



Fire Alarm Systems and Maintenance

(SS CP 10:2005 Requirement)

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Why use Fire Alarm System?

- A fire alarm system is intended to enable a fire to be detected at a sufficiently early stage so that people who are at risk can be made safe either by escaping from the fire, or by the fire being extinguished (also to prevent extensive property damage).

Neither of these measures can be used until people are made aware of fire.

- The effectiveness of the fire detection and alarm system depends on the stage of the fire at which it is operated.

In order for all the occupants to escape without too much difficulty, an early alarm should operate before the escape routes become smoke-logged to such an extent as will cause occupants to have difficulty finding their way out of the building.



Why use Fire Alarm System?

Fire Alarm Systems are used to protect life and property.

It protects by:

- a. detecting a fire at an early stage
- b. alerting and evacuating occupants
- c. notifying the relevant personnel
- d. activating auxiliary functions e.g. smoke controls, lift homing etc.
- e. identifying and guiding fire fighters



Is Fire Alarm System a Mandatory requirement?

Mandatory - By the relevant authority

Non-mandatory - By Building Owner, Landlord and Insurance etc.

The requirements are specified in :

- Code of Practice for Fire Precautions in Buildings 2013
(Fire Code 2013) – by SCDF
- Code of Practice for Installation and Servicing of Electrical Fire Alarm System
(SS CP10-2005) – by Spring Singapore

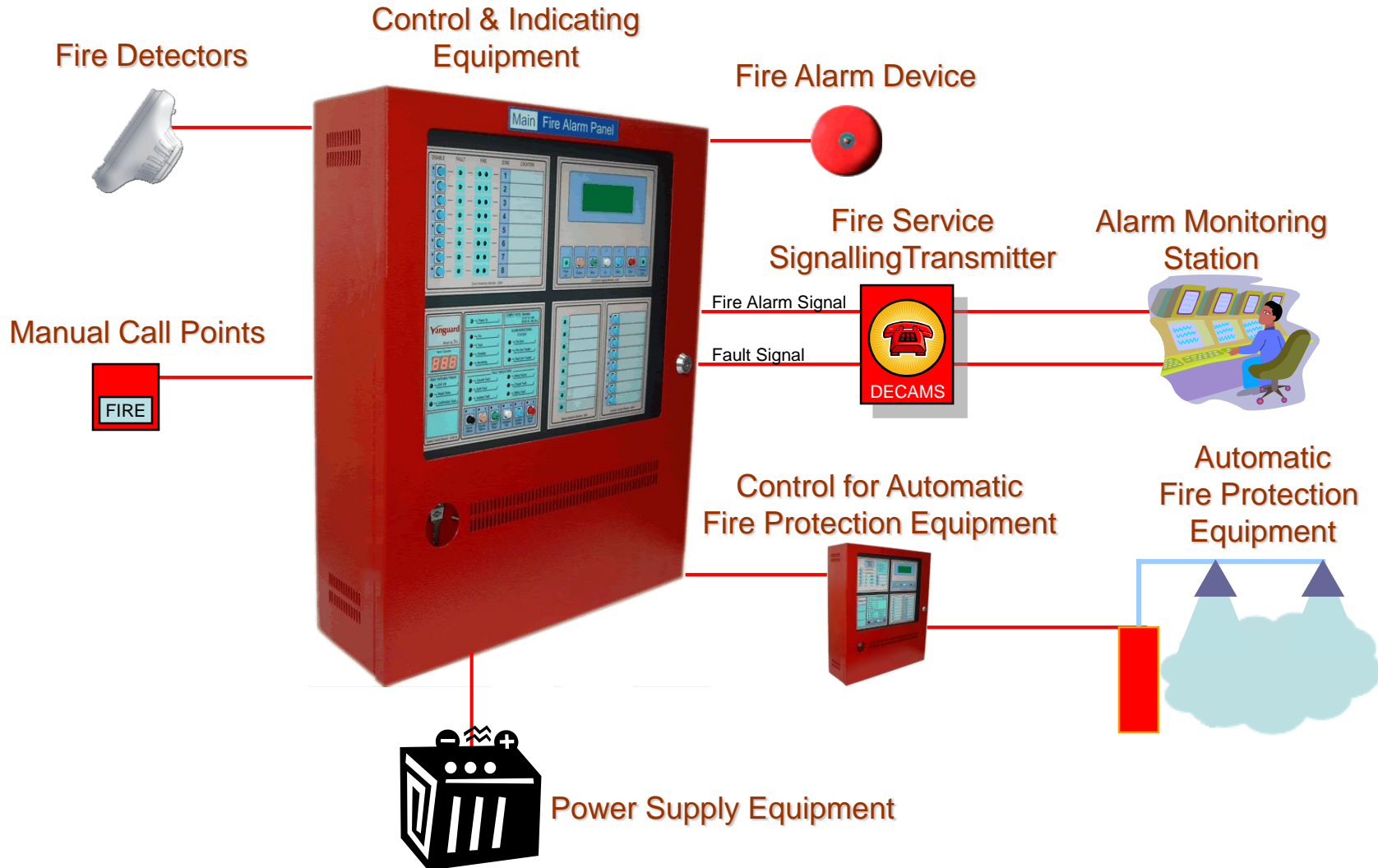



What is a Fire Alarm System made up of?

Components forming the System - 9 Items

1. Smoke / Heat Detectors (Fire Detectors)
2. Alarm Panels (Control and Indicating Equipment)
3. Alarm Bells (Fire Alarm Devices)
4. Manual Call Points
5. DECAM Panel (Fire Services Signaling Transmitter)
6. DECAM Station (Alarm Monitoring Station)
7. Extinguishing Panels (Control for automatic fire protection equipment)
8. Gas / Sprinkler (Automatic fire protection equipment)
9. Charger / Battery (Power Supply Equipment)

What is a Fire Alarm System made up of?

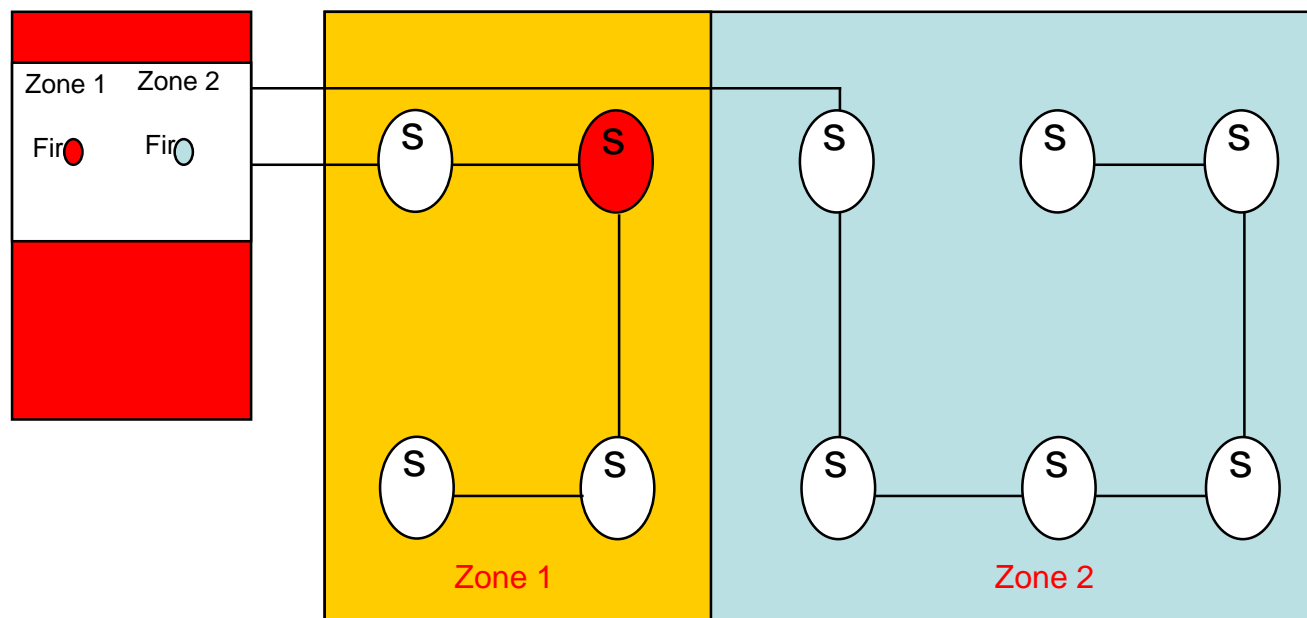




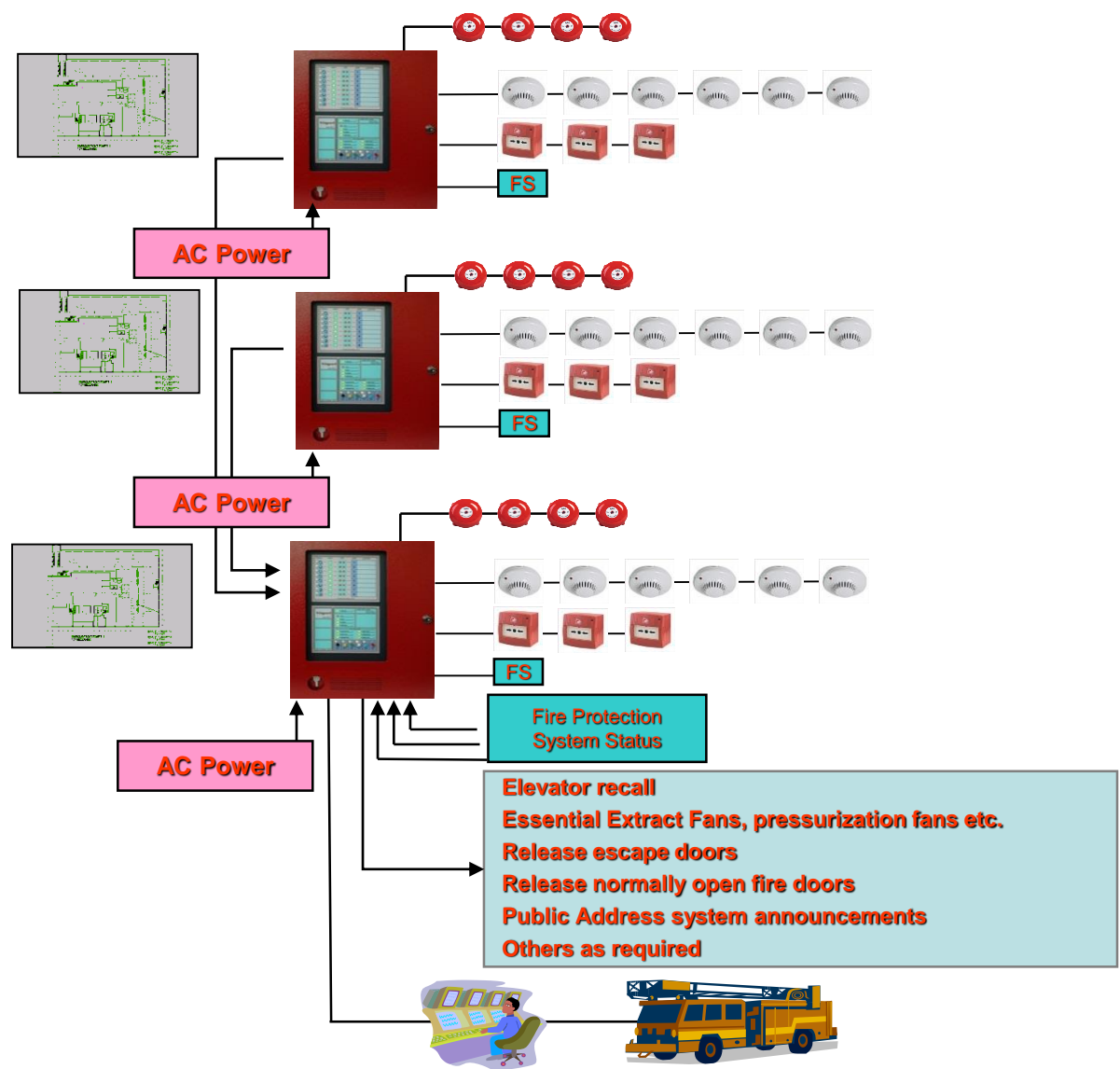
Types of Fire Alarm Systems in use today

Non-Addressable System

- also commonly known as “conventional”
- fire detectors are wired to the panel in groups known as zone
- identification of alarm status by zone
- fire detectors indicates either “Fire” or “Normal” status only
- system only indicate events but without event recording feature

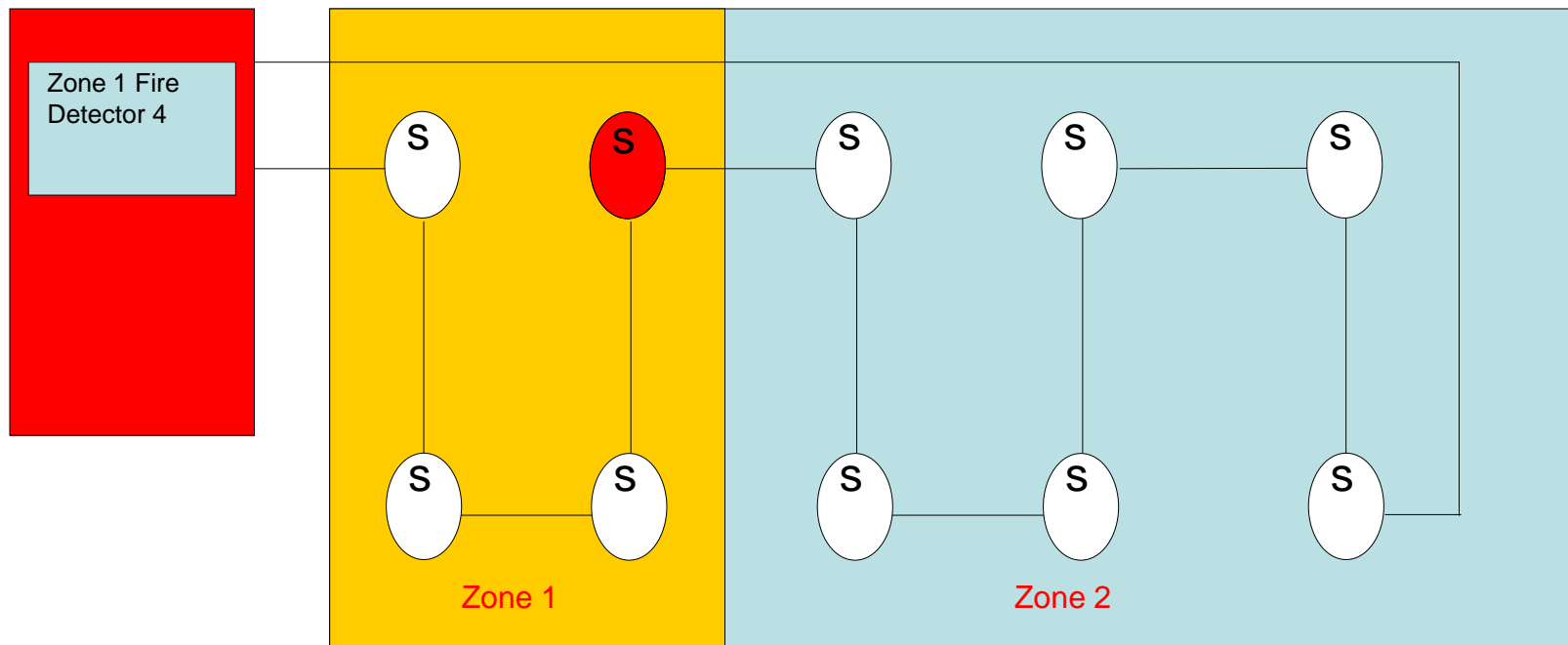


Typical Non-Addressable Fire Alarm System Configuration

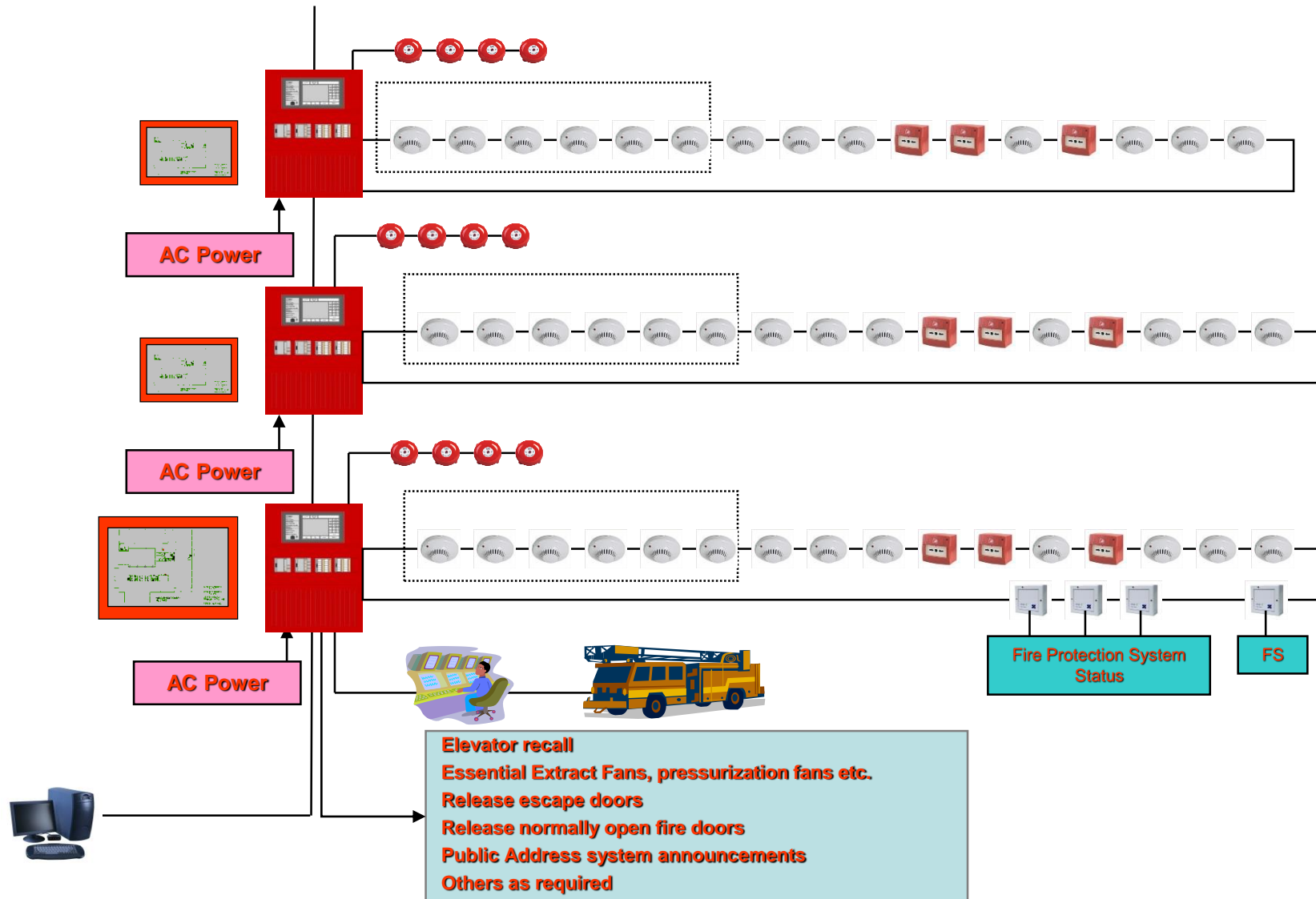


Addressable System

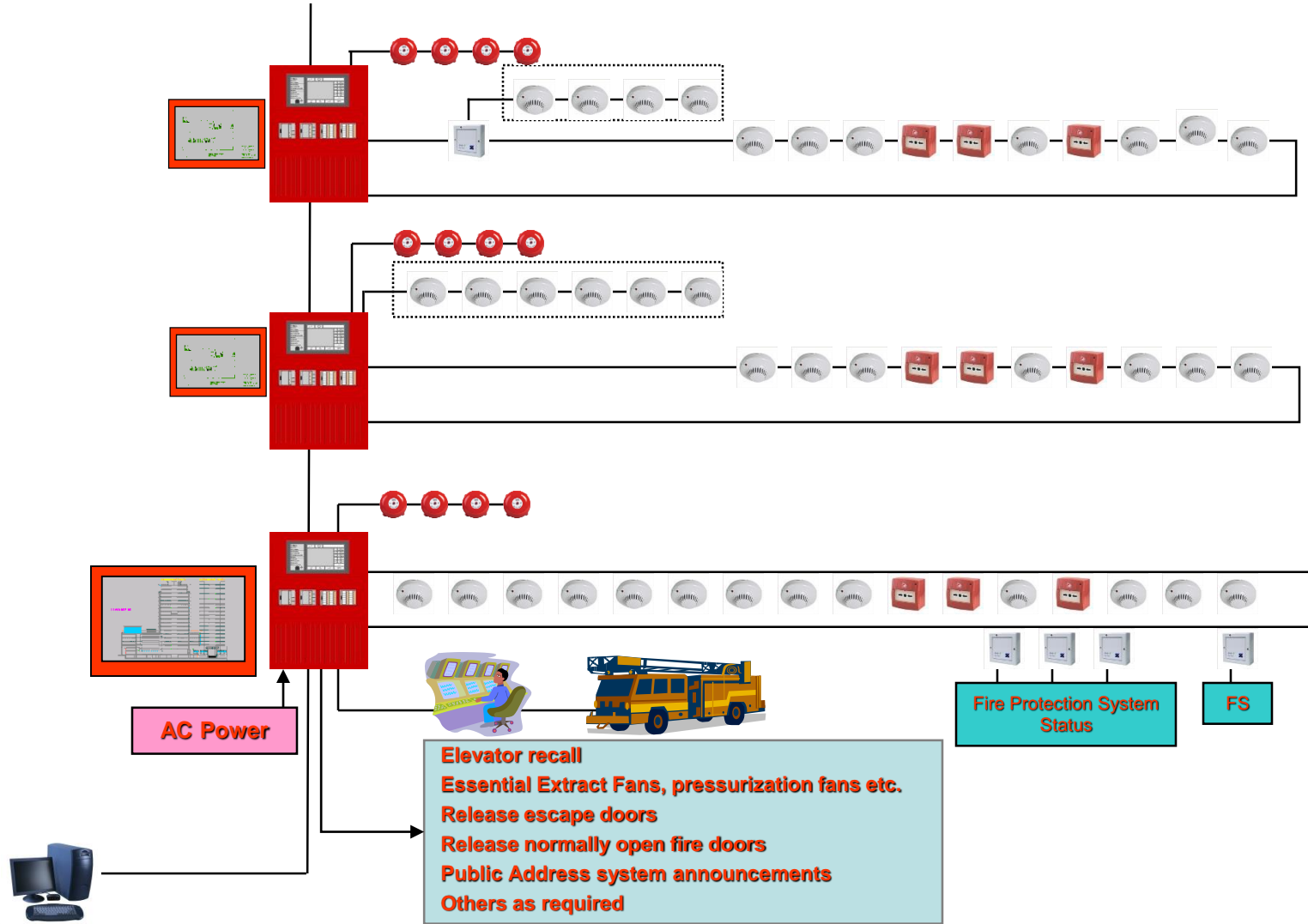
- each fire detector is provided with an address
- identification of alarm status by zone and by address
- fire detectors indicates various condition such as smoke level
- indicates and records system events



Typical Addressable Fire Alarm System Configuration



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





Maintenance



Maintenance

Objectives

- a) to ensure continuous reliability of the fire alarm system

Responsibility

- a) building owner or owner representatives
 - to engage manufacturer's representative or competent contractor
 - owner representative with suitable experience and special training



Regular Testing and Inspection

As per SS : CP10-2005 Requirements

- Daily Check
- Weekly Test
- Monthly Test
- Annual Test



Regular Testing and Inspection

Daily Checks

A check should be made every day to ascertain if the system is operating normally. Fault(s) detected should be recorded and steps taken immediately to ensure that the fault(s) is rectified.

If a fault is detected, the responsible person should ensure that the following actions are taken:

- a) Determine the area affected by the fault and decide whether special action (such as fire patrols) are needed in that area;
- b) If possible, determine the cause of the fault, or note the activities immediately prior to the fault in the area affected;
- c) Enter the fault in the log record, inform the organisation responsible for servicing and arrange for repair.

Regular Testing and Inspection

Weekly Tests

The following tests and checks should be made every week:

- a) Carry out a simulation & transmission of fire alarm and fault signals to the monitoring station and confirm it is functioning correctly;

NOTE – It will be necessary to contact the monitoring station prior to the transmitting of the simulated fire alarm and fault signals to inform them of the test and also to check with the monitoring station after completion of the test to ensure the fire alarm and fault signals were received and to advise them when the system has been normalised.

- b) Check the battery voltage and conditions;
- c) On completion of the test, take corrective action immediately on any abnormality or fault(s) encountered within the system;
- d) Enter the test result(s) and follow-up actions, if any, in the log record.

Regular Testing and Inspection

Monthly Tests

In addition to the weekly test specified above, the following checking and testing procedures should be carried out each month:

- a) Simulate fire and fault condition on all alarm zones to ensure it is operational. Confirm with the monitoring station that the fire alarm and fault signals have been received.
- b) Check charger voltage and charging current in accordance with the manufacturer's instructions.
- c) Check batteries and their terminals as specified by the manufacturer to ensure that they are in good serviceable condition. Carry out measurement of the impedance of the battery.
- d) Check condition of battery cabinet for corrosion and ensure that batteries are stored in a secure condition.
- e) Check to ensure that all indicating lights are operating correctly and replace if faulty.
- f) Check operation of all alarm sounders.
- g) Check and confirm the battery monitoring function is operational

Regular Testing and Inspection

Monthly Tests

- h) Test the system under the failure of electrical supply to the fire alarm panel to confirm it is operational (battery back up and recharging).
- i) Simulate fire alarm conditions and check the output signals available to initiate the remote auxiliary functions that is required to be in operation in the event of fire.
- j) Check and ensure the fire alarm panels, zone charts and all necessary indicators, printer, where applicable, are clean and in clearly visible condition.
- k) Visually inspect the condition of components, terminations and cables.
- l) Ensure that faulty parts are satisfactorily replaced and recorded.
Enter in the log record any fault(s) that requires repair.
- m) Check that all switches are returned to their operating positions after the test.
- n) Enter the test results and follow-up actions, if any, in the log record.

Regular Testing and Inspection

Yearly Tests

The annual test should consist of all the inspection and testing procedures specified in the monthly testing and the following:

- a) The maintenance personnel should arrange to check the operation of at least 20 percent of the detectors in an installation each year. The selection of detectors to be tested should be spread over as many zones as possible and should be made in such a way that all detectors in an installation should have been checked at least once in 5 years.

The checking of the detectors should take the form of in situ testing to ensure it is operational.

- b) Circuits connecting ancillary equipment which require automatic voltage regulated supplies should be checked to ensure correct operation and voltage output.
- c) Where the heat-sensitive element of thermal detectors or the enclosure of other detectors are found to be coated with paint or any other material likely to affect the operation of the detectors, such material should be cleaned off or if necessary, have the detector replaced.
- d) The smoke detectors shall be cleaned, tested or calibrated according to the manufacturer's recommendation.
- e) Enter the test results and follow-up actions, if any, in the log record

Fire Alarm System Testing – Conventional Panel



Fire Alarm System Test Tools and Equipment



Multi-meter



Fibreglass telescopic pole

Fire Alarm System Test Tools and Equipment



Smoke Check Can



Smoke Detector Tester

Fire Alarm System Test Tools and Equipment

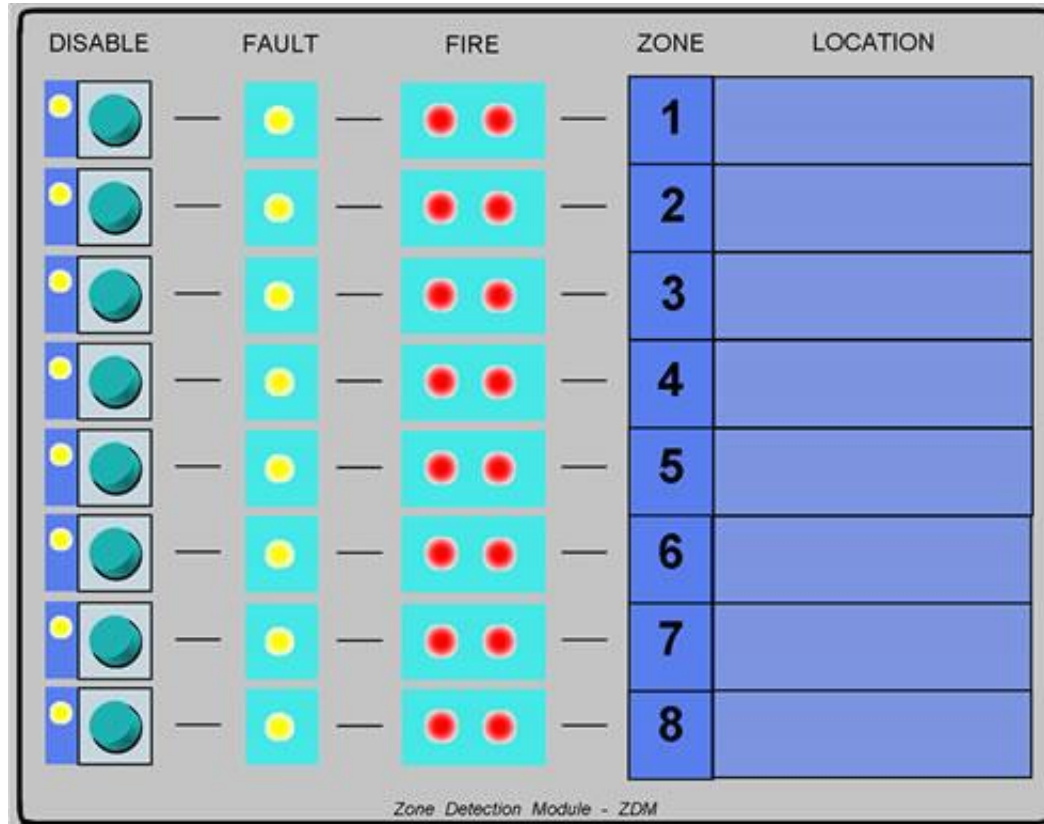


Heat Detector Tester



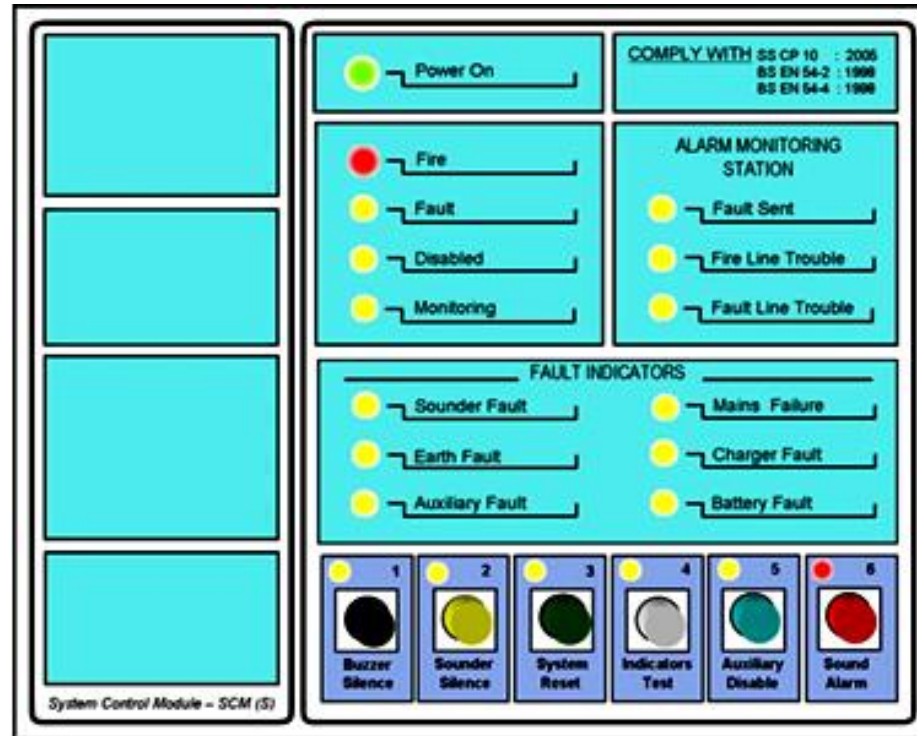
Detector Remover

Fire Alarm System Testing – Conventional Panel (Zone Control Module)



- a) Fire (Red) : Zone in fire condition
- b) Fault (Amber) : Zone detection circuit open/short fault condition
- c) Disable (Amber) : Zone in disabled condition
- d) Disable Switch : To disable zone fire & fault detection circuit

Fire Alarm System Testing – Conventional Panel (System Control Module)



Indicators

- Power On (Green): System energised by Mains and/or Standby Battery
- Fire (Red) : General Fire Indicator, system in fire condition
- Fault (Amber) : General Fault Indicator, system in fault condition
- Disabled (Amber) : General Disabled Indicator, system in disabled condition
- System Fault (Amber) : Indicate Programmable Micro Controller failure
- Fire Sent (Red) : Fire Signal to Alarm Remote Monitoring Station activated (Optional)

Fire Alarm System Testing – Conventional Panel (Fire Base Module)



Technical Specification

| | |
|---------------------|------------------------------------|
| PCB Model | : 1 |
| Description | : Fire Base Module |
| Dimension | : 210mm X 110mm |
| Current Consumption | : Quiescent = 35mA Fire = 194mA |
| Operating Voltage | : DC 21V – DC 30V |

Indicators

| | |
|------------------|---|
| Red (3mm LEDs) | : Alarm Relay energized indication, Line short fault indication, +VE earth fault indication |
| Amber (3mm LEDs) | : Fault Relay energized indication, Line open fault indication, -VE earth fault indication |

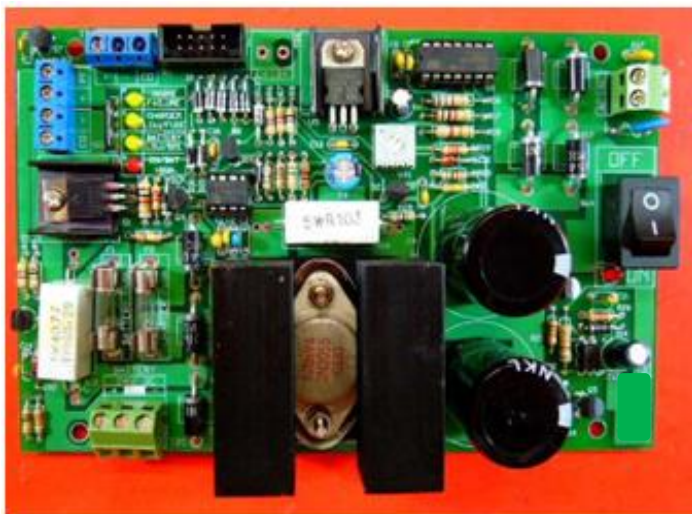
Fuses

| | |
|-------|-----------------|
| F1-F4 | : 5 x 20mm Fuse |
|-------|-----------------|

Terminal Block

| | |
|---------------------|---------------------------------------|
| Terminal Wire Range | : 24-12 AWG (max 2.5mm ²) |
|---------------------|---------------------------------------|

Fire Alarm System Testing – Conventional Panel (Power Supply Module)



V5-PSM-2 (Type 2A)

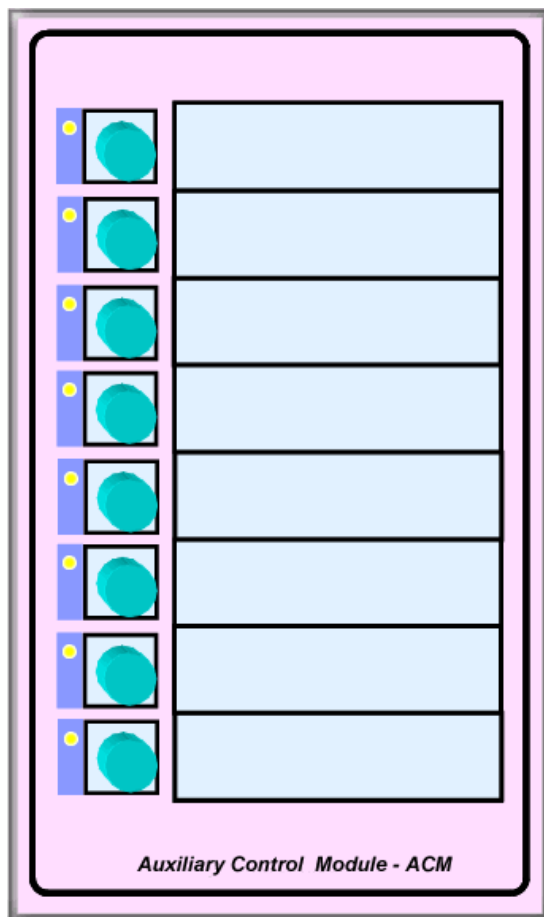


V5-PSM-2 (Type 5A)

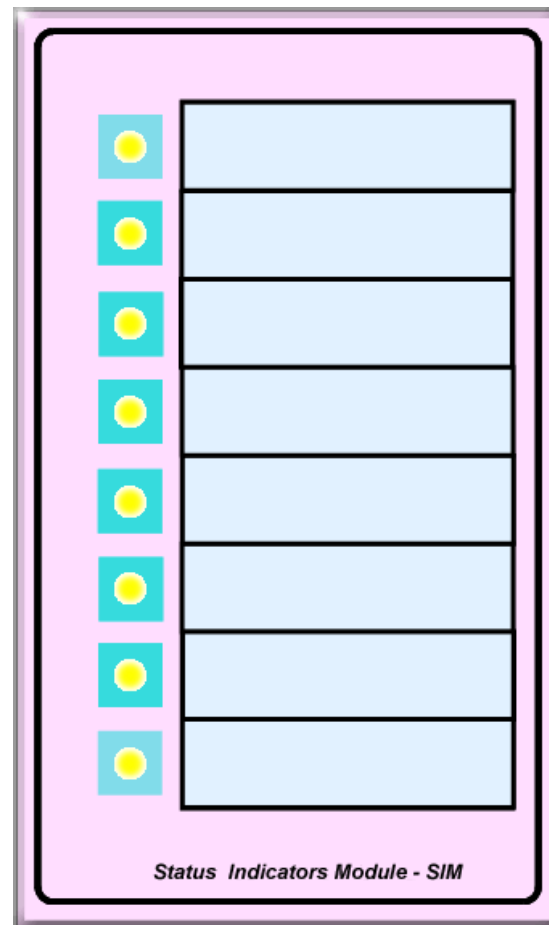
Technical Specification

| | | |
|--------------------------|---|---|
| PCB Model | : | |
| Description | : | Power Supply Module |
| Dimension | : | 160mm X 103mm |
| Current Consumption | : | 87mA |
| Capacity | : | 2Amp, 5Amp |
| Mains Supply | : | AC 195 – 255V, 50Hz |
| X'mer Secondary Output | : | AC 28V |
| Output Voltage | : | DC 27.5V (Regulated) |
| Battery Charging Method | : | Constant Voltage Charge |
| Charging Current | : | a) Max 800mA (Type 2A) b) Max 2.5A (Type 5A) |
| Fuses (5 x 20mm) | : | a) 2A (Type 2A) b) 5A (Type 5A) |
| Fault Diagnosis Function | : | a) Mains Failure b) Charger / Battery Voltage Low < DC 21V c) Charger / Battery Voltage High > DC 30V d) Blown Fuse e) Battery Disconnected |
| Protection | : | Mains surge/over voltage, battery short and battery reverse connection |

Fire Alarm System Testing – Conventional Panel (Control and Status Module)



Auxiliary Control Module



Status Indicator Module



Fire Alarm Activation

- Inform fire alarm monitoring company (DECAM)
- Ensure all lightings, mechanical ventilation systems & building services to be operating under normal condition
- Activate fire alarm



Fire Alarm Activation – Check List

Check List

- Check sounding of alarm bells, alarm signal transmission to SAP, MAP & DECAM company
- Homing of lifts
- Opening & stay opened of auto exit sliding door
- Releasing of door held by magnetic device
- Closing of fire shutters and/or lowering of smoke curtains
- Starting of pressurisation fans
- Auto running of smoke extract system including opening of smoke vents, if applicable



Fire Alarm Activation – Check List

Check List - cont'd

- Activation of smoke purging system eg. basement car park, warehouse, etc.
- Activation of recording device for emergency voice communication system
- Observe running status of remote fan control panel at FCC or MAP
- Reset fire alarm, lift system, sliding doors, magnetic doors & fire shutters



False Alarm Management

1. false alarm causes disruption to the normal operation of business and create a drain to the fire services
2. responsibility for reducing false alarms rest with every party involved in
 - specification
 - design
 - installation
 - commissioning
 - management at the operation level
 - maintenance of the fire alarm system



False Alarm Management

Category of False Alarms

1. Unwanted Alarms

- a. environmental influences
- b. fire like phenomena
- c. inappropriate action by people in building
- d. accidental damage

2. False Alarm

- a. alarms arising out of faulty equipment

False Alarm Management

Common Causes of False Alarms

- fumes from cooking process
- steam from bathrooms, showers etc.
- tobacco smoke
- dust (whether built up over time or not)
- insects
- incense, candle
- high humidity
- accidental damage (manual call point)
- aerosol spray
- high air velocities
- water egress
- testing or maintenance of the system without proper disablement.
- arises from fault in equipment

False Alarm Management

Recommendations

- a. system designer should ensure that that the system design takes into account of the guidance provided the Code of Practices
- b. installer identifies any circumstances that might lead to a high rate of false alarm and inform the designer, or user accordingly
- c. at commissioning, checks should be carried out to ensure there is no obvious potential for an unacceptable level of false alarms
- d. the designer and supplier should jointly provide sufficient information to user who may not be familiar with the technology of the Fire Alarm system.

False Alarm Management

Recommendations – cont'd

- e. the user should arrange for suitable investigation and if appropriate, action to be taken on every occasion that a false alarm occurs and record the details which should include the following details :
- date & time
 - identity and location of device
 - category of false alarm
 - reason for false alarm (if known)
 - activity in the area (if the reason of false alarm is unknown)
 - action taken
 - the person responsible for recording the information



Thank You