

*R3 19" Rack Mounted Fully Modular Control Panel
Consultants Specification Document*

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1.0 Introduction to the Panel

The 19” rack mounted fully modular control panel shall comprise of a number of different plug-in modules, each of which shall be dedicated to a particular function within the complete control panel.

The modules shall facilitate the requirements of fire detection, gas detection, alarm signalling, extinguishing, data transmission and plant control.

The modular approach to the provision of the required functions shall result in a system that shall be inherently reliable, easy to install and commission and easy to maintain, repair and fault find.

The 19” rack mounted fully modular control panel must also have the capability to be networked to other panels, repeater and mimic panels Alarm Manager Graphics Systems and provide a suitable MODBUS interface.

The fire detection and extinguishing control system main control panel shall be based on a standard 19 inch rack swing frame each rack carrying a system backplane and the required function modules. The system must be flexible, to the point that, during manufacture or after installation and commissioning, modules may be added or removed without major modifications.

Each module shall be located in a position within a 3U high sub rack. Underneath each sub rack may be located a 1U high identification plate with a clearly engraved legend for each module. The engraving area for each module shall be 25mm wide x 45mm high.

All cabinets shall be rated at a minimum IP rating of IP55.

The cabinets shall be manufactured from 1.5mm mild steel coated with an electrophoresis primer and flint grey surface coat.

All indications shall be visible behind a full sized polycarbonate window mounted in an aluminium framed lockable door.

2.0 Panel Specifications

The 19" rack mounted fully modular control panel shall be infinitely flexible within the following parameters:

2.1 Common Control Module

Each 19" rack mounted fully modular control panel shall contain a common control module. This module shall contain all executive action user controls and shall be always fitted in the right hand module position of its designated rack. There shall be two types of common control module:

2.1.1 K1321

The K1321 common control module, which shall be only suitable for conventional detection systems.

2.1.2 K1339

The K1339 common control module, which shall be suitable for both analogue addressable and conventional detection systems.

2.2 Decoding Module

If the 19" rack mounted fully modular control panel contains more than one rack then all subsequent racks shall contain a K1215 decoding module. This module shall be similarly located beneath the common control module.

2.3 Maximum Racks Per Panel

It shall be possible to fit up to 14 racks into each system subject to cabinet size limitations.

2.4 Maximum Modules Per Rack

If a K1321 common control module shall be used, up to 14 modules may be fitted to that rack. If a K1339 common control module shall be used, up to 10 modules may be fitted in that rack.

Any rack that contains a K1215 decoding module may be fitted with a maximum of 14 modules.

2.5 Module System Limitations

A maximum of 196 modules may be fitted to any 19" rack mounted fully modular control panel that contains one common control module; the limits for each individual module shall be shown below:

Module description	Qty
Analogue addressable loop module (K1412)	64
Conventional zone module (K1261)	84
Gas detection module (K1314)	42
Extinguishing module (K1219)	128
Alarm module (K1304)	84
Relay module (K1205)	84
Input module (K1222)	42
Input module with indications (K1222L)	42
Input module with 1 keyswitch (K1222-1K)	42
Input module with 2 keyswitches (K1222-2K)	42
Output module (K1225)	21
Output module with indications (K1225L)	21
Normally energised output module (K1316)	21
Normally energised output module with indications (K1316L)	21
Annunciator driver module (K1525)	21
Annunciator driver module with indications (K1525L)	21
Timer module (K1539)	21
Initial/reserve changeover module (K1224)	128
Earth leakage detection module (K1241)	1

3.0 Module Descriptions

Shown below is a list of the modules available, followed by detailed description of the functions of the different modules.

Module Part Number	Module Description
K1339	Common control module (Conventional/Analogue)
K1321	Common control module (Conventional)
K1215	Decoding module
K1412	Analogue addressable loop module
K1261	Conventional zone module
K1314	Gas detection module
K1219	Extinguishing module
K1304	Alarm module
K1205	Relay module
K1222	Input module
K1222L	Input module with indications
K1222-1K	Input module with 1 keyswitch
K1222-2K	Input module with 2 keyswitches
K1225	Output module
K1225L	Output module with indications
K1316	Normally energised output module
K1316L	Normally energised output module with indications
K1525	Annunciator driver module
K1525L	Annunciator driver module with indications
K1539	3 way timer module
K1224	Initial/reserve changeover module
K1241	Earth leakage detection module

3.1 K1339 Common Control Module

The K1339 common control module shall be designed for use with both conventional and analogue addressable detection systems and shall be fully compatible with all modules in the 19” rack mounted fully modular control panel.

The following standard features shall be provided:

A user keypad, a 4 line x 20 character LCD display and 7 LED indications.

3.1.1 LED Indications

- i. System failed
- ii. System healthy
- iii. Power fault
- iv. Card removed
- v. Alarms silenced
- vi. Buzzer silenced
- vii. More data

3.1.2 Alpha-Numeric LCD Indications

The system shall have a 4 line x 20-character backlit LCD display, showing the first two events. The top line of each provides the loop number, sensor number, device type and device status, for example:

The second line of the event display shall be user definable (see User Controls below).

If further alarms are present the MORE DATA LED shall illuminate and further alarms can be scrolled.

All fire indications shall be latched until the system shall be reset.

3.1.3 User Controls

A standard 12-button keypad shall be provided to enable the following functions:

- i. Silence alarms
- ii. Reset system
- iii. Test alarms
- iv. Silence buzzer
- v. Test display
- vi. Next message

The ZERO button shall give access to the system menu after entry of a code:

- i. Set time and date
- ii. Edit messages
- iii. Isolate sensors

The edit message facility shall allow the user (via a plug in keyboard) to input messages identifying the location of each device, conventional zone or input.

The edit message facility shall give the following options:

- i. Edit sensor message (for analogue addressable devices)
- ii. Edit indicator message (for conventional zones or indication only zones)
- iii. Edit input message (for inputs only)

Each message associated with an analogue addressable device, conventional zone, indication only zone or input, shall be defined within the single line of 20 characters. This message shall be displayed each time a status condition occurs for any of the above options.

3.1.4 Standard Facilities

The Fully Modular Fire Alarm Control System shall have the following standard output sockets to connect the following items:

- i. Standard QWERTY keyboard - to enable user defined messages to be inputted.
- ii. Printer output - this enables a variety of commercially available printers to be connected to the panel (Centronics standard parallel printer connection).
- iii. RS232 serial data output - this permits alphanumeric repeater panels to be connected to the panel. The repeater panels shall display messages identical to control panel.

The RS232 output can also be used to enable remote silence alarms and system reset controls to be incorporated into the repeater panel without the need for extra cabling.

If required, input modules can be used to provide keyswitch silence alarms, system reset and evacuate controls in addition to those on the keypad.

3.1.5 System Logic Facilities

The running software and cause and effect programming facilities of the module shall be held in EPROM.

3.1.6 Sensor Isolation

Access to the system menu via the keypad and entry of the code provides the following isolation menu:

- i. List sensors isolated, with an option to print
- ii. Isolate individual sensor
- iii. De-isolate sensors
- iv. Isolate range of sensors, facility to isolate a numerical series of devices on a loop
- v. De-isolate a range of sensors
- vi. De-isolate all sensors

3.2 K1321 Common Control Module

The K1321 common control module shall be designed for use with conventional detection systems only and shall be fully compatible with all modules in the 19" rack mounted fully modular control panel except for the K1412 module.

User switches and LED indications shall be provided as standard:

3.2.1 LED Indications

- i. System healthy
- ii. Power fault
- iii. Card removed
- iv. Alarms silenced
- v. Buzzer silenced

All indications shall be latched until the system shall be reset.

3.2.2 User Controls

5 switches shall be provided to give the following functions:

- i. Silence alarms
- ii. Reset system
- iii. Test alarms
- iv. Silence buzzer
- v. Test lamps

The K1321 common control module requires no ribbon connection.

3.3 K1215 Decoding Module

The K1215 decoding module shall be used in the second and subsequent racks in any system that contains more than one rack.

The function of the K1215 module shall be to communicate with modules fitted in the same rack as itself and with the common control module.

The K1215 module must always be installed beneath the common control module.

The module shall be equipped with a system healthy LED and a test lamps switch to test the indications of all modules fitted into that rack.

3.4 K1412 Analogue Addressable Loop Module

The K1412 analogue addressable loop module operates in conjunction with the K1339 common control module and shall be compatible with Apollo series 90, XP95 devices and CEL loop interface outstations.

The module shall allow connection of up to 126 devices on a single pair of wires. Dependent upon site conditions, loops may be wired as a continuous loop for maximum system integrity, or as radial circuits. Both options may have spurs.

The circuit wiring shall be monitored for open and short circuit fault and also monitors for the presence of all devices.

The module gathers information from the sensor devices and then sends the information to the common control module.

The module shall be fitted with an LED to indicate whether any sensors on that loop are isolated. Isolation of loop sensors shall be controlled from the common control module.

The module shall be fitted with an engineers switch which when operated shall automatically configure the loop module to the devices fitted on the loop. The common control module shall indicate the total number of devices on that loop after configuration is complete.

The configuration information shall be stored in non-volatile memory in the loop module.

The module shall automatically report its configuration information on power up.

3.5 K1261 Conventional Zone Module

The K1261 conventional zone detection module provides facilities for connection of conventional detection devices (smoke, heat, flame etc.). 3 zone circuits may be connected to each module. Circuit wiring shall be monitored for open and short circuit fault conditions.

The following features shall be available on the module:

3.5.1 12 Way DIP Switch

- i. Zone 1 non - latch, operation of this switch shall cause zone 1 to become non - latching, i.e. when the zone shall be triggered into fire, the fire LED's shall pulse and a signal shall be sent to the common control module. until the fire signal shall be removed. The system shall then return to its quiescent state.
- ii. Zone 2 non- - latch, as above but for zone 2.
- iii. Zone 3 non- - latch, as above but for zone 3.
- iv. Zone 1 Zener barrier, operation of this switch shall cause the short circuit threshold of zone 1 to change to allow the zone to be monitored through a Zener barrier or galvanic isolator.
- v. Zone 2 Zener barrier, as above but for zone 2.
- vi. Zone 3 Zener barrier, as above but for zone 3.
- vii. Zone 1 fire delay, operation of this switch shall cause the reaction of zone 1 to a fire trigger to be delayed for the time delay set by adjustment of VR1 (adjustable between 0.5

to 60 seconds), after the time delay has elapsed the fire condition shall latch in a normal fire condition. This function shall be suitable for use with sprinkler flow switches.

- viii. Zone 2-fire delay, as above but for zone 2.
- ix. Zone 3-fire delay, as above but for zone 3.
- x. Latching faults, operation of this switch shall cause both open and short circuit faults on the module to become latching, the fault condition shall latch until cleared by operation of the System Reset switch.
- xi. Fault output/isolate, operation of this switch shall cause a fault signal to be sent to the common control module when any zone shall be set to its isolate position.
- xii. Short circuit disable, operation of this switch shall disable the short circuit fault monitoring on the module. This changes the fire condition window of 14-49mA to 14-88mA for all zones.

3.5.2 Frontplate Mounted Switches (1 Set Per Zone, 3 Way Toggle Switch)

Position 1 Normal

When the switch is in this position the zone shall operate as normal, i.e. as defined by the DIP switch settings described above.

Position 2 Isolate

When the switch is in this position the +ve supply shall be disconnected from the zone and the zone shall be totally isolated from the system. The module shall send a zonal fault signal to the common control module unless DIP switch 11 shall be set to the OFF position, the module buzzer shall sound for 1 second per 15 seconds whilst the zone shall be in an isolate condition.

Position 3 Test

When the is in this position, the zone shall be in a fully monitoring condition but when a fire signal shall be received the module buzzer shall sound for a period of 5 seconds and then the zone shall be automatically reset, no fire signal shall be sent to the common control module.

When the zone is in the test mode the module buzzer shall sound for 1 second every 15 seconds and a fault signal shall be sent to the common control module.

3.6 K1314 Flammable Gas Detection Module

The K1314 flammable gas detection module shall provide the facility to connect a flammable gas detector to the 19" rack mounted fully modular control panel.

The detection circuit shall be fully monitored for open and short circuit wiring faults.

Two discrete alarm trip levels may be set using internally mounted controls. A digital LED display of the % LEL of the gas being monitored shall be provided on the front panel of the module.

Over and under range fault signals shall be provided by the module.

The following indications shall be provided on the module:

- i. % LEL
- ii. Alarm level 1
- iii. Alarm level 2
- iv. Power on
- v. Fault

The following user controls shall be provided:

- i. Zero control
- ii. Span control
- iii. Normal/calibrate switch

The following engineers' controls shall be provided:

- i. VR1 shall be used to set the head voltage
- ii. VR3 shall be used to set the alarm 2 trip level
- iii. VR4 shall be used to set the alarm 1 trip level
- iv. VR6 shall be used to set the display blanking level

The module shall be used with a large range of gas detectors; the type of gas detector shall be pre-set at the factory.

3.7 K1219 Extinguishing Module

The K1219 extinguishing module shall provide all the functions normally associated with a gaseous, water, foam or powder extinguishing system.

The module shall have the following indications:

- i. System discharged, normally signalled from the gas gone pressure or water flowing switch.
- ii. Auto, this indicates when the extinguishing system shall be in its automatic monitoring mode.
- iii. Manual, this indicates when the extinguishing system shall be in its manual monitoring mode.
- iv. Low pressure, this shall indicate when the pressure of the extinguishing medium shall be low.
- v. Low pressure fault, this shall indicate when either a short or open circuit wiring fault shall be present.

- vi. Pressure switch fault, this shall indicate when either a short or open circuit wiring fault shall be present.
- vii. Actuator, this indicates when the discharge signal has been sent to the actuating device or valve.
- viii. Alarm, this indicates when the alarm circuit shall be active. The alarm circuit wiring shall be monitored for open and short circuit wiring faults.

The following user control shall be provided:

- i. Auto/manual/isolate selector keyswitch

The following engineers' controls shall be provided:

- i. Actuator time delay, this shall be the delay between the panel detecting an extinguishing situation and the panel signalling to the actuator to operate, it can be set between 0 and 255 seconds in 1 second increments.
- ii. Short circuit fault monitoring disable, short circuit wiring fault monitoring can be disabled via DIP switches on the module.
- iii. Second stage alarm N/O or N/C, the 2nd Stage Alarm output can be selected for either normally open or normally closed operation via a jumper J1 on the module.
- iv. Latching/non-latching fault indication, fault indications can be set for latching or non-latching operation via a DIP switch on the module.

Provision shall be made for the connection of remote auto/manual switching and repeat status indication.

3.8 K1304 Alarm Module

The K1304 alarm module shall provide three independent 24 volts DC outputs for alarm control. Each output shall be fused at 2 amps.

Each alarm circuit shall be monitored for open and short circuit wiring faults. In the event of a short circuit fault occurring, the output from that circuit shall be automatically disabled.

The output polarity shall reverse on operation of the alarm circuit and the alarm devices must be made polarity sensitive in order for the monitoring system to operate correctly.

The following indications shall be provided:

- i. Alarm circuit A operated
- ii. Alarm circuit B operated
- iii. Alarm circuit C operated
- iv. Alarm circuit A fault
- v. Alarm circuit B fault
- vi. Alarm circuit C fault

The following user controls shall be provided:

Three 3-way toggle switches shall be fitted to the frontplate (one for each alarm circuit); these have the following functions:

Position 1 - Isolate

Operation of this switch shall cause that individual alarm circuit to become isolated; a fault signal shall be sent to the common control module. The module also has an on-board buzzer which shall sound once every 15 seconds.

Position 2 - Normal

When the switch is in this position the module operates as normal.

Position 3 - Test

Operation of this switch shall cause all devices connected to that alarm circuit to sound, a fault signal shall be sent to the common control module.

The following engineers' functions shall be provided:

- i. Short circuit fault monitoring disable, operation of the switch disables the S/C monitoring on all three alarm circuits.
- ii. Test disable, operation of this switch disables the frontplate individual alarm test function on all three alarm circuits.
- iii. Isolate disable, operation of this switch disables the frontplate individual alarm circuit isolate function on all three alarm circuits.
- iv. Latching faults, operation of this switch causes faults on the alarm circuits to become latching.

3.9 K1205 Relay Module

The K1205 relay module shall provide three independent relay outputs each with two sets of changeover contacts rated at 1 amp at 24 volts DC.

The relay coils shall be independently monitored.

The following indications shall be provided:

- i. Relay A operated
- ii. Relay B operated
- iii. Relay C operated
- iv. Relay A fault
- v. Relay B fault
- vi. Relay C fault

The following engineers' functions shall be provided:

- i. Isolate relay A
- ii. Isolate relay B
- iii. Isolate relay C

3.10 K1222 Input Module

The K1222 input module shall provide 6 non-monitored inputs into the control system.

Each input shall operate when the system 0 volts shall be connected to the input circuit.

As standard no indications or controls shall be provided.

3.11 K1222L Input Module With Indications

The K1222L input module shall be identical to the standard K1222 module but additionally has 6 pairs of LEDs fitted to the frontplate which indicate the status of the input circuits.

3.12 K1222-1K and K1222-3K Input Modules

The K1222-1K and K1222-3K input modules shall be identical to the standard K1222 module but shall be additionally provided with one and three keyswitches fitted respectively for control of critical control panel functions.

The remaining input circuits (5 and 3 inputs respectively) shall be available for use as standard non-monitored input circuits.

3.13 K1225 Output Module

The K1225 output module provides 12 open collector transistor outputs capable of driving up to 80mA.

The output shall be normally floating and switches to 0 volts when the output shall be active.

As standard no indications or controls shall be provided.

3.14 K1225L Output Module with Indications

The K1225L output module shall be identical to the K1225 module but shall be fitted with 12 single LEDs which indicate when the output shall be active.

3.15 K1316 Normally Energised Output Module

The K1316 normally energised output module shall be identical to the K1225 module plus the provision of 12 open collector transistor outputs which shall be normally active (switched to 0 volts).

The outputs shall be allowed to float when the output shall be switched.
As standard no indications or controls shall be provided.

3.16 K1316L Normally Energised Output Module with Indications

The K1316L output module shall be identical to the K1316 module but shall be fitted with 12 single LEDs which indicate when the output shall be active.

3.17 K1525 Annunciator Driver Module

The K1525 annunciator driver module provides annunciator driving capability to the 19" rack mounted fully modular control panel, it has the following features:

- i. 12 outputs, each output shall drive one LED, the output shall be rated at 100mA each.
- ii. Test lamps input, 0v normally from a switch on the annunciator or mimic.

NOTE: Operation of Test Lamps on the common control module shall only cause the LEDs on the K1525 module frontplate to illuminate (if fitted).

- iii. Accept input, 0v normally from a switch on the annunciator or mimic, this shall be switchable from a DIP switch on the PCB, see below for details.
- iv. First to fire signal input/output. This feature reserves the first signal received as the first to fire signal when the specification requires First To Fire indication of the first event received. The DIP switch options shall be detailed below. The input/output requires linking between all K1525 header boards to give a common first fire received signal for all modules. This signal shall bar the other K1525 boards from interpreting the first input received on subsequent cards as being the first input received on the annunciator.
- v. Synchronisation input/output - when required one K 1525 can be selected as a 'Master' for synchronisation purposes, see below for details. If this function shall be used then the Sync output on the master K1525 card must be linked to the Sync input on the next K1525 and then the Sync output on that card linked to the Sync input on the next K1525 card and so on. Engineers' controls shall be provided to give the following functions:
 - i. Accept external only - operation of this switch shall cause the module to ignore the silence alarms output from the common control module and respond only to an external signal.
 - ii. First fire dim flash - operation of this switch shall cause the first to fire signal to flash dim after the signal has been accepted: off, dim flash, off, dim flash and so on. This enables the operator to differentiate between new alarms and the accepted first to fire signal.
 - iii. First to fire flash - operation of this switch shall cause the first to fire signal to flash after the signal has been accepted as described for switch 2 but the flash shall be of normal brightness.

- iv. External pulse - operation of this switch shall disable the clock pulse from the common control module and allow synchronisation from an external source, i.e. from a 'Master' K1525 card as described in 5 above.
- v. Slow flash - operation of this switch causes the clock signal from the common control module to be halved on the card. This shall cause the flash rate of the LEDs to become a 'slow flash'.
- vi. Dim/bright flash - operation of this switch shall cause the first to fire signal to operate as described in 2 and 3 above but the flash shall be dim, bright, dim, bright and so on. The LED shall not extinguish until reset.
- vii. Brightness 1 and brightness 2 - operation of these switches in their various alternative positions allows the brightness of the first to fire signal to be specified on card. See below for settings:

Switch setting	7	8	brightness
	Off	off	1/2 normal brightness
	On	off	1/2 above brightness
	Off	on	1/2 above brightness
	On	on	3/4 normal brightness

No indications shall be provided as standard.

3.18 K1525L Annunciator Driver Module with Indications

The K1525L annunciator driver module with indications shall be exactly the same as the standard K1525 module but has 12 LEDs fitted which indicate when the output shall be active.

3.19 K1539 3-Way Timer Module

The K1539 3-way timer module provides 3 x digital time delay facility for use within the 19" rack mounted fully modular control panel. The time delays shall be variable from 0 up to 8 minutes 30 seconds by the adjustment of a pcb mounted DIL switch.

3 off open collector outputs capable of driving 100 mA each shall be provided to indicate that the timer delays are running.

3 off open collector outputs capable of driving 100mA each shall be provided to indicate that the timer delays have ended.

There shall also be a facility to start the 3 off timer delays by applying 0 volts signal to the module separately from the cause / effect.

The module shall be fitted with the following indications for each of the 3 independent time delays.

- i. Delay on (A, B or C). Delay on LED's shall pulse when the time delay is running and delay on LED's shall be lit continuously when the time delay has ended.

3.20 K1224 Initial/Reserve Changeover Module

The K1224 initial/reserve changeover module may only be used in conjunction with the K1219 extinguishing module.

The module provides a means of selecting one of two extinguishing actuators. Selection shall be controlled by the operation of a front panel mounted keyswitch. Indications shall be provided to indicate which of the two actuators circuits shall be selected.

The K1224 module may also be fitted with an extra keyswitch which shall be used to totally isolate the actuator circuits. The isolate switch disconnects the actuator circuit from the K1219 module.

When the isolate switch shall be operated the K1224 module shall indicate 'locked off' and the K1219 module shall indicate 'actuator fault'.

The following indications shall be provided:

- i. Initial selected
- ii. Reserve selected
- iii. Locked off

The following controls shall be provided:

- i. Initial/ reserve selection keyswitch
- ii. Actuator isolate keyswitch

A maximum of 128 K1224 modules may be used in any 19" rack mounted fully modular control panel.

3.21 K1241 Earth Leakage Module

The K1241 earth leakage module provides earth leakage detection for the 19" rack mounted fully modular control panel.

The module shall detect positive and negative earth faults on both the control panel and also on the field wiring. When an earth fault shall be detected an indication on the module shall illuminate and the buzzer in the common control module shall sound.

The module shall also include 1 off relay with a single changeover contact rated at 24V DC 1A for external signalling purposes.

4.0 Approvals

4.1 Quality System Approval

The manufacturers of the products supplied for the fire alarm system shall have been in the business of manufacturing fire alarm products for at least fifteen years.

The manufacturing company shall be approved to ISO9001:1994 by The Loss Prevention Certification Board.

4.2 19” rack mounted fully modular control panel type approval

The 19” rack mounted fully modular control panel shall be type approved to BS 5839 Part 4 and Lloyds Test Specification No: 1 (ENV 2 level) by Lloyds Register.

The 19” rack mounted fully modular control panel shall be type approved to carry the CE mark in accordance with EEC directives 91/263/EEC and 89/336/EEC.