ANALOGUE ADDRESSABLE FIRE ALARM CONTROL AND INDICATING EQUIPMENT SPECIFICATION

1. General

1.1 The control and indicating equipment (C.I.E.) shall be the central processing unit of the fire alarm system and shall:

a) Receive and process all data from fire detectors and other devices.

b) Initiate all automatic alarm response sequences.

c) Provide audible and fully detailed visual information of all system fire, fault, warning and supervisory monitoring conditions.

d) Provide the means by which the user interacts with the system.

1.2 As a minimum, the equipment shall comply with the requirements of BS EN54-2 and BS EN54-4; but shall additionally include advanced processing features to ensure optimum detection performance and increased immunity to false alarms.

1.3 The manufacturer of C.I.E. supplied for the fire alarm system shall have been a specialist manufacturer of Fire Alarm products for at least 10 years.

1.4 The C.I.E. shall be selected from the IFAX product range and use an open digital protocol to communicate with fire detectors and other devices.

1.5 The C.I.E. shall be fully compatible with Apollo XP95 and Discovery communication protocols and shall be independently certified in accordance with Apollo Fire Detectors Ltd test schedule TSP01.

1.6 The C.I.E. shall be microprocessor based and shall incorporate separate processors for loop circuits and central processing.
Each individual loop microprocessor shall be dedicated to a maximum of 252 addressable loop devices.

1.7 Communication between the loop circuit modules and the C.I.E. central processing microprocessor shall be via a fully monitored EIA-485 full duplex circuit.

1.8 The C.I.E. shall continuously monitor the quality of loop communications and the status of all addressable devices for fire, pre-alarm, and fault conditions, incorrect addressing, unauthorised device removal or exchange and level of detector drift compensation.
If the status of any device signifies a reduced immunity to a false alarm condition, the C.I.E. must automatically and clearly indicate the need for servicing of that device.
The C.I.E. shall also monitor the loop circuits for short and open-circuit fault conditions and the status of internal connections and interfaces including charger and batteries.

1.9 The C.I.E. shall include specific communication protocols to enable it to report to and be controlled by a building management system (BMS), or be able to report to a graphics system.

1.10 C.I.E. operating programs and system configuration data shall be contained in non-volatile memories that shall not rely on any form of battery or capacitor back-up device.

1.11 An entirely independent monitoring device shall signal a system fault if routines associated with the main functions of the C.I.E. programs are not executed within 100s.

1.12 The contents of the C.I.E. memories containing executable code and the system configuration data shall be automatically checked at intervals not exceeding 1h and shall signal a system fault if corruption is detected.

2. Operational Strategy

2.1 Addressable detectors, alarm sounders and interface devices shall be connected to the C.I.E. via 2-core loop circuits.

2.2 Provision shall be made in the C.I.E configuration data for each addressable loop to be sub-divided into geographical zones.
The section of wiring corresponding to each zone circuit shall be protected from faults in other sections by line isolator modules.

2.3 In order to facilitate re-configuration and system extension, the allocation of addresses to devices shall be independent of their physical arrangement on the loops.

2.4 To ensure the optimum detection performance and increased immunity to false alarms, the C.I.E. shall always:

a) Confirm the responding device address during each poll cycle of any device.

b) Apply full coincidence checking on all fire condition analogue level responses from any device, such that signals are deferred until detector response data has been verified throughout at least five consecutive polling cycles.

c) Continuously monitor the integrity of communications for each loop of addressable devices and extend the number of polling cycles required by paragraph (b) based on the dynamic level of signalling corruption.
The C.I.E. must include facilities to display any form of signalling corruption that could significantly delay the response to a change of sensor status and indicate a fault condition if the loop signal quality is reduced to this extent.

d) Complete an automatic test of all addressable devices (that support this test feature) every 24 hours to provide the earliest warning of potential problems.

2.5 Each loop circuit shall accept up to 126 addressable devices and additionally support operation of up to 100 loop powered detector platform alarm sounders (type MA-3-055).
Interfacing field devices to any loop circuit via spur wiring must also be possible.

2.6 Where loop powered detector platform alarm sounders are used, each sounder shall be protected from malicious or unauthorised tampering by having its combined detector locked into its mounting base.
Additionally, the C.I.E. must provide both a general and a sounder fault condition should an associated combined detector be removed.

2.7 The C.I.E. shall allow full control of the sensitivity / response mode of smoke, heat, gas and multi-sensor detectors to ensure optimum detection performance based on dynamic building environmental conditions (E.g. – Day/Night arrangement).
This control must be able to be completed manually, conditionally, or automatically - via the C.I.E integral clock/calendar as appropriate.
No single method of control shall be mutually exclusive.

2.8 For each detector, the C.I.E. shall record both the number of alarm conditions and the date of the latest alarm in non-volatile memory at each device.
It shall be possible to retrieve this record via the C.I.E. display panel or to a printer / PC.

(This data is particularly relevant to review of the fire alarm system performance where in conjunction with other C.I.E. and system user information, it may highlight any detector application problems or design change requirements).

2.9 In addition to the general control requirements of (2.7), the C.I.E. shall allow further and specific control of any single, or all multi-sensor detectors as follows:

a) Allow confirmation of an alarm condition from the device by switching from its usual sensitivity / response mode to heat detection only mode.

b) While waiting for confirmation the C.I.E. shall indicate a fire warning condition and activate the loop powered, platform alarm sounder combined with the individual device.

c) If alarm confirmation is received from the heat detection only mode of the device, the C.I.E shall immediately escalate to the next stage of building evacuation.

d) If after the time-limited investigation period, no alarm confirmation is received and the device has not been reset, the C.I.E shall escalate to the next stage of building evacuation.

(This control is particularly relevant to applications where the fire compartment is not more than 50m^2 and single sensitivity / response mode use of detectors may be susceptible to unwanted alarms.

It shall effectively add a time-limited staff investigation phase before the initial alarm condition of the detector escalates to the next stage of building evacuation.

Typical applications include halls of residence, hotel bedrooms and sheltered accommodation).

2.10 C.I.E. output alarm responses (single stage / phased evacuation) shall be easily configurable to meet the exact, detector, detection zone, sector and cross-network zone cause-and-effect mapping requirements of the fire alarm system.

2.11 The C.I.E. configuration data shall allow definition of at least 255 programmable outputs to fully satisfy the requirements of paragraph (2.10).

Additionally, it shall be possible to activate outputs by manual operation such as evacuate, or fault, or warning conditions.

These outputs shall have the following attributes:

a) Each may be connected directly to the main C.I.E. (via output modules), or via addressable devices.

b) Each output may be allocated any of the output types: Sounder, Beacon, Remote Signal, Auxiliary, or, Internal Sounder.

c) Any addressable device output may be allocated to any programmable output.

d) There shall be an independent delay timer for each output.

e) From each allocated trigger source, each output may be operated – continuously (after the output delay), continuously (bypassing the output delay), or pulsing (1s on – 1s off).

f) It shall also be possible to define at least four output operation sequences that may be applied to any output.

   Each sequence shall consist of up to 15 elements of Continuous, Pulsing or No Operation, and each element can be defined to operate for up to 255s.

   At the end of the sequence, it may be repeated from any point in the sequence.

   (This output sequence control may be particularly relevant to applications where the alarm is required to interface with separate PA or voice evacuation systems).

g) All output types, except for the C.I.E. internal sounder, shall be individually disable -able.

2.12 The C.I.E. shall use appropriate rapid device polling algorithms to ensure that all outputs are operated in the shortest time.

2.13 To ensure optimum synchronisation of loop powered addressable alarm sounders tones, the C.I.E. configuration data shall enable the following control:

a) Synchronised pulsing (e.g. Alert tone) operation of addressable sounders regardless of their distribution across loops.

b) Synchronisation with conventional sounder circuits' devices.

c) Synchronised pulsing (e.g. Alert tone) operation of addressable sounders activated across networked C.I.E.

d) Allow addressable sounders to be combined and controlled as 'group' arrangements to ensure simultaneous activation.

2.14 Each C.I.E. loop circuit module shall incorporate an automatic 'Standalone-Mode' to maintain the maximum possible fire detection and alarm facilities in the event of any communications failure between the loop circuits and the central processing microprocessor.

2.15 In Standalone-Mode, the loop circuit module itself shall handle any new alarm conditions from addressable devices and shall trigger the following actions:

a) Continuous activation of addressable loop powered alarm sounders or sounder control units that are in the same zone as the detector in alarm and of those in zone 0.

b) Continuous activation of any loop powered combined platform alarm sounders connected to detectors

c) Continuous activation of an open-collector alarm output for the loop circuit module.

d) Continuous activation of the C.I.E. Fire LED indicator and internal sounder.

These actions shall at least apply to the alarm sounders on the loops that are controlled by the loop circuit module processing any such alarm condition.

3. Control and Indicating Equipment (C.I.E.) Hardware

3.1 The C.I.E. shall be of modular format to simplify service and maintenance operations and to allow subsequent expansion of the system.

3.2 The enclosure shall be of all steel construction and shall be capable of being surface or semi-flush mounted.
It shall include cable entry knocks-outs to accommodate likely cabling requirements and shall afford a minimum ingress protection to IP40.

3.3 The C.I.E. shall have a hinged front cover secured with a keyed lock.
Where required, an optional overall front door with observation window and door lock shall be available.

3.4 The standard multi-loop C.I.E. enclosure shall have a minimum capacity for integral fitting of the following:

a) 8 Loop Circuits - each accepting up to 126 addressable sensors / interface devices and able to operate an additional quantity of 100 combined detector platform alarm sounders (MA-3-055).
Each loop circuit shall include full short-circuit protection and be able to supply a minimum continuous current of 1A @ 24V DC.

b) 12 Programmable, fully monitored outputs for conventionally wired alarm sounder circuits.

c) 6 Programmable Auxiliary Relays.

Larger loop capacity systems shall be accommodated by network arrangement of C.I.E. (See section 8).

3.5 The standard multi-loop C.I.E. shall include an integral 5 Amp power supply / charger for use with maintenance-free sealed lead acid batteries, and shall accommodate stand-by batteries of up to 17AHr capacity within the enclosure.

3.6 It shall be possible to fit an integral 40-column printer to the multi-loop C.I.E. that will print system events automatically and logged data upon request.

4. Control and Indicating Equipment (C.I.E.) Indications and Display

4.1 The C.I.E. shall provide the following discrete high-intensity visual indications:

a) System On – Green LED.
b) Fire – Red LED.
c) Warning – Yellow LED.
d) Fault – Yellow LED.
e) Disabled – Yellow LED.
f) Test – Yellow LED.
g) Delays Enabled – Yellow LED.
h) Sounders Activated – Red LED.]
i) Remote Signal Activated – Red LED.
j) Sounders Silenced – Yellow LED.
k) Sounders Fault / Disabled – Yellow LED.
l) Remote Signal Fault / Disabled – Yellow LED.
m) Supply Fault – Yellow LED.
n) System Fault – Yellow LED
o) 48 - Fire Zone Indicators - Red LED's. (Multi-loop C.I.E.)
To give rapid and clear 'at–a-glance' indication of the general area of any fire activation.

4.2 There shall be a simple method of increasing the number of fire zone indicators of the multi-loop C.I.E. to at least 144.
This expansion may be provided in an adjoining enclosure.

4.3 In addition to the above, the C.I.E. shall include an alphanumeric display having a minimum of 160 characters.
The display shall be continuously backlit liquid crystal of the STN (Super-Twist-Nematic) type, or an equivalent providing at least equal visibility.

4.4 The display shall provide fully detailed information on system status at all times and include context-sensitive guidance to enable the best possible interaction with the system operator.

4.5 The display shall be capable of simultaneously indicating the number of outstanding events as well as the current event of any given type.

4.6 To enable the exact location and initiating cause of any alarm condition to be accurately pinpointed, the display shall include:

a) Device Type.

b) Device Address.

c) Loop Number and Zone Location.

d) Individual Detector and Zone textual descriptions.
(40 characters must be available for Detector and Zone textual location descriptions).

5. Control and Indicating Equipment (C.I.E.) Manual Controls

5.1 All user operations shall be initiated via an integral keypad, or an equivalent means and shall provide a minimum of two levels of user access.

5.2 The C.I.E shall provide the following manual controls:

a) Silence Alarms.

b) Re-Sound Alarms.

c) Silence Internal Panel Sounder.

d) Reset.

e) Next Event.

f) Menu.

g) Yes / Enter, – To acknowledge or confirm a menu selection.

h) No / Cancel, – To decline or reject a menu selection.

i) Numeric keypad 0…9, - To enable access code entry and selection of menu choice.

5.3 The C.I.E display screen shall provide fully context-sensitive and clear menu operating guidance to the system user.

5.4 The menu selection procedures shall be tolerant of system user keying errors to ensure correct choice selection before command execution.

6. Control and Indicating Equipment (C.I.E.) Event Information Storage

6.1 The C.I.E. shall include an independent real time clock to enable all system events to be referenced against time and date.

6.2 All alarm activations, detector faults, warnings, disablements and any C.I.E faults, shall be stored in protected memory for later recall via the liquid-crystal display, or printer.

6.3 Each system event originated from an addressable device (e.g. alarm, fault condition, etc) shall include full location of the device.

6.4 Each event initiated by a user of the system (e.g. disablement, test condition, etc) shall include full detail of both the location of the command and the system operator entering the command.

6.5 The latest 1000 system events shall be retained in the memory for not less than 14 days in the event of removal of mains and stand-by battery power supplies from the C.I.E.

6.6 The C.I.E. shall store the total of all system alarm conditions for the previous 12-month period on a monthly basis.
There shall be a facility to use this information in conjunction with other input data provided by the operator, to produce system false alarm performance statistics for inclusion in the system logbook.
(Reference BS 5839-1:2002 Section 30.2).

7. Repeater Facilities

7.1 The C.I.E. shall accept up to 31 Repeater/Control Panels and each of these shall duplicate all LED indicators and display information shown at the main control unit.

Of this total, 14 shall be able to provide exactly the same control facilities as the main C.I.E. but there shall also be provision to limit any one, or more of the facilities on an individual Repeater/Control Panel basis.

7.2 Repeater/Control Panels shall connect to the main C.I.E. via a dedicated EIA-485 circuit. Repeater/Control Panels shall be able to derive their power supply from the main C.I.E. and shall allow interconnection over a distance of at least 1.2Km to be completed via a standard 4-core fire-resistant cable.

7.3 It shall be possible to provide an EIA-232 interface integral with each Repeater / Control Panel to permit local printer, pager, graphics or Building Management System connection.

8. Network Facilities

8.1 It shall be possible to interconnect a minimum of 32 C.I.E. units, via interface equipment and cable, or fibre-optic links, to form a 'seamless' high integrity peer-to-peer network.

8.2 Each networked C.I.E. unit shall function independently as an autonomous Fire Detection and Alarm System, but shall additionally be able to operate as a part of a fully integrated control system.

8.3 The network shall allow C.I.E. units interconnection over a unit–to-unit distance of 1.2Km using standard fire resistant cables.

8.4 From any location, it shall be possible to complete interrogation and control operations of any one, or all other C.I.E. units on the network as follows:

a) Disabling / Re-enabling individual zones, detectors, or loop circuits.
b) Disabling / Re-enabling alarm sounders, auxiliary relay outputs, or individual outputs.
c) Command network-wide alarm silence and re-sound actions.
d) Command network-wide system reset actions.
e) Conduct a full analysis of any addressable device or loop circuit.

8.5 To ensure maximum robustness and reliability network C.I.E. units shall be interconnected with two fully monitored counter-rotational 2-core ring circuits, one of which shall operate as a secondary or 'stand-by' communication ring.

This topology shall provide the following minimum fault tolerance:

a) With a one short-circuit or open-circuit fault between network C.I.E. units, full communication will be maintained throughout all units.
b) With multiple interconnection failures, the network shall automatically re-configure into two or more independent and fully functional networks.
c) Each C.I.E. unit on the network shall indicate the location of any interconnection faults and any network division conditions.
d) The network shall automatically re-configure as communication faults occur, or are cleared.

8.6 The network shall use a token-passing non-collision communications protocol, and must include full error-correction and re-generation of data at each network C.I.E. unit.

8.7 Full information of all alarm, fault, warning and disablement conditions at any C.I.E. location, shall be broadcast throughout the network and be available at all other C.I.E. units connected to the network.

8.8 The event record of each C.I.E. shall contain all events from each C.I.E. connected to the network.

8.9 It shall be possible to program the alarm and auxiliary outputs of each C.I.E. to operate as individually required on the occurrence of an alarm condition from each individual zone of all other C.I.E. units on the network.

9. C.I.E Configuration Data

9.1 The C.I.E. shall allow all system configuration data to be entered from, and transferred to a specific PC configuration data software program via an EIA-232 port.

9.2 The PC program shall also allow any C.I.E. firmware updates that may become available from time to time, to be independently downloaded to the C.I.E. without affecting the configuration data.

9.3 The PC program shall be a 32-bit windows application and compatible with Windows 95©, Windows 98© and Windows XP© operating system platforms.

9.4 The PC program shall include interactive data windows and a context-sensitive contents structure format.
It shall also include fully context-sensitive on-line help facilities to ensure both straightforward entry, and simple editing of C.I.E. configuration data.

9.5 The PC program shall be made available to suitably qualified and trained users without impediment.

9.6 The C.I.E. configuration data shall allow inclusion of a password as a secure means of protection against possible misuse of this facility by non-authorised personnel.

9.7 It shall be possible to include detail notes and records within the C.I.E. configuration data as a single point of reference providing information about the fire alarm system.
These shall be created via the PC configuration data program and contain a summary of the fire alarm system specification and other relevant information, together with date referenced ‘change notes’ detailing all revisions of C.I.E. configuration data throughout the systems lifetime.
It shall be possible to access this reference information, using the PC configuration data program, or from the C.I.E. using a printer.

10. Pre-commissioning Facility

10.1 The PC program shall be able to export the C.I.E. configuration data in a file format suitable for use with the Apollo Discovery SimSystem©.

10.2 The program shall be able to provide detailed loop design calculation results to verify the implementation of loop circuits defined in the C.I.E. configuration data.

10.3 Used in conjunction with the C.I.E., the SimSystem program and associated interface unit(s) shall enable full functional simulated test and verification of the C.I.E. configuration data.

This exercise shall encompass full cause- and-effect testing, verification of detector sensitivity/response mode control functions (e.g. – Day / Night arrangements) and any additional procedures that may be included.

11. Commissioning, Service and Maintenance Features

As a minimum, the C.I.E. shall provide at least all of the following facilities to aid system pre-commissioning, commissioning, and maintenance and service operations:

11.1 Include a loop examination facility that will provide a ‘display map’ of addressable devices fitted to any loop circuit.

This shall provide ‘at-a-glance’ identification of all device types that are physically present on a loop circuit and clearly shows all ‘spare’ and ‘multiple address’ locations.

11.2 Facility to display the dynamic condition of communication signalling quality for any loop circuit and to examine the DC supply voltage / DC current, and maximum supply voltage (DC + protocol pulses) and current levels.

11.3 Facility to display the dynamic characteristics of any individual device, and where appropriate to illuminate its LED indicator to visually pinpoint its location.

This report facility must include all of the following information:

a) Device Type.
b) Device Status.
c) Device Input and Output Bits Status.
d) Device Textual Description.
e) Zone Allocation of Device.
f) Zone Textual Description.

Where the addressable detectors are of the 'Discovery' type, the report must also include:

g) Detector Manufacture Date.
h) Detector Sensitivity/Response Mode.
i) Detector Drift Compensation Value.
j) Detector Alarm Count.
k) Detector Last Alarm Date.

11.4 Facility to print full details of the devices of any addressable loop, to record the information of (11.3) for all devices fitted to the loop circuit.

11.5 Facility to test the output operation of any one or more addressable devices on an individual selection basis.

11.6 Facility to disable all, or selected alarm sounders and auxiliary output circuits.

11.7 Facility to disable an individual addressable detector, an individual zone, or loop circuit.

11.8 Facility to ‘Walk-Test' and record operation of all devices, either with, or without alarm outputs activating.

11.9 Facility to input alarm conditions data and automatically generate system false alarm performance statistics.

(Reference BS 5839-1:2002 Section 30.2).

12. C.I.E. and Associated Products List

Item Description	Part Number
IFAX Single Loop Analogue Addressable Control Unit	MA-05-001S
IFAX 2-Loop Analogue Addressable Control Unit	MA-05-012
IFAX 4-Loop Analogue Addressable Control Unit	MA-05-014
IFAX 6-Loop Analogue Addressable Control Unit	MA-05-016
IFAX 8-Loop Analogue Addressable Control Unit	MA-05-018
IFAX Single Loop Analogue Addressable Control Unit c/w Network Port	MA-05-001S
IFAX 2-Loop Analogue Addressable Control Unit c/w Network Port	MA-05-212
IFAX 4-Loop Analogue Addressable Control Unit c/w Network Port	MA-05-214
IFAX 6-Loop Analogue Addressable Control Unit c/w Network Port	MA-05-216
IFAX 8-Loop Analogue Addressable Control Unit c/w Network Port	MA-05-218
IFAX Dual Ring Network Interface Module	MA-05-060
IFAX Repeater / Control Panel (Surface Mounting)	MA-05-102
IFAX Repeater / Control Panel (Flush Mounting)	MA-05-103
IFAX Loop Powered Detector Platform Sounder	MA-03-055