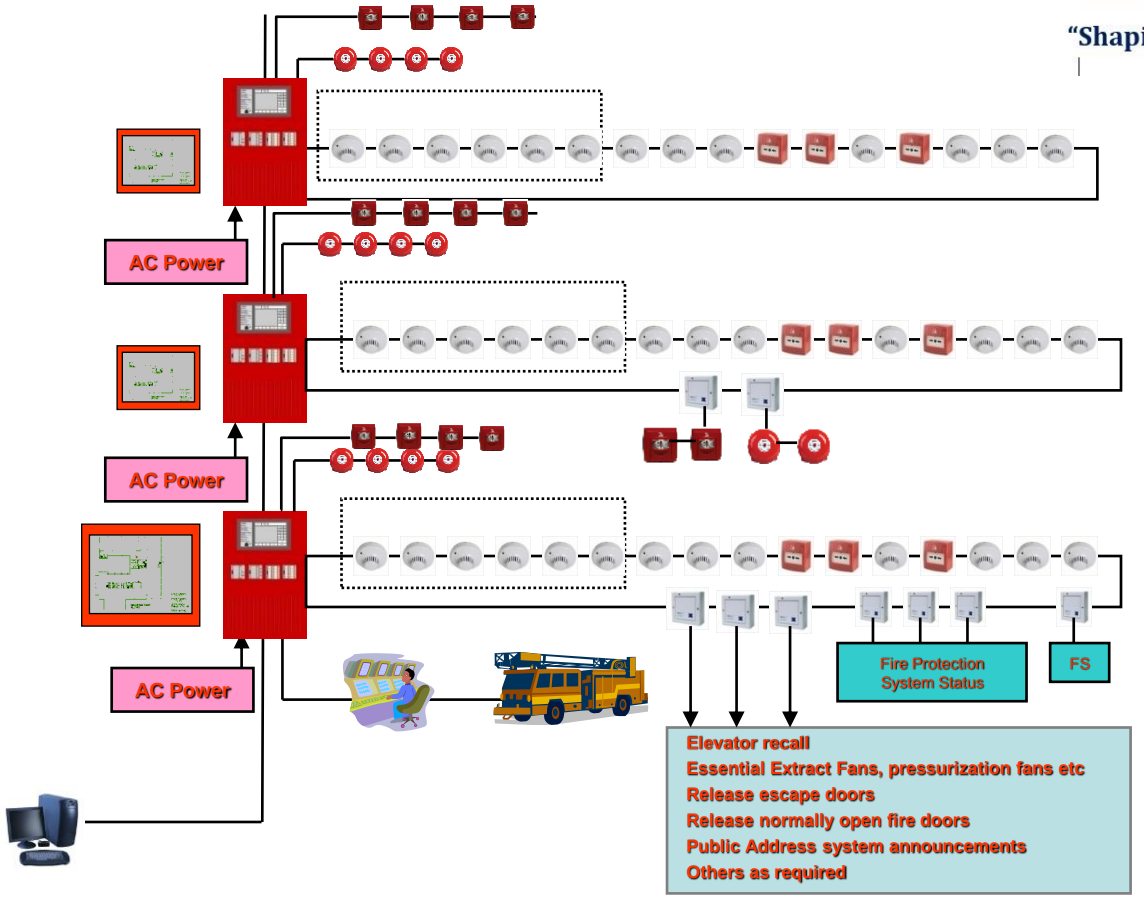

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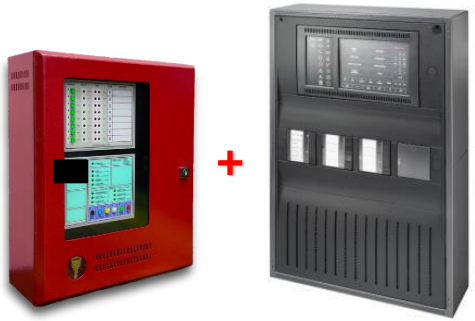
Hybrid System (conventional + addressable)

- a combination of features from both addressable and non-addressable systems
- built from an addressable system with conventional module
- event recording and alarm management feature



Typical Hybrid Fire Alarm System Configuration (addressable with conventional module add-on)

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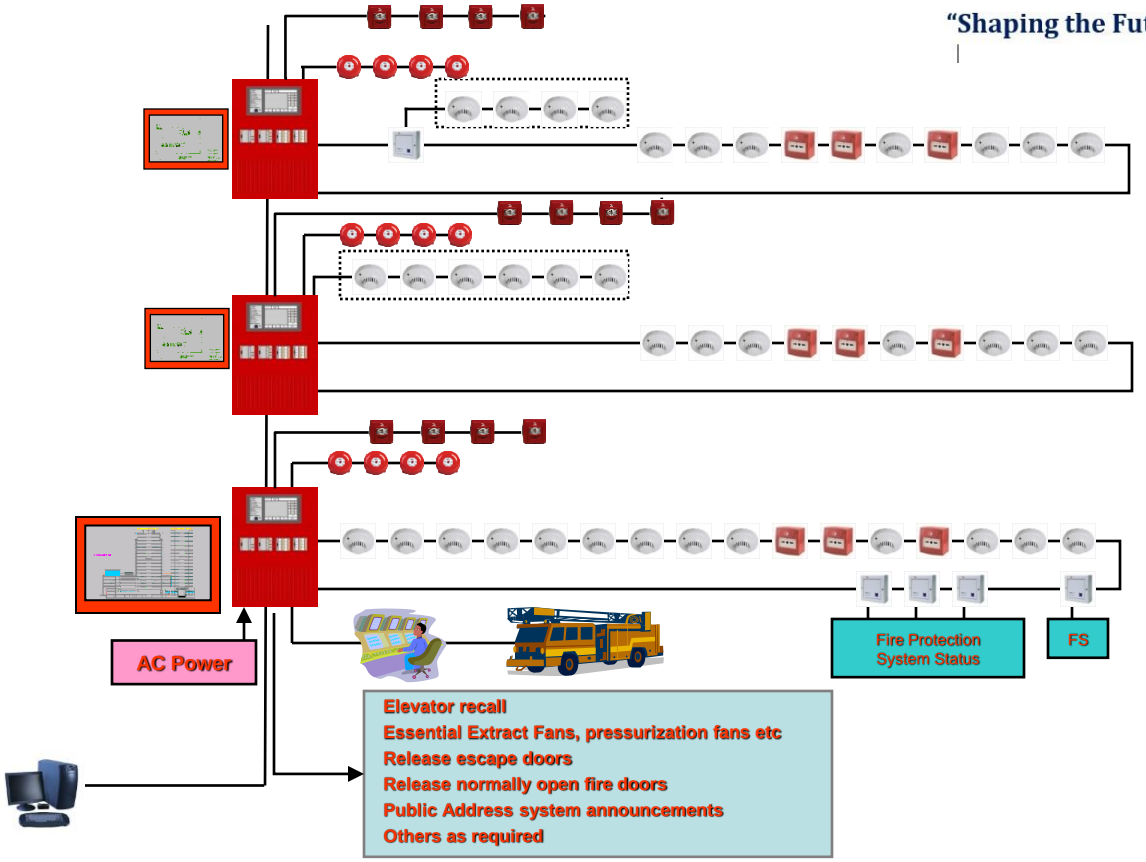

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What is False Alarm?

A fire alarm signal resulting from a cause(s) other than **FIRE.**

Causes of False Alarms

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SS 645:2019 clause 6.3.2.2 Preventive maintenance

The number of false alarms that can be anticipated is virtually proportional to the number of automatic fire detectors installed. The constant of proportionality will normally be highest where the fire detectors are smoke detectors. Systems incorporating only manual call points or manual call points in conjunction with heat detectors do not normally produce many false alarms.

Smoke detection systems with signal processing incorporating techniques specifically intended to discriminate between certain unwanted alarms and real fires are likely to offer better immunity to false alarms.

Systems with a pre-alarm warning feature enable the investigation of conditions that would lead to an unwanted alarm if no action is taken.

The owner's representative, competent contractor or servicing organization shall inspect the signal processing data available from the smoke detection systems regularly and investigate any pre-alarm warning.

Preventive Maintenance

Current analog values

Optical system value (display of the current contamination value):

0 . . . 170	Initial set-up value for a new detector
0 . . . 350	Normal working range
350 . . . 450	Slight contamination: Exchange detector soon
450 . . . 510	Heavy contamination: Exchange detector immediately

From 511 O fault: optical sensor is deactivated!

Contamination

The optical initial set-up value of a new detector is stored in the integrated EEPROM during the final inspection. The contamination value specifies by how much this analog value has increased in comparison with the delivery state.

What additional information can you obtain from Addressable Fire Alarm Panels?

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Conventional Fire Alarm Panels

Addressable Fire Alarm Panels

What additional information can you obtain from Addressable Fire Alarm Panels?

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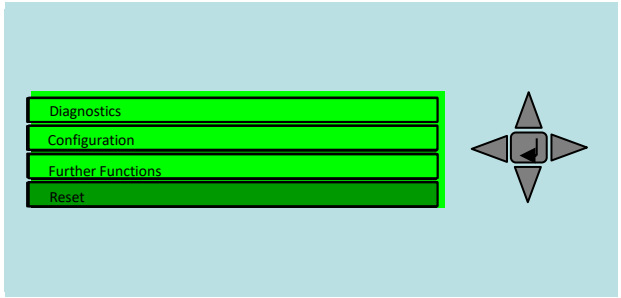

What additional information can you obtain from Addressable Fire Alarm Panels?

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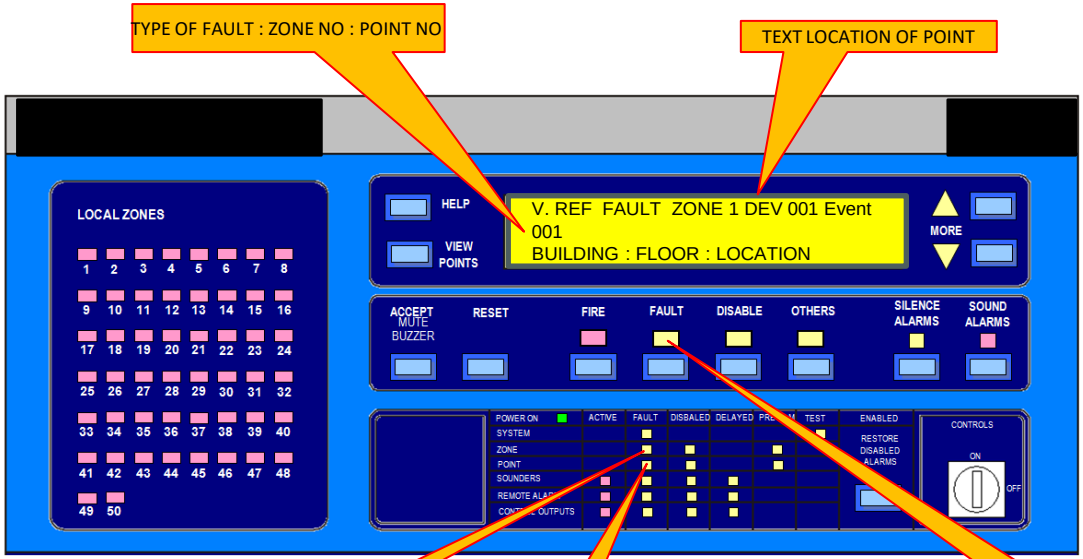
Example of some addressable fire alarm system operation status



Panels Operation – Fault Display

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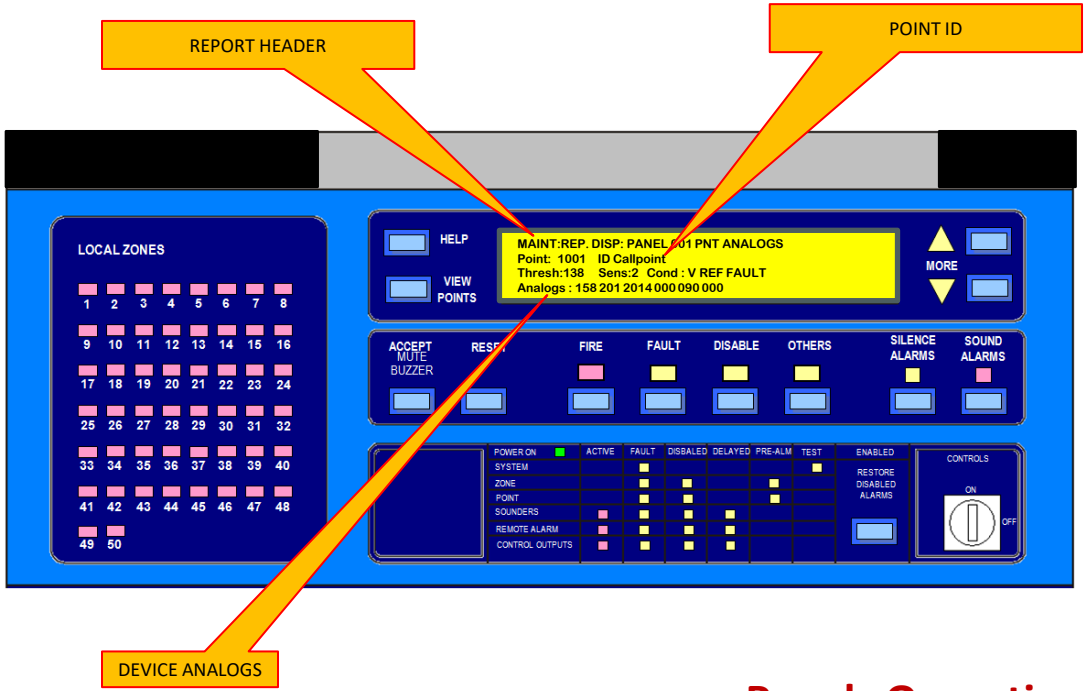

Panels Operation – Device Diagnostics Screen

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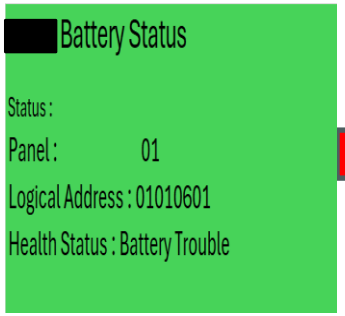
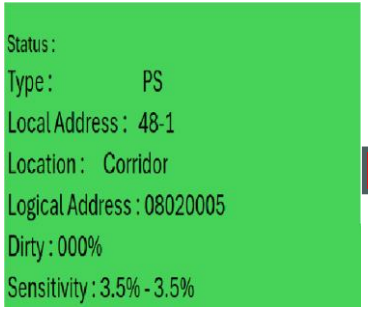
Example of some addressable fire alarm system operation status





What additional information can you obtain from Addressable Fire Alarm Panels

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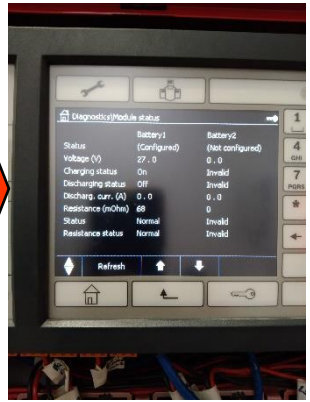
Example of some addressable fire alarm system operation status

Main Power Supply Status:

Main power supply voltage:	27.1
System current:	1.4 A
System voltage:	27.3 V
Main power status:	Normal
Main power fail signal:	Normal
Charger status:	Normal
Power out (to battery):	
Current (A):	0.2
Status:	Normal

Battery Status:

Voltage (V):	27.0
Charging status:	On
Discharge status:	Off
Discharge current(A):	0.0
Resistance (mOhm):	68
Status:	Normal
Resistance status:	Normal



What additional information can you obtain from Addressable Fire Alarm Panels?

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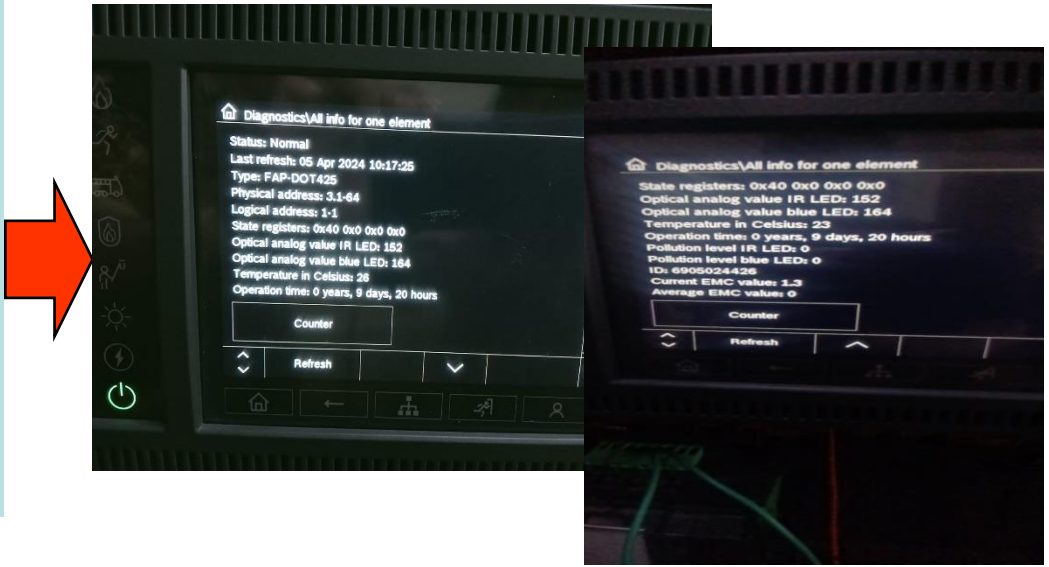
Example of some addressable fire alarm system operation status

Multi-sensor Detector Status:

Status:	Normal
Last refresh:	05 April 2024 10:17:25
Type:	model number
Physical address:	3.1-64
Logical address:	1-1
State registers:	0x40
Optical analogue value IR LED:	152
Optical analogue value blue LED:	164
Temperature in Celsius:	26
Operation time: 0 years, 9 days, 20 hours	
Pollution level IR LED:	0
Pollution level blue LED:	0



Records – General Test / Events

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Event Log for Fire Alarm System

Events other than false alarms or maintenance work

Date	Time	Event [A]	Zone [B]	Device [B]	Action required [B]	Date completed [B]	Initials

[A] For example test, fire alarm signal, fault
[B] Where applicable

False alarms

Date	Time	Zone	Device that Triggered alarm signal	Cause (if known)	Brief circumstances [A]	Maintenance visit required? (Yes/No)	Findings of maintance technician [B]	Category of false alarm	Further actions required [B]	Action completed [B]

[A] Where cause in unknown, record activties in this area
[B] Where applicable

Maintenance Work

Date	Time	Zone [A]	Device [A]	Reason for work	Work carried out	Further work required	Signature

[A] Where applicable

Weekly / monthly / annual test report

OWNER: _____

LOCATION: _____ TIME: _____

TYPE OF TEST: WEEKLY/MONTHLY/ANNUAL* DATE: _____

ALARM ZONE NUMBER										
DEVICES+	HEAT DETECTOR	ALARM TEST								
		FAULT TEST								
		ISOLATION								
	SMOKE DETECTOR	ALARM TEST								
		FAULT TEST								
		ISOLATION								
	FLAME DETECTOR	ALARM TEST								
		FAULT TEST								
		ISOLATION								
	MANUAL CALL POINT	ALARM TEST								
		FAULT TEST								
		ISOLATION								

		OPERATIVE	NON-OPERATIVE	REMARKS
POWER SUPPLY*	MAIN SUPPLY			
	CHARGER			
	BATTERY			
ALARM MONITORING STATION	ALARM TEST			
	FAULT TEST			
ALARMS* AND ANCILLARY	AUDIBLE ALARM SOUNDER			
	VISUAL ALARM DEVICE			
	ANCILLARY CONTROL			

REMARKS:

I HEREBY CERTIFY THAT THE ABOVE TESTS HAVE BEEN CARRIED OUT

Tester's Name _____

Signature _____

Owner's Name _____

Signature _____

* Delete if not applicable
+ Tick if satisfactory; put 'x' if unsatisfactory and provide details in the remarks section

Records – additional information from addressable systems

[redacted]

[redacted]

Item	Description	Remarks					
A	**Preparation**						
1	Inform DECAMS and record operator id.	ID: [redacted]				Time: 9:00	
2	Inform person-in-charge before commencement of test.	Name: [redacted]				Time: 9:00	
3	Advise person in-charge that bell, lift, fans, EM doors will be activated during test unless instructed to bypass.	NOTE1					
B	**Inspection and checks**						
1	Lamp Test	Main Alarm Panel	Sub Alarm Panel 1 1st Storey	Sub Alarm Panel 2 5th Storey	Sub Alarm Panel 3 1st Storey	Sub Alarm Panel 4 5th Storey	Repeater Panel 1st Storey
	a. All modules	✓	✓	✓	✓	✓	
	b. All indicators on MPC1300 / FMR5000	✓	✓	✓	✓	✓	✓
	c. Mimic LED	FCC	1st Storey 2nd Storey 3rd Storey 4th Storey	5th Storey 6th Storey 7th Storey 8th Storey	1st Storey 2nd Storey 3rd Storey 4th Storey	5th Storey 6th Storey 7th Storey 8th Storey	
	Lamp test	✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	
	Lamp test						
2	System power supply	Main Alarm Panel	Sub Alarm Panel 1	Sub Alarm Panel 2	Sub Alarm Panel 3	Sub Alarm Panel 4	Repeater Panel
	a. Record system current & voltage	0.6 / 27.0	0.7 / 27.2	0.7 / 26.8	0.5 / 26.8	0.5 / 27.1	
	b. Record battery voltage & discharge current	26.9 / 0.0	26.8 / 0.0	26.6 / 0.0	26.6 / 0.0	26.9 / 0.0	
	c. Record battery internal resistance	100 mΩ	100 mΩ	128 mΩ	98 mΩ	92 mΩ	
	d. Record charging status	Chg / Off	Chg / Off	Chg / Off	Chg / Off	Chg / Off	
3	Check general visibility of MPC1300 / FMR5000	✓	✓	✓	✓	✓	✓
C	**Testing**	Main Alarm Panel	Sub Alarm Panel 1	Sub Alarm Panel 2	Sub Alarm Panel 3	Sub Alarm Panel 4	Repeater Panel
1	Check battery supervision by disconnecting battery	✓	✓	✓	✓	✓	
2	Reconnect battery, system returns to normal	✓	✓	✓	✓	✓	
3	Check main supply supervision by switching of mains supply	✓	✓	✓	✓	✓	
4	Remove detector and check for fault indication	Zone:	Zone:	Zone:	Zone:	Zone:	
	Fault indicated on panel						
5	Activate Callpoint / Smoke / Heat detectors	Zone description		Address #	Bell activated	Mimic LED activated	Pollution level
	*To trigger 2 callpoint, 6 smoke and 1 heat detector per service						
	8 Sty Elec Riser (Sp) Zone	Z8-05-01		#22		✓	12
	8 Sty Elec Riser (Cp) Zone	Z-8-19-01		#38		✓	0
	7 Sty Elec Riser (Sp) Zone	Z-7-25-01		#042		✓	20
	7 Sty Elec Riser (Cp) Zone	Z-7-05-01		#018		✓	114
	6 Sty Elec Riser (Sp) Zone	Z6-06-01		#013		✓	58
	5 Sty Elec Riser (Sp) Zone	Z5A-04-01		#008		✓	14
	5 Sty Elec Riser (Cp) Zone	Z5-05-01		#002		✓	0
	4 Sty Elec Riser (Sp) Zone	Z4-04-01		#022		✓	0
	3 Sty Driveway (Cp) Zone	Z3-23-01		#030		✓	–
	3 Sty Elec Riser (Sp) Zone	Z3-06-01		#016		✓	6
	2 Sty Elec Riser (Cp) Zone	Z-2-05-01		#010		✓	90
	1 Sty Elec Riser (Sp) Zone	Z1-04-01		#008	NOTE1	✓	0
	5 Sty Tel Riser (Sp) Zone	Z5-09-01		#003		✓	18
	6 Sty Tel Riser (Cp) Zone	Z6-10-01		#008		✓	4
	4 Sty Tel Riser (Cp) Zone	Z4-08-01		#080		✓	4
	3 Sty Tel Riser (Sp) Zone	Z3-10-01		#012		✓	14
	3 Sty Corridor (Cp) Zone	Z3-18-01		#069		✓	–
	2 Sty Elec Riser (Sp) Zone	Z2-11-01		#052		✓	2
	1 Sty Tel Riser (Sp) Zone	Z1-1A-01		#066		✓	0
	1 Sty PL1 Lobby (Hs) Zone	Z-03-01		#120			–
	Zone						
	Zone						
	Zone						
	Zone						
	Zone						
	Zone						
	Zone						
	Zone						

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[redacted]

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S/No	Expose Detector Zone	Expose Detector Address	Pollution Level IR LED	Pollution Level Blue LED	S/No	Conceal Detector Zone	Conceal Detector Address	Pollution Level IR LED	Pollution Level Blue LED
1	ZDV1-05-01	77	6	4	27	ZDV1-05-01	78	0	0
2	ZDV1-05-02	75	10	0	28	ZDV1-05-02	76	0	0
3	ZDV1-05-03	71	4	0	29	ZDV1-05-03	72	0	0
4	ZDV1-05-04	69	0	0	30	ZDV1-05-04	70	0	0
5	ZDV1-05-05	67	2	0	31	ZDV1-05-05	68	0	0
6	ZDV1-05-06	65	6	0	32	ZDV1-05-06	66	0	0
7	ZDV1-05-07	63	6	4	33	ZDV1-05-07	64	0	0
8	ZDV1-05-08	61	0	0	34	ZDV1-05-08	62	0	0
9	ZDV1-05-09	59	0	6	35	ZDV1-05-09	60	0	0
10	ZDV1-05-10	57	0	0	36	ZDV1-05-10	58	0	0
11	ZDV1-05-11	55	0	0	37	ZDV1-05-11	56	0	0
12	ZDV1-05-12	53	0	0	38	ZDV1-05-12	54	0	0
13	ZDV1-05-13	51	0	0	39	ZDV1-05-13	52	0	0
14	ZDV1-05-14	49	0	0	40	ZDV1-05-14	50	0	0
15	ZDV1-05-15	47	0	0	41	ZDV1-05-15	48	0	0
16	ZDV1-05-16	45	0	0	42	ZDV1-05-16	46	0	0
17	ZDV1-05-17	43	2	0	43	ZDV1-05-17	44	0	0
18	ZDV1-05-18	41	0	0	44	ZDV1-05-18	42	0	0
19	ZDV1-05-19	39	0	0	45	ZDV1-05-19	40	0	0
20	ZDV1-05-20	37	0	0	46	ZDV1-05-20	38	0	0
21	ZDV1-05-21	35	0	0	47	ZDV1-05-21	36	0	0
22	ZDV1-05-22	33	2	0	48	ZDV1-05-22	34	4	0
23	ZDV1-05-23	31	2	0	49	ZDV1-05-23	32	0	0
24	ZDV1-05-24	29	0	0	50	ZDV1-05-24	30	0	0
25	ZDV1-05-25	27	0	0	51	ZDV1-05-25	28	0	0
26	ZDV1-05-26	74	0	0	52	ZDV1-05-26	73	0	0

[redacted]

[redacted]

S/No	Expose Detector Zone	Expose Detector Address	Pollution Level IR LED	Pollution Level Blue LED	S/No	Conceal Detector Zone	Conceal Detector Address	Pollution Level IR LED	Pollution Level Blue LED
1	ZDV1-04-01	15	0	2	27	ZDV1-04-01	16	0	2
2	ZDV1-04-02	17	0	0	28	ZDV1-04-02	18	2	0
3	ZDV1-06-01	13	0	0	29	ZDV1-06-01	14	0	0
4	ZDV1-06-02	11	0	0	30	ZDV1-06-02	12	0	0
5	ZDV1-06-03	9	0	0	31	ZDV1-06-03	10	2	2
6	ZDV1-06-04	7	6	0	32	ZDV1-06-04	8	8	0
7	ZDV1-06-05	5	0	0	33	ZDV1-06-05	6	0	0

Threshold Alarm (since last service)					
Date and time	Zone	Address	Date and time	Zone	Address

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What FSMs can take away after today…..

1. Addressable Fire Alarm System is not so complicated, FSMs can have the knowledge and skill to handle the basic operator's system.
2. Ensure fire maintenance contractors carry out details checking and analyzed the signal processing value.
3. Manage the fire maintenance contactors to submit reports on the systems details function and performance
4. Make full use of advance technologies to reduce false alarm and enhance system performance on early detection.

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Thank you