WHICH SYSTEM

SYSTEM OVERVIEW

Once the need for an automatic fire detection and alarm system has been identified, it becomes necessary to select the system type. Very small premises will normally require the lowest cost system that is available, and this will normally be a conventional system. For very large premises the choice will normally be analogue addressable because the reduced installation and maintenance costs easily offset the increased equipment cost, and in addition increased system sophistication generally provides enhanced performance and reliability.

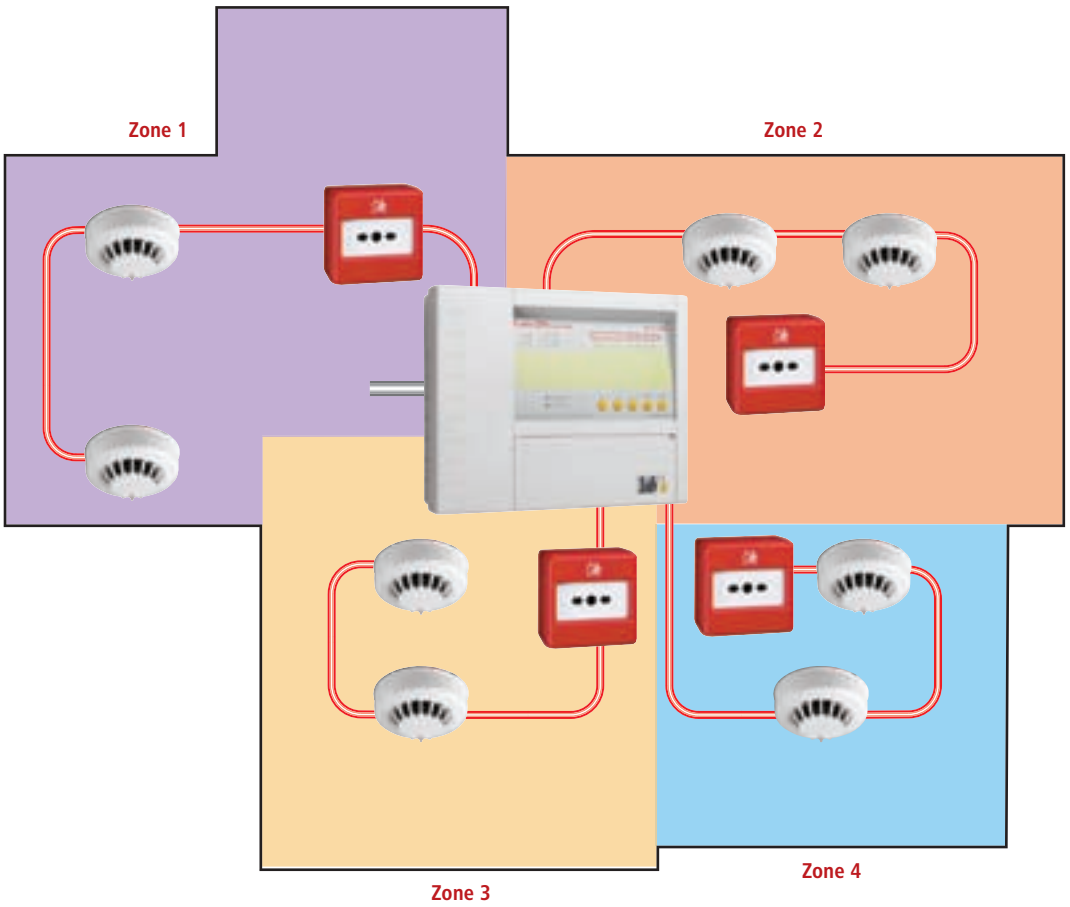
For systems between these two extremes, the choice may be less straightforward, this section of the design handbook aims to describe the benefits of each system so as to aid the decision process.

There is a vast array of fire detection systems and devices on the market today, ranging from the relatively simple to the most technically sophisticated. Modern automatic fire detection systems are available in two types, conventional and analogue - which, broadly speaking, tend to be used in smaller and larger installations respectively.

CONVENTIONAL SYSTEMS

The philosophy of a conventional system revolves around dividing the building into a number of areas called zones, the detectors and callpoints within each zone are then wired on dedicated circuits. In the event of a detector or callpoint being triggered, the panel is able to identify which circuit contains the triggered device and thereby indicate which zone the fire alarm has come from.

It is then necessary to manually search the indicated zone to pinpoint the exact cause of the fire alarm.



UNWANTED ALARMS

Because most conventional detectors are simple two state devices they can only be in either a normal or fire condition.
Although modern components and good system design can go some way to reducing potential problems, it is not uncommon for conventional systems to generate unwanted alarms due to certain operating conditions or transient environmental conditions such as the presence of steam near to a smoke detector.

A key development aimed at reducing such unwanted alarms has been the multi-criteria detector. Traditionally, detectors were designed to respond to particular fire phenomena such as heat or the presence of smoke. However, Cooper Lighting and Security now offer multi-criteria devices, which contain both a smoke sensing element and a thermal sensing element.

The fire alarm decision is taken by analysis of the responses from both elements, resulting in improved detection performance as well as greatly enhanced false alarm suppression.

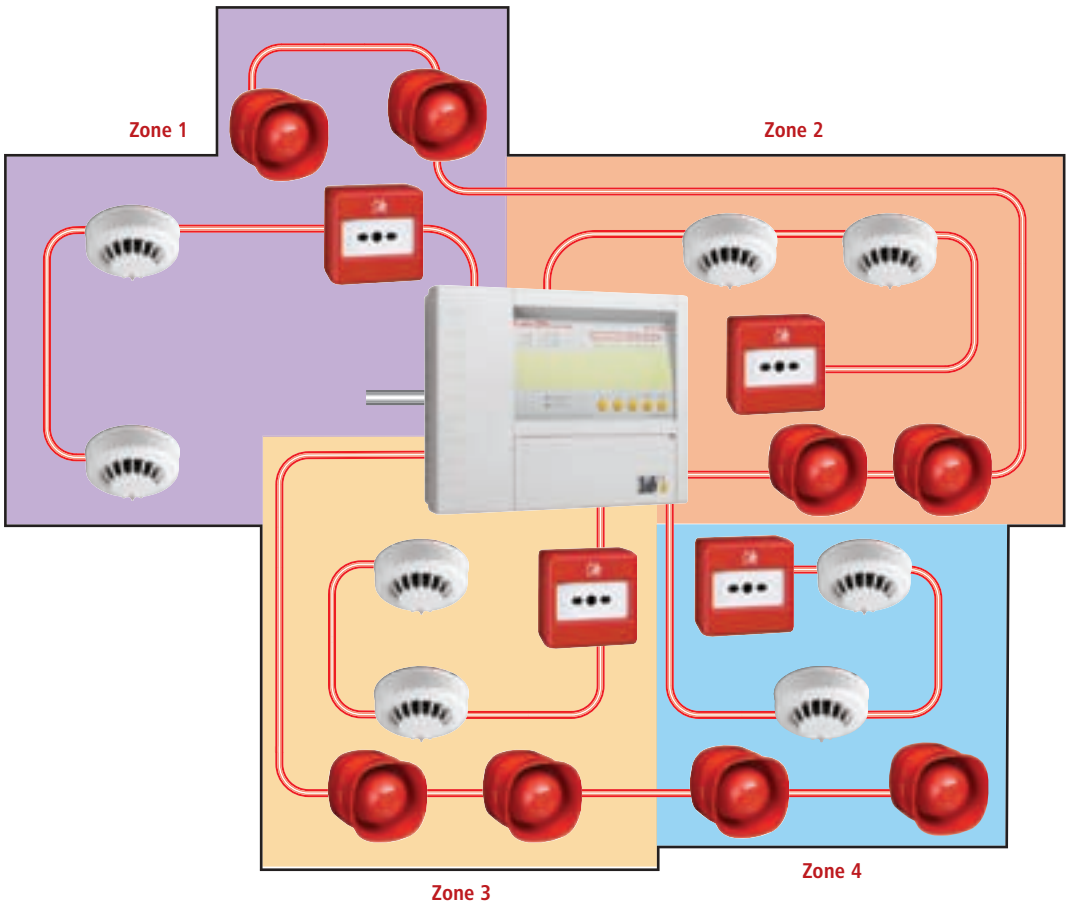
SOUNDER CIRCUITS

In addition to the detection circuits, there is also a need for separate circuits of alarm annunciation devices such as sounders and beacons to signal the existence of a fire alarm condition to the building users. For sounder circuit continuity monitoring to function effectively, sounder circuits have to be wired in a single radial circuit, spurs and tees are not permitted.

Almost every conventional fire panel will have facilities for more than one sounder circuit and generally the higher the specification of the panel or the higher the number of detection zones provided, the more sounder circuits will be provided.

Normally however there will be less sounder circuits than detection zone circuits so it will be necessary for a sounder circuit to provide cover for more than one zone (see below)

This increases installation complexity by forcing the sounder wiring to follow different routes to that of the detector wiring.
When designing a conventional system it is important to ensure that the panel has adequate zone capacity for the size and complexity of the building and that the panel can support the intended sounder circuit wiring and loading.



WHICH SYSTEM

Bi wire systems

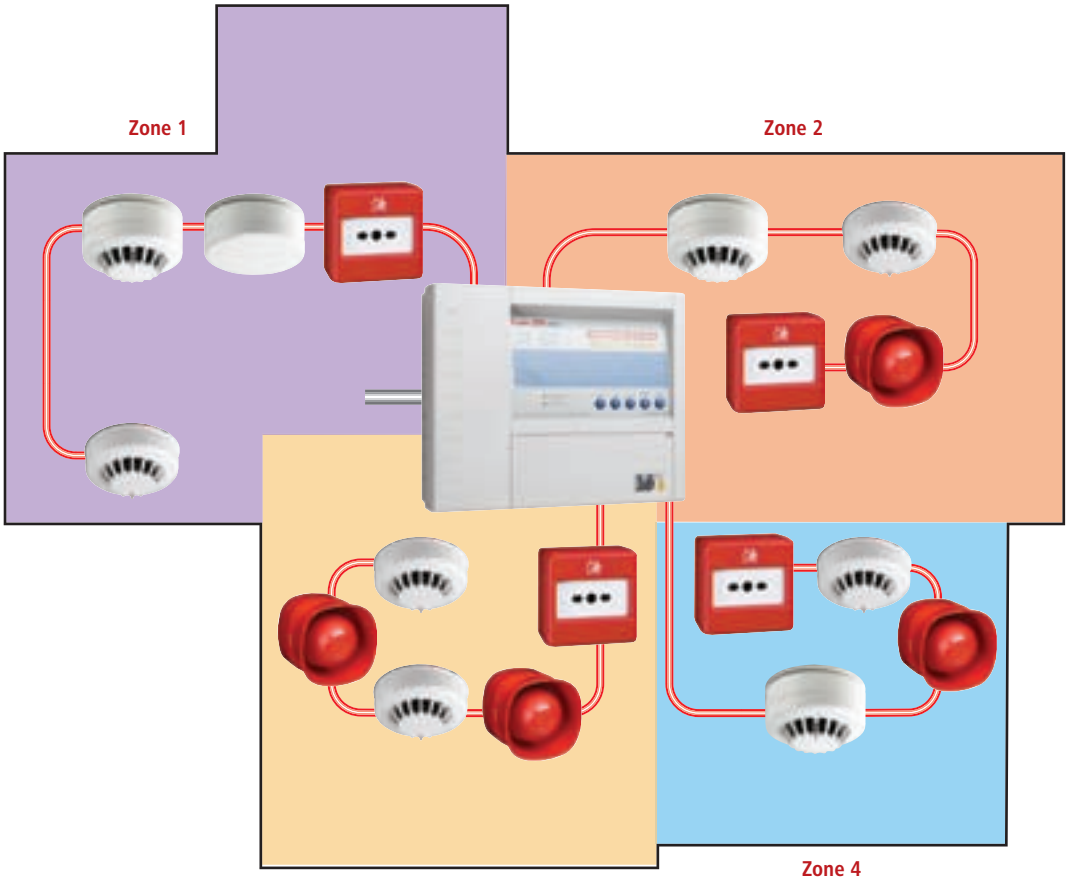
Bi wire systems are based on standard conventional system technology, but in addition incorporate additional functionality to enable the callpoints, detectors and the sounders for each separate zone to be wired on a single common circuit.

This enables the control panel to use a single circuit per zone both for detection and to power the sounders.

Even though the panel continually powers the sounders, control functionality incorporated within the sounders enables them to only be activated in the event of a fire alarm condition.

By combining both the detection and the alarm annunciation wiring into a single circuit, considerable savings in installation time and cabling can be achieved.

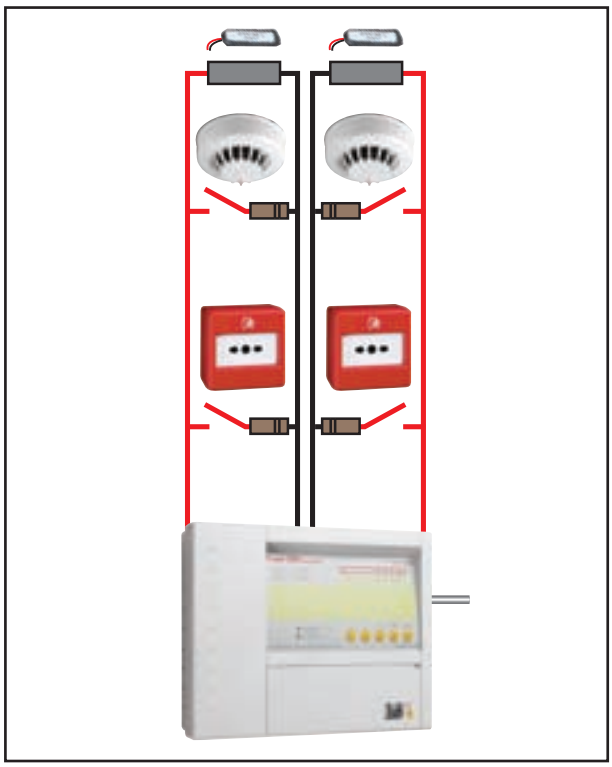
Although adding Bi wire technology to the detectors and the sounders does slightly increase the equipment costs this is normally more than offset by savings in installation cost.



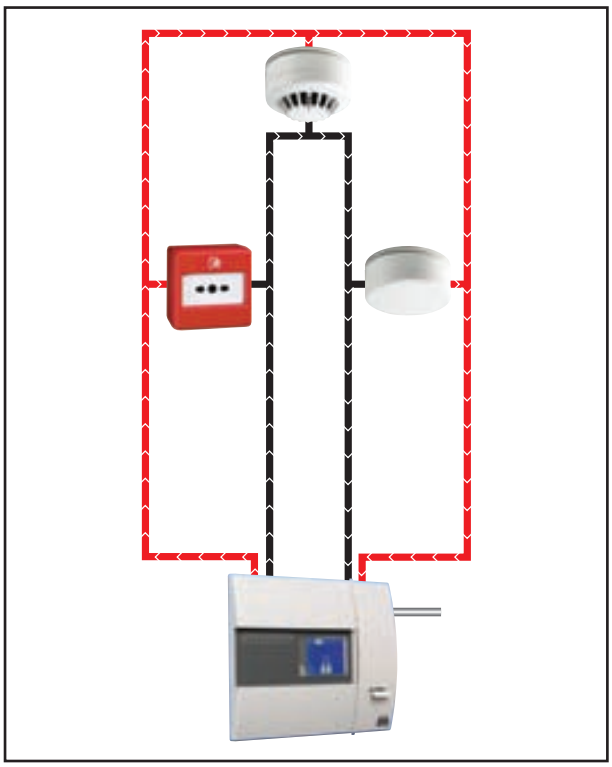
Analogue addressable systems

Both Bi wire and standard conventional systems utilise simple two state detectors, which simply provide a switch type signal to the conventional control panel.

To enable the source of the alarm to be identified, each zone must be wired using a separate circuit, furthermore in the event of a fire alarm being triggered, the panel can only identify which zone contains the triggered device, it is then necessary to manually search the affected zone to discover the actual cause of the alarm.



Typical conventional system where detectors and callpoints function as simple switches



With an analogue system detectors and callpoints are sensors which constantly communicate with control panel providing data

Analogue addressable systems overcome these limitations, each fire detecting sensor or call point is electronically coded with a unique identification or 'address' which is programmed into the device during installation.

The control panel is then able to conduct two way communication with any of the addressable devices connected to the system by using the unique address number to define which device it wishes to communicate with. This operates in a similar manner to that of a telephone number enabling communication between specific telephones.

Under normal conditions the control panel continuously interrogates each device in sequence using a low power digitally pulsed signal, and analyses the reply to determine the status of the sensor or callpoint.

In this manner, the panel can ascertain whether each device is functioning correctly and also discover the amount of smoke or heat that the device is currently sensing.

This technology allows the panel to make intelligent decisions as to the appropriate action to take based on the information it receives from the individual sensors.

This has many advantages, for example very slow build up of apparent smoke density seen by a sensor can cause a warning or pre alarm condition to be triggered by the alarm panel prior to the situation becoming serious enough to warrant a full alarm.

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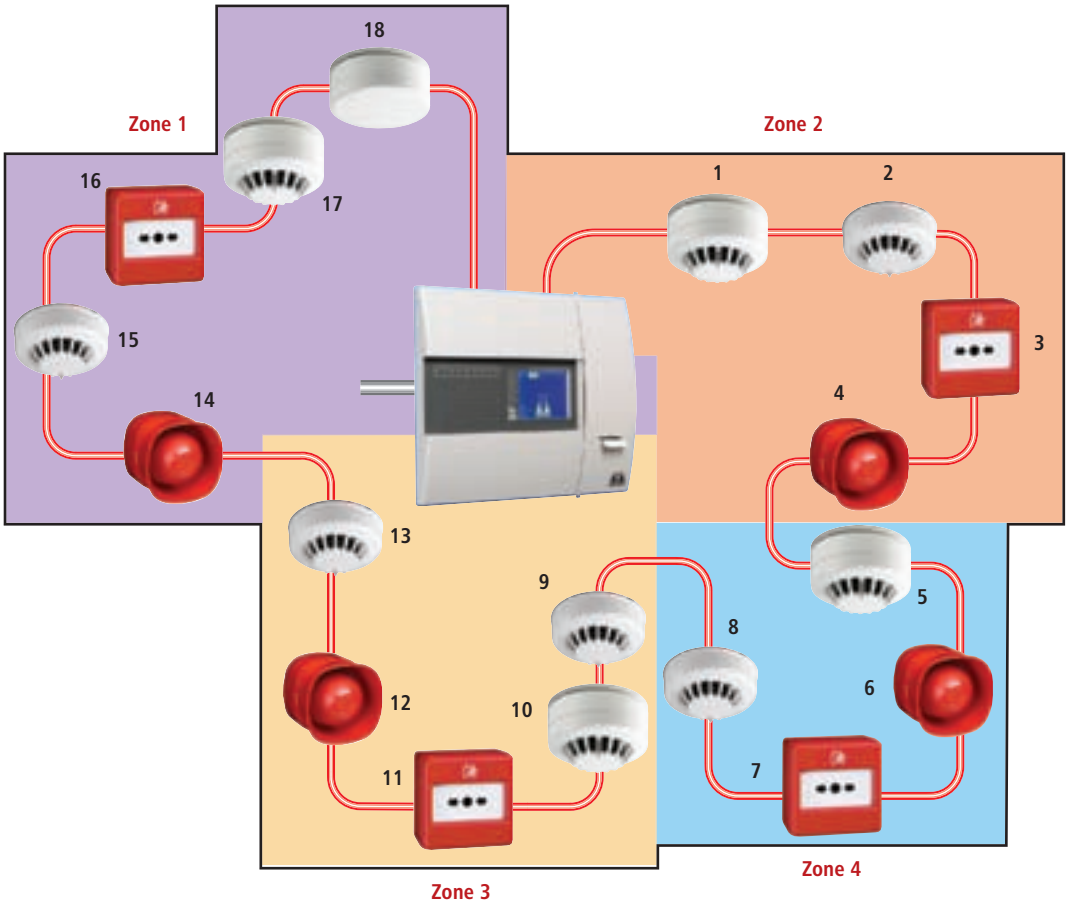

A typical practical benefit of this technology is the situation whereby airbourne dust particles enter smoke detectors and mimic the appearance of smoke, over time the concentration of dust can increase to a point where it can cause the detector to falsely trigger an alarm condition. With an analogue system, a pre alarm condition will normally be triggered rather than a full alarm giving the building operator the opportunity to clean or replace the sensor rather than suffer the disruption of an unwanted false alarm.

If whilst continually interrogating the smoke and heat sensors, the panel determines that the data gathered from a specific device is appropriate to instigate either a fire, fault or pre alarm condition, it uses the unique identifying number or address to determine which device is involved. Consequently the panel can pinpoint and identify precisely which device has triggered the fire, fault or pre alarm condition.

This level of sophistication removes the need for each zone of the building to be wired as a separate circuit. For this reason analogue addressable system components are typically connected to the panel using a small number of large loops thus greatly simplifying the installation of the system and reducing the installation cost.

Detectors instead of being simple two state devices now function as sensors continually communicating with the control panel and providing information regarding the temperature or concentration of smoke in their local environment.

For fire protection applications demanding both high reliability and performance, the more technically sophisticated and versatile analogue systems provide a clear advantage, despite a higher initial equipment cost.

For the largest sites, several systems can be linked to form a complete network providing total coverage. As well as dramatically reducing false alarms from transients or faulty circuitry, analogue addressable fire alarm systems can provide a far higher and more versatile degree of protection. Detectors can often be individually programmed for sensitivity or automatically switched between high and low alarm thresholds, or even different detection modes - e.g. for night or day protection.

Sophisticated analogue systems can be interfaced with building management systems, and can also be used to interact with other services such as ventilation or warden call systems.

In addition to providing simplified installation, enhanced suppression of unwanted alarms and precise location of any incidents, analogue technology also allows greater control of the response of the system to a fire alarm being triggered.

Because each sounder also has a unique individual address, specific sounders can be activated in response to specific triggers. High specification systems such as DF6000 and DF6100 have the ability to support highly complex sounder ringing pattern requirements, for example, if a single detector is triggered, the system can be programmed such that the sounder nearest to the detector operates immediately and continuously, while the remaining sounders in the affected zone operate in a pulsed mode, and the other sounders delay for a selectable period to allow the cause of the alarm to be investigated before global ringing commences.

The sounder programming capability is very flexible, enabling the response to a condition to be precisely tailored to the building, providing maximum safety for building users whilst at the same time minimizing the disruption to building users from false alarms or localised incidents a considerable distance from particular parts of the building.

Ultimately the decision as to the most suitable equipment will depend upon specifier preferences, application details and performance objectives.

Our technical support is available to provide any possible assistance to guide the choice of system choice if required (Tel 01302 303350)