VIGILANT FP4000

INTELLIGENT FIRE ALARM

SYSTEM MANUAL

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1. GENERAL INFORMATION

1.1 INTRODUCTION AND SCOPE

This manual describes the Wormald Vigilant 'Vigilant FP4000 Intelligent Fire Alarm'. It contains information concerning the design, installation and commissioning of fire alarm systems based on the Vigilant FP4000. There are also two other manuals as follows:

1. **Programming and Diagnostic Manual**

   Programming a Controller for the various options and diagnosing system faults using a Programming terminal;

2. **Technical Manual**

   Technical description of the system and circuit board;

Specific detail of detectors, alerting devices and Brigade receiving equipment is not given in this manual but is provided in other Wormald Vigilant manuals.

1. INTRODUCTION AND SCOPE (Cont'd)

The relevant sections of this manual must be read and understood before attempting to install, configure, operate, test, or service a Vigilant FP4000. Although some protection components have been included, damage to either the Controller or to external equipment may occur if the unit is installed incorrectly.

```
* * * * * * * * * * * * * * * *
*                                 *
*         ATTENTION               *
*                               *
*   This equipment contains   *
*  STATIC SENSITIVE DEVICES   *
*                               *
*  Use Antistatic Procedures  *
*       when handling         *
*                               *
* * * * * * * * * * * * * * * *
```

1.2 ORGANISATION OF THIS MANUAL

This manual is made up of 7 sections as follows:

1. General Information - includes details of documentation and a brief product description.

2. System Description

3. Planning - information to assist branch staff plan and order an FP4000 system

4. Installation Information

5. Operation - tells owner and branch staff how to use an FP4000

6. Commissioning, routine testing and maintenance

7. Spares list and system drawings

1.3 PRODUCT DESCRIPTION

The Vigilant FP4000 is an addressable fire alarm control system designed to provide fire protection in premises which require more than 4 zones. It uses modular construction and an addressable serial communications loop which allows substantial cost savings for larger systems, but maintains cost-effectiveness for small systems (while still offering the large system features).

The system has been designed specifically to meet the requirements of New Zealand Standards NZS 4512 'Automatic Fire Alarm Systems in Buildings' and NZS 4561 'Manual Fire Alarm Systems in Buildings'. It also meets the New Zealand Fire Service requirements for connection to remote receiving stations.

Communications Loop

A major feature of the Vigilant FP4000 is the alarm responder communications loop. Fire detector circuits in various parts of the protected premises are connected to a number of local responders. These responders are in turn connected by a 4 wire serial communications loop to the main controller. This configuration offers considerable wiring savings compared with conventional systems where every detector circuit must be wired all the way back to the controller.

The responders have been designed to cater for a wide range of detector type (eg: heat detectors, smoke detectors, flame detectors, manual call points). All detector circuits are monitored by the use of end-of-line devices.

1.3 PRODUCT DESCRIPTION (Cont'd)

A relay output responder is also available for remote evacuation or control functions. Provision has also been made for the future integration of a number of Gas Flooding subsystems.

Because the integrity of the responder communications loop is vital to the alarm system's operation, careful thought has been given to its design. The loop is fully protected. A partial or complete break, or short, anywhere in the loop will be detected and isolated. All communications are still preserved even in the presence of the fault condition. This is achieved by the dual path nature of the loop and the fault isolation facilities incorporated in each responder.

Alarm Signalling

The FP4000 is suitable for connection to the various types of Brigade alarm receiving equipment. In most cases provision has been made for mounting the transmitting device inside the controller cabinet. Signalling arrangements have been made flexible to allow for a wide variety of connections. Provision has also been made for connection to the Wormald Vigilant VICNET fire alarm data network.

In addition to Brigade signalling, the FP4000 also provides the power supply and control for a variety of alerting devices for evacuation control. Standby power is provided by a lead acid battery with mains supply and associated charger. The battery is monitored to provide early indication of diminishing capacity.

1.3 PRODUCT DESCRIPTION (Cont'd)

A number of evacuation control options are provided. All alerting devices may be wired to the main controller, alternatively local devices may be controlled by a local relay output responder. Provision has also been made for the connection of a separate evacuation control system for specialised applications. In all cases evacuation circuits may be optionally monitored for fault conditions.

<u>Indicators and Controls</u>

Indication is provided on the controller, by means of high-efficiency solid state lamps (LEDs) of 'normal', 'defect', and 'fire'. Individual 'alarm' indicators are also provided for each zone. Indicators may also be programmed to display other types of information (eg, sprinkler flow switches, interference switches).

A number of Remote Zone Display Units may optionally be connected. These allow the remote display of the indications provided on the main controller as described above. Connection to these is by means of a monitored serial data link.

External keyswitch controls are provided for both Trial Evacuation and Brigade Silence Alarms. These controls may also be provided on any Remote Zone Display Units connected.

1.3 PRODUCT DESCRIPTION (Cont'd)

Advanced Features

The Vigilant FP4000 utilises the flexibility and intelligence of microprocessor-based electronics. Advanced programming features are available in the field to trained service and installation personnel. This programming is accomplished by means of a portable programmer unit which also allows the verification of all system configuration parameters. The programmable features include:

* Fully programmable circuit/zone allocations
* Selectable instantaneous or grouped 'dual alarm' circuits
* Programmable outputs for customised control functions (eg, sprinkler monitoring, plant shutdown, local alarms)
* Gated or instantaneous smoke detector circuits
* Day/Date/Time
* Selectable days and times for performing automatic tests to minimise after hours callouts
* Monitoring of remote evacuation circuits
* Ancillary non-alarm or non-latching inputs (eg, sprinkler flow switches)

1.3 PRODUCT DESCRIPTION (Cont’d)

All programmable parameters are stored in non-volatile memory which is protected even when the power supply is completed removed.

An optional logging printer may be connected to provide hard copy record of all events. Provision has also been made for the supply of alarm information to building services systems.

1.4 RELATED DOCUMENTATION

1. Wormald Vigilant FP4000
   Intelligent Fire Alarm Technical Manual

2. Wormald Vigilant FP4000
   Intelligent Fire Alarm Programming and Diagnostic Manual

3. NZS 4512 : 1981
   New Zealand Standard, Automatic Fire Alarm
   Systems in Buildings

4. NZS 6200 : 1988
   New Zealand Standard, General Requirements for Electrical
   Apparatus and Material

5. PTC101 : 1987
   Electrical Safety Requirements for a Telecom Permit to Connect

6. Wormald Vigilant Technical Manual, Volume 5
   Section 1 : Fire Alarm System Planning
   Instructions

7. Wormald Vigilant Maintenance Manual
   Section 1 : Regular Testing of Fire Alarm Systems

1.5 SOFTWARE ISSUE LOG

Descriptions of Software issue changes and issue numbers are given below.

Controller

V1.00	First production release
V1.01	Fixed set up failures and internal faults

RZDU

V1.00	Prototype release
V1.01	First production release

Responder

V1.00	Prototype release
V1.01	First production release
V1.02	Error corrections and upgrades to make system re-initialisation work better
V1.03	Minor changes to accommodate new microprocessor type
V1.04	Replaces V1.02, increased time delays for ASR circuit input debounce
V1.10	Provides "combined" circuit operation for ASR only on all 4 circuits.

1.6 HARDWARE ISSUE LOG

Details of hardware issue changes and modifications are given below where the change affects operation or function.

Main PC 1888-5-1	Issue (P2) A	Prototype and first production release.
	Issue AA	Mods to current limit.
	Issue AAA	8 x 180E resistors added configuration memory alteration reliability improved.
ATR PC 1888-1	Issue (P2) A	Prototype and first production release.
	Issue C	Component change 5V loop monitoring level.
ARR PC 1888-2	Issue (P2) A	Prototype and first production release.
	Issue A	Component change 5V loop monitoring level.
ASR PC 1888-3	Issue (P2) A	Prototype and first production release.
	Issue AA	Minor mod. loop reset voltage.
	Issue B	5V loop monitoring level.
Rest of hardware	Issue (P2) A	Prototype and first production release.

1.7 GLOSSARY OF TERMS

AEOL	Active End Of Line (1616-10 PA0203)
ARR	Addressable Relay Responder
ASR	Addressable Smoke Responder
ATR	Addressable Thermal Responder
CCT	Circuit
DBA	Direct Brigade Alarm (Sprinkler signalling unit)
EEPROM	Electrically Erasable Programmable Read Only Memory (non-volatile program memory)
EOL(s)	End Of Line(s)
EOLR	End Of Line Resistor
LED	Light-Emitting Diode
MCB/MCP	Manual Call Box/Point
NZS	New Zealand Standard
PCB	Printed Circuit Board
PTC	Positive Temperature Coefficient (thermal safety device)
RZDU	Remote Zone Display Unit
SAFE	A type of Brigade Receiving Equipment
TPS	Tough Plastic Sheath (type of cable)

2. FIRE SYSTEM DESCRIPTION

2.1 GENERAL

2.1.1 Basic System

In essence, a fire alarm system in a building detects a fire and warns people to leave the building by operating evacuation alerting devices (eg, bells). It may also automatically call the Fire Brigade and give a display to show which particular area of the building the fire is in. In the New Zealand Standard each fire search area is called a zone, and the control panel that does all of this is called a Zone Control Unit.

The Standard requires that a Zone Control Unit has certain built-in monitoring (checking), and that it be regularly tested to prove that it is operational. Control switches to isolate the signal to Brigade, silence the alerting devices, operate the alerting devices, etc, must be provided.

The FP4000 may be a Zone Control Unit for most buildings from small to very large.

It has all the required control switches and monitoring plus extra monitoring and self-test features.

2.1.2 Additional Requirements

In addition to the above basic functions, a fire alarm system may be required to:

- signal to a plant or building services computer;
- provide a printed record of alarms or other events;
- display information at other places eg, a reception desk or control room/watchroom;
- provide other control outputs eg, release of extinguishant, return of lifts to ground floor.

The FP4000 is well suited to performing these functions. It has control outputs and can have many alarm inputs. The inputs can be programmed to operate any of the zone indicating LEDs (semiconductor lamps) on the display panels, and any of the control outputs.

Logic functions (called Boolean) using operators such as AND, OR and NOT may be programmed. For example, an output can be programmed to turn on when Input 1 OR Input 2 OR Input 3 goes into alarm.

2.2 SYSTEM STRUCTURE

Figure 2.2.1 shows the typical structure of an FP4000 system. Much of the flexibility of the system comes from the use of separate devices called Responders to monitor the detector circuits.

Normally one detector circuit runs through one zone and has as many detectors on it as are considered necessary to provide adequate detection coverage for that area. There may, however, be more than one detector circuit in any one zone eg, there may be one circuit with heat detectors and another with smoke detectors placed strategically throughout the area.

The Responders take up to 4 detector circuits each, and can be located centrally in the area (up to 4 zones) that they are monitoring. The Responders are all connected in a loop that starts and ends at the Controller. This arrangement avoids running all the detector circuit cables back to the master, which becomes time consuming and expensive in a large system. It also makes expansion easier because additional wiring required for new areas does not have to be run through the existing part of the building to the Controller.

One type of Responder (the ARR) has outputs as well as inputs. Inputs from any part of the building, or logical combinations of inputs can be made to operate an output in another part of the building.

The Controller is the main element of the system. It provides power to the Responders via the loop, and interrogates (polls) them, receiving from them data on their circuit status (alarm, normal or defect).

FIG 2.2.1 VIGILANT FP4000 FIRE ALARM SYSTEM

2.2 SYSTEM STRUCTURE (Cont'd)

The FP4000 performs all the functions of a Zone Control Unit as previously stated. It can be programmed by use of a portable programming terminal which is plugged in specifically for that job and removed when it is finished.
It can drive an event logging printer and up to 8 Remote Zone Display Units (RZDUs).

Physically, the controller or RZDU consists of one or more cabinets mounted together. The master cabinet, contains an enclosed mains power supply, room for internal sealed batteries, the FP4000 master printed circuit board (pcb), one 16 zone display pcb, and the necessary internal cabling. Where one or more additional 16 zone displays are required they are fitted in extender cabinets. Up to 4 displays can be fitted per extender, depending on the index requirements. Horizontal expansion is done by mounting large extender cabinets adjacent to the master. Vertical expansion is done by mounting the shorter small extender above the master (ref Fig 4.2.1.1).

For larger systems larger batteries are required. These, with an appropriate 24V charger, are normally mounted in an external battery box at the nearest suitable location.

2.3 DETECTORS

A detector is a device which changes its electrical characteristics as the result of the presence of a fire. The FP4000 caters for two main types:

Hard Contact: Usually heat (thermal) detectors which have closed contacts that open at a certain temperature. Thermal circuits are connected to an ATR or ARR (ref Section 2.4).

Active : Usually products of combustion (smoke) detectors. These are 20Vdc (nominal) devices having a high resistance which goes low in the presence of smoke particles. They are used to sense 'smouldering' before fire proper has broken out ie, to give an early warning. Smoke circuits are connected to an ASR (ref Section 2.4).

Heat detectors available:

Vigilant 1756
Approved detectors with normally closed contacts are usually acceptable

Smoke detectors available:

Much of the Cerberus low voltage range, including the F915 and R925 which give a 'defect' warning (fault) when their effectiveness has been reduced by dirt.
Includes R600, S600, F712, F716, F732, R716, D900, F906, R906, F910, R910, F915, D920, R925, S2406. (Also A2400 with ASR modified).

2.3 DETECTORS (Cont'd)

Numbers per circuit:

Hard contact - no practical limit
Smoke - ref Section 3.2.

MCB: A Manual Call Box (MCB) is a switch mounted in a box with a break glass front. It is normally closed, going open when operated. It may be connected to a thermal circuit.

With the addition of a Contact Conversion Module an MCB can be connected to a smoke circuit. (This has to be programmed at the Controller, ref Programming Manual, and cannot be used on circuits which have fault indication, ie, with F915 detectors).

For responder software with "combined" ASR circuit operation, an ASR circuit with a resistor end of line may have an MCB connected without a contact conversion module.

2.4 RESPONDERS

2.4.1 General

The responders are the input devices in the system. There are three types, one type (the ARR) is also an output device, having 4 relays. They are supplied with a metal box and are normally mounted out of sight in the area being protected.

Function:

* Responders monitor 4 detector circuits for detector operation alarms.
* Monitor the 4 circuits for circuit defects.
* Perform self-tests by simulating detector operation and circuit defect.
* Monitor their supply line and disconnect the loop if there is a short circuit.
* Communicate with the Controller.

Form: Responders are:

* 24V dc powered, low current devices supplied from the Controller via the loop.
* Microprocessor based, with a watchdog circuit to restart them if they fail.
* Single board, with on-board voltage regulators.
* Individually addressable.
* Complete with field wiring terminals which take up to $4mm^2$ cable.
* Mounted on plastic standoffs in a metal box.

2.4.1 General (Cont'd)

Number: Up to 127 per system.

Address: From 1 to 127.
Selected by snipping diodes.

Note : For the purposes of system re-initialisation V1.02 or higher responders are incompatible with V1.00 controllers.

2.4.2 Addressable Thermal Responder (ATR)

Part No. 1888-1 Order No. FP0454

The ATR has four circuits which:

Accept detectors with normally closed contacts.

Can be configured as 'fire' or 'non-fire' (at the Controller).

Have an end of line resistor (EOLR) to allow monitoring.

Interpret open circuit as alarm, short circuit as defect.

Are supplied from the 5V regulator in the ATR.

2.4.2 Addressable Thermal Responder (ATR) (Cont'd)

Each circuit has four input resistance ranges which are interpreted as defect, normal or alarm depending on the circuit type (see Table 2.4.1 below showing circuit resistance, voltage at
+ terminal and state).

Non-fire (Ancillary Control) circuits are used for such applications as sprinkler valve monitoring.

EOLR : 3k3 Fire circuit
10k Non-fire circuit

Modes of Operation:

Detector circuits can be configured as 'latching' or 'non-latching' (ie, tracking or following) at the Controller. In non-latching mode the circuit returns to normal when the detector does. In latching, it remains in alarm until the detector is normal and the Controller is reset.

2.4.2 Addressable Thermal Responder (ATR) (Cont'd)

Resistance Between Terminals

Circuit Type	SHORT CCT	1k5	5k5	16k9	OPEN CCT
Fire		defect	normal	alarm	alarm
Non-fire		defect	defect	normal	alarm
+ Tmnl	0V	1.16V	2.41V	3.66V	5V
EOLR			3k3	10k	
+ Tmnl			1.79V	3.14V	

Resistance and voltages shown are nominal

TABLE 2.4.1 ATR CIRCUIT RESISTANCE, STATE AND VOLTAGE

2.4.3 Addressable Relay Responder (ARR)

Part No. 1888-2 Order No. FP0455

The ARR is an ATR with added circuitry to drive four latching relays. The relays each have one set of clean changeover contacts rated at 1A 30V dc. They are operated by messages sent from the Controller. By programming the Controller and fitting wire links on the ARR the relays can be configured in pairs to form monitored 'evacuation circuits' (Evac circuits) ie, to switch on alerting devices.

Evac Circuits: (Monitored)

* Switch the ARR 24V supply (loop power).
* Switch both +ve and -ve legs (this gives protection against a circuit fault causing a false evacuation).
* Are monitored for circuit faults by use of an EOLR.
* Require a diode in series with each alerting device to allow circuit monitoring.
* Monitor the current flow after being switched on (this assists routine testing).
* Are limited to 1A maximum load (per circuit and total per ARR).

Evac Circuit EOLR: 10k

2.4.4 Addressable Smoke Responder (ASR)

Part No. 1888-3 Order No. FP0456

The four circuits on the ASR accept the Cerberus detectors listed in Section 2.3 The circuitry includes a 21V regulator for supplying the detectors and a monitor to signal defect if this voltage goes low. For an ASR with "combined" circuit operation, the four circuits may also have any of the heat detectors listed in Section 2.3 connected directly.

End Of Line: There are two types of EOL available ie, Active End of Line (AEOL) or Resistor (REOL or EOLR). Selection is made in the field by snipping a diode and a resistor for each circuit that is to have an REOL. An AEOL uses less current than an REOL and allows more detectors to be connected to a circuit, but is more expensive.

EOLR = 27k (1mA), 10k (2mA)
AEOL = 1616-10 (PA0203)

Modes of Operation: Apart from the EOL type there are three other options selectable for each circuit:

gated	or	instant
latching	or	non-latching
detector fault	or	mcb

2.4.4 Addressable Smoke Responder (ASR) (Cont'd)

Unless changed by programming the Controller, the left hand options are automatically selected (default conditions).

gated : when smoke is detected the circuit is clamped off for 8 seconds, Only if smoke is sensed again within 45 seconds is it considered as an alarm.

latching : once a circuit is in alarm it remains in alarm until the smoke has been cleared from the detector and the Controller is reset. The circuit is pulsed with current, illuminating the LED indicator on the base of the detector that operated.

non-latching : once a circuit is in alarm, current is turned on for 2 seconds to illuminate the LED in the base of the detector that operated. The circuit is then clamped off. On release, if the detector senses smoke again the 2 second indication, clamp procedure is repeated. When the detector ceases to detect smoke, the Responder signals alarm for another 30 seconds before returning to normal.

2.4.4 Addressable Smoke Responder (ASR) (Cont'd)

Detector : Fault/mcb The ASR senses 3 states of the smoke detectors ie, high resistance, low resistance and very low resistance. Low resistance indicates smoke has been detected. Very low resistance indicates either an F915 (or similar) is in fault condition (dirty) or a mcb (with PA0443 contact conversion module) is operated.

For a responder with "combined" circuit operation, high resistance indicates either a thermal detector operated or MCB (WITHOUT contact conversion module) operated.

Monitoring: Defect is signalled for all circuits if detector 21 volt supply drops below 18V.

2.5 RESPONDER LOOP

The Responder loop structure is a major feature of the FP4000. It allows protection against failures, system flexibility and saving of cabling. The loop consists of 4 wires which run into, through, and out of each Responder as shown in Fig 2.5.1. The wires are:

+ve supply	(+24V dc)
-ve supply	(0V and communications common)
channel 1	(communications)
channel 2	(communications)

The two channels allow simultaneous data flow in both directions around the loop. Similarly the dual connections of supply (In, Out) to each board allow duplicated supply routes. If there is a break or short in any link, all Responders continue to operate and communicate with the Controller. A warning (Loop Defect) is generated, and the system diagnostics of the FP4000 show which link is damaged.

In the case of a short, current limits in the Controller limit the 24V supply to both ends of the loop. When the short is applied, the loop voltage falls and the Responders ’drop out’ ie, turn off their internal power supplies and ’connect’ relays. The short is thereby isolated, and the voltage returns to normal. Starting from the ends of the loop, the Responders in turn switch on and turn on their connect relays. The two Responders either side of the short, however, turn on but do not reconnect until the short is removed. (Ref Fig 2.5.2).

FIGURE 2.5.1 RESPONDER LOOP CONNECTIONS

FIGURE 2.5.2 RESPONDER CONNECT RELAYS WITH SHORTED SUPPLY LINES

FIGURE 2.5.3 DATA REDIRECT WITH SHORTED COMMS LINE

2.5 RESPONDER LOOP (Cont'd)

For an ARR, all relays turn off and disconnect any load. They turn on (one by one) when the supply is restored.

Where a short or break stops communications passing along a link the Responders either side of that link redirect data flow back towards the Controller on the other channel (ref Fig 2.5.3).

Non Loop Configuration

Instead of having a closed loop, it is possible to connect the Responders in two (or one) strings (ref Fig 2.5.4). This is known as "dual linear mode", and must be software programmed at the Controller to prevent a loop Defect. Although this configuration may save some cabling, it is not recommended as it does not have the safety features of the loop.

Loop Size and Constraints

There are constraints on the length of loop allowable. The voltage drop around the supply lines must be such that if the loop was opened at one end there would still be enough voltage at that end to supply a responder, with the battery voltage at the controller at minimum and the current load at maximum (ie, includes any evacuation current load). For large systems it may be necessary to use a voltage booster which increases the dc voltage applied to the loop. Details of how to calculate voltage drop are given in section 3.6 of this manual.

NOTE: When responders are not connected in a loop they lack the safety duplication.

FIG 2.5.4 DUAL LINEAR CONFIGURATION (NON RECOMMENDED)

2.6 BRIGADE CONNECTION

The Vigilant FP4000 has been designed to accommodate the following Brigade connection types:

SAFE TRANSPONDER

Mounted internally or externally. Provision for line test jack internally on plug-in connector.

MK X MODULATOR

Mounted internally. Both types of line isolate signalling provided by plug-in potentiometer and link assembly.

CM3

Duplicated connections provided.

BENEFIS TRANSMITTER

Mounted internally or externally. Screw connector Telecom line termination provided.

MK VIII

Transmitter and standby battery mounted in separate box. Provision for connection to controller and use of Brigade Isolate switch. Defect buzzer provided separately if required.

2.6 BRIGADE CONNECTION (Cont'd)

OTHER

Uncommitted contacts available for signalling Fire, Defect, Test and Isolate in a variety of configurations. Sufficient flexibility for most requirements.

NO BRIGADE CONNECTION

Local defect annunciation by means of internal or external buzzer. Selected by fitting local link on controller.

2.7 STATES, INDICATIONS AND CONTROLS

2.7.1 Brigade Transmission States

As regards transmission to the Brigade there are four main states: Fire, Defect, Brigade Isolate and Normal. Where supported by the Brigade receiving equipment, a fifth state called Test is accommodated.

Fire Calls the Brigade to the premises

Defect Indicates a fault in the system and prompts the Brigade to call a serviceman

Brigade Isolate Indicates that a serviceman is working on the system and that any subsequent concurrent states either will not be transmitted, or will be transmitted but ignored. (This depends on the Brigade receiving equipment. Also, some Brigade receiving equipment does not have Brigade Isolate but transmits it as Defect).

Test Indicates that a test Fire signal is about to be sent to the Brigade, but it is not an alarm.

Normal Indicates that none of the above states exist.

2.7.2 System States and External Indicators

As regards the external status indicators there are four basic states: Fire, Defect, Normal and Abnormal.

The three status indicators are Fire (red), Defect (amber) and Normal (green). These high brightness LEDs are mounted on the top of the main display board in the system and flash twice per second to indicate the appropriate status.

Fire Indicates an alarm on responder circuit that is mapped to a ’Fire’ zone,
or battery voltage is very low.

Defect Detector circuit defective,
or evacuation circuit defective,
or battery voltage is low,
or display is unplugged or fails,
or other faults as described in section 5.6.2.

Abnormal Various conditions can exist that are not defects, but are not normal for the system while it is unattended by a serviceman or building owner. For example:
operation of the Brigade Isolate switch;
operation of any other of the internal control switches;
operation of the ’Trial Evacuation’ switch;
having a responder in the loop that the controller is not programmed to expect.

2.7.2 System States and External Indicators (Cont'd)

Abnormal is indicated by all status LEDs being off. If the cabinet door is closed during Abnormal the internal buzzer sounds.

Normal Absence of any of the above states.
Fire and Defect states can exist individually or together.

If a circuit mapped to a 'non-fire' zone goes to alarm, the controller state does not change.

The status LEDs are also used to indicate special conditions as described in section 5.

Zone Indicators

There are 16 red, high brightness LEDs on each display board. These flash to indicate zone alarm conditions.

2.7.3 Internal Indicators

As a service aid there are LEDs mounted on the rear of each display board and on the master and RZDU main pc board. These are a repeat of the external LEDs described in 2.7.2 plus others to identify the source of any alarm, defect or abnormal condition. Except from the individual zone indicators, these LEDs only illuminate if the master cabinet door is open.

Display Board

On the top of the master display there are 2 rows of 3 LEDs as follows:

Defect	Normal	Fire
Ancillary Isolate	Non-Fire Alarm	Silence Alarms

"Silence Alarms" indicates the operation of either of the 'Silence Alarm' switches, sometimes called 'Bell Cut Off'.

As noted previously, circuits mapped to 'non-fire' zone indicators do not alter the status shown on the top 3 LEDs. They do however cause the common 'Non-Fire Alarm' LED to flash.

On all display boards there are Defect and Alarm indicators for each of the 16 zones.

2.7.3 Internal Indicators (Cont'd)

Main Board

The column of LEDs on the main board is as follows from top to bottom:

Watchdog, Loop Defect, RZDU Defect, Evac Defect, Batt Low, Charger, Self Test, Mains, Fault

The function of these is described in section 5.6.2.

The main board also has a buzzer which sounds on Defect for a non Brigade connected system, and to attract attention to various abnormal conditions.

2.7.4 External Control Switches

The FP4000 has two external, key operated control switches for use of the building owner and Brigade.

Trial Evacuation A key for this switch is supplied with the controller to allow the building owner to conduct trial evacuations from the premises (without calling the Brigade).

Silence Alarms For Brigade use only. This allows the alerting devices to be turned off by the Brigade when attending the premises.

2.7.5 Internal Control Switches and Links

The internal control switches are intended for use by service staff only. Apart from the 'Mains on/off' switch they are all mounted on the main board. They are:

Mains on/off	isolates mains to internal charger only
Reset	pushbutton
Self Test)	
Silence Alarms)	
Ancillary Isolate)	toggle switches
Brigade Isolate)	
Brigade Test)	

The functions of these switches are described in section 5.7.2.

There are a number of links on the main board. Some are hard wired at time of manufacture but the following are field programmable by use of mini jump connectors.

Lk1	Local (Brigade connected or not)
Lk2	Non-latching (system testing mode of operation)
Lk3	Serial Port Supply
Lk13,Lk14	Baud Rate
Lk15	EEPROM (configuration memory) write enable
PB7,PB8	Lamp Test (Faston tab lugs)

A complete description is given in section 4.4.2.

2.8 POWER SUPPLIES

The Vigilant FP4000 requires a nominal 24 volt dc supply which may be derived in one of two ways:

external dc supply
internal batteries and charger

An external supply normally consists of two, 12V wet cell lead-acid batteries in series and a constant voltage battery charger.

Smaller FP4000 installations may be operated from two internal, sealed lead-acid batteries. These are charged by an internal 230VAC powered constant voltage charger provided as standard.

The FP4000 incorporates a timer which periodically cuts the charger off. This allows monitoring of the battery under discharge.

The number and type of detectors and alerting devices determine whether an internal battery may be used. Further details and battery capacity calculations are contained in section 3.10.

2.9 SPECIFICATION

Control and Remote Display Units

Cabinet size (mm)	:	510h x 485w x 110d
Extension Multiple (mm)	:	360h x 485w x 110d
Mounting Styles	:	Rear service (window mount) Front service (wall mount)
Cabinet Material	:	1.2mm mild steel
Cabinet Colour	:	Beige (Oxyplast PR12/9406C)
Cabinet Finish	:	Oxyplast Baked Epoxy
Service Clearance Required	:	20mm from window (rear service) 1 metre from service door
Shipping Weight	:	7.5kg (without battery)

Responder Units

Cabinet Size	:	180h x 240w x 50d
Mounting Style	:	Surface mount
Cabinet Material	:	1mm mild steel
Cabinet Colour	:	Silver
Cabinet Finish	:	Galvanized
Service Clearance Required	:	100mm all around 1 metre in front
Shipping Weight	:	0.8kg

2.9 SPECIFICATION (Cont'd)

Power Supply

Physical	:	Separate enclosure containing mains terminal, transformer, and isolating switch wiring. Charger circuitry on main pcb.
Mains Input	:	207V - 253V 50Hz AC only (230V nominal $\pm$10%)
Protection	:	PTC thermistor in transformer primary circuit. Chassis and electronics 0V to mains earth.
Isolating Switch	:	Phase interrupt. Located inside locked cabinet.
Secondary Voltage	:	32VAC nominal
Battery	:	2 x 12V, 6.5Ah sealed lead-acid (leads supplied)
Float Voltage	:	27.4V, temperature compensated
Automatic Charger Cut Off	:	1 hour every 24 hours. Reconnects and signals defect if battery low occurs during cutoff period.
Charger Output	:	450mA (min), 550mA (max)

2.9 SPECIFICATION (Cont'd)

Reverse Polarity Protection : Crowbar blowing of fuse F1

Internal Fusing : 10A (from battery or ext supply)
5A (evacuation)
2A (ancillary and RZDU)

Load Testing : Unfused battery connection lugs provided (H2880 tabs PB9,10)

External Supply : 28.8V dc maximum
4 sq mm terminations

Battery Low : Below 24.4V (± 0.2V) Controller in defect. Reset level 24.8V. Level sensitive, indicator latching

Battery Very Low : Below 19.2V (± 0.2V). Hardware latch, Controller in fire

RZDU Power Supply

Preferred : Identical to the master power supply specifications above.

Non Preferred : +24V derived from the master +VRZDU and 0V terminals via a 2A fuse.

2.9 SPECIFICATION (Cont'd)

Responder Power Supply

Loop Supply : +24V from responder loop. Derived from master +VL1, +VLN, and 0V terminals. Current limited to 2.5A at each end of loop.

Environmental

Operating Temperature : 0ºC to 45ºC outside cabinet

Storage Temperature : -20ºC to 70ºC (not battery)
-15ºC to 30ºC (battery only)

Humidity : 0% to 95% RH, non-condensing

Other : Dry heat, damp heat, cold, and vibration to NZS 4512 cl.120.

Zones

Number : 16 minimum. Expandable in 16 zone increments up to 528 zones.

2.9 SPECIFICATION (Cont'd)

Responder Loop

Physical : 4 wire connection to responders, 2 for power, 2 for communications. Maximum 1km between responders. Maximum loop length 2km.

Responders : Maximum number of responders is 127, each individually addressable.

Loop Supply Voltage : 24V nominal, supplied to either end of loop, 2.5A current limited at each end of loop.

Loop Communications : 2 channel (redundant)
1 driver and 1 receiver at each end of loop. Each responder polled by master.

Receiver Input (Master & Responders) : Threshold set at half loop and voltage. Input voltage levels nominally 0V (idle) and +24 volts. 2400 baud. Over-voltage protected.

2.9 SPECIFICATION (Cont'd)

Responder Loop (Cont'd)

Transmitter Output (Master & Responders) : Output voltage levels nominally 0V (idle) and +24 volts. 2400 baud. Short circuit and over voltage protected. Drives RC equivalent of 150E 275nF.

Data Byte : 1 start bit, 8 data bits, 1 stop bit.

Loop Supply Short : A short circuit anywhere on
Circuit Protectionthe loop is
disconnected by the responder either side of the short circuit.

Loop Supply Open Circuit Detection : Controller goes into defect no detection of open circuit

Comms Line Short or Open Circuit : If comms lines short or open circuited responder redirects data onto other channel so that communications remains fully operational.

Alarm Response Time : 3.8 seconds maximum

2.9 SPECIFICATION (Cont'd)

Responders (General)

Types	:	Thermal (ATR), Smoke (ASR), Relay (ARR)
Address	:	Uniquely addressable from 1 to 127. Configured by snipping diodes on pcb.
Indicator	:	Red LED single flash indicates software running, double flash indicates responder being polled by master.
Supply	:	From loop. 24 volt nominal. 17V - 28V range. ASR signals defect if voltage on detector 21V supply drops below 17V (at loop = 18V approx)
Loop Connections	:	4 wire connection to other responders and/or master. 2 for power, 2 for communications
Communications	:	2 channel (redundant) 1 driver and 1 receiver for each side where connected in loop.
Propagation Delay	:	37mS (typical) per responder.

2.9 SPECIFICATION (Cont’d)

Thermal Responder

Circuits	:	4 thermal/manual input circuits accept normally closed contacts.
Supply Current	:	5mA required from loop supply.
Detector Type	:	Normally closed, metallic voltage free.
End of Line	:	Fire, 3k3 resistor; Non-fire, 10k resistor.

2.9 SPECIFICATION (Cont'd)

Smoke Responder

Circuits	:	4 smoke detector input circuits accept normally open contacts. For a responder with "combined" circuit operation, each of the 4 circuits may also have thermal devices with normally closed contacts.
Supply Current (1mA ASR)	:	Responder itself : 5mA Including detector currents: 9mA All 4 Circuits in alarm :15mA (2mA ASR currents are all treble the above)
Detector Type	:	Cerberus 20 volt range (eg, F910 smoke detector). Normally open. Normally closed also on "combined" circuits.
End of Line	:	Active, type 1616-10. Passive, 27k resistor (1mA ASR). ASR 10k resistor (2mA ASR).

Relay Responder

Circuits	:	4 thermal/manual input circuits accept normally closed contacts.
Outputs	:	4 changeover relay outputs. May be used in pairs as monitored evacuation outputs. (600mA max). Configuration of outputs by wire links and programmer.
Supply Current	:	5mA required from loop for ARR. 600mA max optionally available for powering loads switched via relay outputs.

2.9 SPECIFICATION (Cont'd)

Relay Contact Ratings : 1A 30V dc

Detector Type : Normally closed, metallic, voltage free.

End of Line : Fire, 3k3 resistor;
Non-fire, 10k resistor

Smoke Circuit

Configured By : Link on ASR selects active (pulsing) or passive (resistor) EOL.

Detector Type : Cerberus 20 volt range (eg, F910 smoke detector). Normally open.

End Of Line : Active, type 1616-10
Passive, 27k resistor

Gating : Programmer selectable.

Gating : 8 seconds

Total Gating : 53 seconds including 8 second reset (if selected)

2.9 SPECIFICATION (Cont'd)

External Indicators (Master and RZDUs)

Normal	:	Green flashing LED (hi-bright). Indicates Controller normal state.
Defect	:	Amber flashing LED (hi-bright). Indicates Controller defect state.
Alarm/Fire	:	Red flashing LEDs (hi-brightness) one common fire. One per zone, indicating zone alarm.
Index Illumination	:	3 watt 'festoon' 6 x 31 24V incandescent lamp mounted on display board. Operates when Controller in fire state.
Buzzer (pulsing)	:	Sounds when Controller or system in abnormal state with cabinet door closed. Sounds on defect state for a non- connected system.

2.9 SPECIFICATION (Cont'd)

External Controls (Master and RZDU)

Trial Evacuation	:	Keyswitch. Bulgin SM320. Operates evacuation alarms (overrides silence alarms)
Silence Alarms	:	Keyswitch. Bulgin SM324. Silences evacuation alarms.
Service Door Lock	:	L+F A/C519/02/3C/-51 Keyed 60124.

Internal Indicators (Master and RZDU)

Common Defect	:	Yellow flashing LED indicates Controller defect state.
Normal	:	Green flashing LED indicates Controller normal state.
Common Fire	:	Red flashing LED indicates Controller fire state.
Ancillary Isolate	:	Yellow flashing LED indicates the 7 ancillary outputs are inhibited.
Common Alarm (Non-Fire)	:	Yellow flashing LED indicates the controller is in the Alarm (non- fire) state.

2.9 SPECIFICATION (Cont'd)

Silence Alarms	:	Yellow LED indicates the controller is in the Silence alarms state (internal or external silence alarms switch on).
Zone Defect	:	Yellow flashing LEDs indicate defect on individual zones.
Zone Alarm	:	Red flashing LEDs indicate alarm (fire or non-fire) on individual zones.
Watchdog	:	Yellow LED indicates processor watchdog timeout.
Loop Defect (Master Only)	:	Yellow flashing LED indicates defect in any responder or responder loop.
Polled (RZDU Only)	:	Green flashing LED indicates RZDU being polled by master.
RZDU Defect (At Master)	:	Yellow steady LED indicates the presence of a foreign RZDU. Yellow flashing LED indicates defect in any RZDU or RZDU communications link.

2.9 SPECIFICATION (Cont'd)

RZDU Defect (at RZDU)	:	Yellow flashing LED indicates defect at that RZDU.
Evacuation Defect (Master Only)	:	Yellow LED indicates defect on monitored evacuation circuit.
Battery Low	:	Yellow flashing LED indicates battery low condition.
Charger	:	Red LED indicates battery charger timer operation.
Self Test	:	Yellow LED indicates progress of self test.
Fault (Master)	:	Yellow steady LED indicates a display defect. Yellow flashing LED indicates no responders connected. Yellow rapid flashing LED indicates a fatal software error.
Fault (RZDU)	:	Yellow steady LED indicates display defect. Yellow flashing LED indicates RZDU not polled by master.
Mains	:	Green LED indicates mains on.
Buzzer (rapid)	:	Sounds on failure of self-test.

2.9 SPECIFICATION (Cont'd)

Internal Indicator at Responders

Polled	:	Red single flashing LED indicates responder software running. Red double flashing LED indicates responder being polled by master.

Internal Controls and Links (Master)

Panel Reset Switch (RZDUs also)	:	Resets latches, latched indications, charger timer and test functions.
Self Test Switch	:	Activates self-test sequence.
Silence Alarms Switch	:	De-activates evacuation outputs.
Brigade Isolate Switch	:	Isolates Brigade signalling.
Brigade Test Switch	:	Signals Test to Brigade connection equipment.
Ancillary Isolate Switch	:	Isolates power from and de-asserts ancillary outputs.
Local Link	:	Selects local (non-connected) operation.

2.9 SPECIFICATION (Cont'd)

Non-Latching Link	:	Selects special non-latching test mode.
Serial Port Supply (LK3)	:	Link to select source of serial port power. Fitted as standard to select +12V from on board regulator.
Lamp Test Link (RZDUs also)	:	Faston H2880 tabs. Link to perform lamp test at that unit.
Baud Rate (LK13,LK14)	:	Links select baud rate for programmer port (9600, 1200 or 300).
Evacuation Supply Links (R59,R61)	:	Select switched 24V or voltage-free evacuation relay.
Bell Clamp Link (R60)	:	Selects 36V clamp circuit connected to switched evacuation supply.
On/Off Switch	:	Mains isolation switch.
Battery V Low	:	Potentiometer adjustable battery very low (preset 19.2V)
Battery Low	:	Potentiometer adjustable battery low (preset 24.4V)
Configuration Memory Protect (Lk15)	:	Lk15 EEPROM (configuration memory) write enable

2.9 SPECIFICATION (Cont'd)

Test Features

Self Test	:	Initiated at master. Independent self test at each of master, responder and RZDU. Responder circuit inputs cycle through test-defect and test-fire. Brigade signalling toggles defect/fire.
Non-Latching	:	Link selected. Controller becomes non-latching on fire. Activations recorded on zone indicators. Allows single person testing of circuits.
Watchdog	:	Monitors processor operation and 5V normal continuously. Resets processor if program stops or 5V falls below 4.8V. Signals defect if processor does not recover.
Line Jack	:	Provided on SAFE connections for Transponder Meter.
Test-Fire	:	Automatic daily test of all fire inputs. Signals defect on failure.

2.9 SPECIFICATION (Cont'd)

Brigade Connection Outputs

Fire	:	Two pole changeover relay contacts. 60VDC 1A max. Common and NC screw terminals. Relay normally energised.
Defect	:	Two pole changeover relay contacts. 60VDC 1A max. Common and NC screw terminals. Relay normally de-energised.
Brigade Test	:	Two pole changeover switch contacts. 28VDC 2A max. Common and NC screw terminals.
Brigade Isolate	:	Two pole changeover switch. 28VDC 2A max. Common and NC screw terminals direct. NO contact screw terminal via isolate PCB to configure variety of Brigade signalling requirements.
Isolate PCB	:	1864-19-1 Mk X Isolate PCB 1864-19-2 Benefis Isolate PCB 1864-20 SAFE Test Jack PCB
Defect Buzzer	:	Defect relay pulses (500ms on, 20 sec off) when Controller non-connected to allow remote defect annunciation.

2.9 SPECIFICATION (Cont'd)

Brigade Connection Types

SAFE	:	Internal Transponder (1643-1-1). Test Jack PCB (1864-20). Colocated Transponder.
Mk X	:	Internal Modulator (1530-1) Isolate PCB (1864-19-1)
CM3	:	Connection via cable pairs.
Benefis	:	Internal Transmitter (BS033). Isolate PCB (1864-19-2). Colocated Transmitter.
Mk VIII	:	Connection to externally mounted Transmitter (1207-1) possible.
Other	:	Flexibility of output contacts and wiring. Caters for most requirements.
None	:	Local operation. Brigade connection relays inoperative. Buzzer sounds on defect. Provision for external defect buzzer.

2.9 SPECIFICATION (Cont'd)

Other Outputs

Evacuation (Master)	:	Switched +24V @ 2.5A (max resistive) or uncommitted changeover contacts (5A, 30V resistive; inductive 3A, 30V, 7ms)
Evacuation (Responder)	:	Switched +24V @ 1A (max resistive). Relays configured in pairs and may be monitored.
Relay (Responder)	:	4 independent unmonitored voltage-free contacts.
Ext Sounder	:	Synchronous with internal (Master and RZDUs)sounder. Supply and ground, plus open collector darlington transistor 'closure to earth' (200mA @ 1.5V, 34V max open) for EXT SNDR-signal.

2.9 SPECIFICATION (Cont'd)

Other Outputs (Cont'd)

Mimic Drivers : Implemented on display boards (Master and RZDUs) but connectors not fitted as standard. Supply and ground plus open collector darlington transistor 'closure to 0V' (200mA @ 1.5V, 34V max open) for signals:

NORMAL
COMMON DEFECT
COMMON FIRE
ZONE ALARMS

Ancillary : (Master and RZDUs) Supply and ground plus open collector darlington transistor 'closure to 0V' (200mA @ 1.5V, 34V max open) for signals:

NORMAL-
DEFECT-
FIRE-
ANCIL1-
ANCIL2-
ANCIL3-
ANCIL4-

36V zener clamp on outputs.

Serial Port (Master) : Connector for 1616-101 series modems and compatible serial interfaces. Optional printer port as standard.

2.9 SPECIFICATION (Cont'd)

Other Outputs (Cont'd)

Inhibit (Master and RZDUs) : Open collector transistor closure to 0V (50mA @ 0.4V max, 30V max open). Asserted during charger 1 hour cutoff period.

2.9 SPECIFICATION (Cont'd)

Other Inputs (Master and RZDUs)

External Defect	:	Active low input, 10k pullup to +24V. Active below 5V, generates defect condition.
External Reset	:	Active low input, 10k pullup to +24V. Active below 5V, generates panel reset.
Serial Port (Master)	:	Connector for 1616-101 series modems and compatible serial interfaces.
Defect Buzzer Cancel	:	Active low input, 10k pullup to +24V. Active below 5V, cancels local defect buzzer.

Programming Facility

Port	:	0 - 5 volt RS232. TxD, RxD, 0V implemented. 8 bits, no parity, 1 stop bit 9600, 1200, 300 baud (links).
System Commands	:	Start/Stop, Memory Allocate, Time and Date, Serial Port Setup, History Log Interrogate, Configure System, Re-initialise.

2.9 SPECIFICATION (Cont'd)

Query : Configuration, Programmed Parameters, Diagnostics, Help.

Program : System configuration, Responder type/functions, Circuit functions -
Fire/Non-Fire
Latching/Tracking
Gated/Instant (Smoke)
Dirt Sensing smoke detector/
MCP
Zone function -
Fire/Non-Fire
Latching/Tracking
Ancillary function -
Tracking/Latching
Circuit to zone mappings
Dual hit groupings
Evacuation monitoring enable
Test Inhibit dates
Battery test time
Output logic equations -
Boolean AND, OR, NOT

3. PLANNING A FIRE ALARM SYSTEM

3.1 GENERAL

A Fire Alarm System is of considerable importance because it can prevent loss of life and considerable damage to property. The system must therefore be reliable in all aspects and should be engineered correctly to suit the particular requirements of each installation. This engineering includes the following:

the choice of the most appropriate types of detectors and alerting devices,

the choice of the best position for all detectors, alerting devices, and the zone display units (Controller and Remotes),

the division of the property being protected into zones and the representation of these zones on the Controller index panel,

the consideration of level of protection (and hence cost) versus reduction in risk.

Planning the cabling routes and sizes, optimising cabling costs versus responder costs for lowest overall price of reliable system.

3.1 GENERAL (Cont'd)

In all cases the importance of good planning cannot be overemphasised. It is essential that the personnel responsible for planning and enginering fire alarm systems are properly trained, familiar with all the relevant fire alarm standards, and also with the general Wormald Vigilant fire alarm planning instructions contained in the Technical Manual Volume 5 (and elsewhere).

3.2 DETECTOR TYPE, LOCATION AND NUMBERS PER CIRCUIT

The choice of detector type and location is fundamental to the effectiveness of the whole fire alarm system. The choice should be made with reference to the standards and Technical Manual Volume 5 considering the following criteria (among others):

- the nature of flammable material concerned,
- the position of detector mounting in relation to the flammable material,
- the environmental conditions,
- cost versus risk,
- governing regulations.

Generally well positioned heat detectors provide the more reliable and cheaper detection of fire producing a rapid build up of heat. Smoke detectors can provide early detection of smouldering before fire proper occurs, thus allowing a better save. Flame detectors can monitor outdoor spaces where other types of detector are not suitable.

Manual call boxes, if clearly identified and accessible, can provide effective detection in areas where personnel are present. It is usual to place call boxes on thermal circuits. However, with FP4000 it is possible to have these on smoke circuits as well by using the PA0443 ’Contact Conversion Module’, as described in section 4.3.2.

3.2 DETECTOR TYPE, LOCATION AND NUMBERS PER CIRCUIT (Cont'd)

Number Per Circuit (See product bulletins for more detail of newer detectors)

For hard contact detectors on thermal circuits any practical number of detectors and any cable length of less than 2km is acceptable.

For smoke circuits, the maximum allowable detector current is:

	1mA ASR	2mA ASR
REOL Circuit	200uA	600uA
AEOL Circuit	1000uA	2000uA

Typical currents for some of the Cerberus detectors are as follows:

Detector Type	uA
F716	10
R716	80
D900	130
F906	30
R906	90
F910	30
R910	100
F915	45
D920	130
R925	90
S2406	250
A2400	Requires ASR to be modified (see below)
Contact Conversion Module	20

3.2 DETECTOR TYPE, LOCATION AND NUMBERS PER CIRCUIT (Cont'd)

The ASR must be specially modified to use the A2400. Only one A2400 receiver/transmitter pair may be connected per circuit on the ASR. Each circuit so modified counts extra in the battery calculations (section 3.10).

An active end of line must be used in A2400 detector circuits.

3.3 ZONES, PANEL, INDEX AND LOCATION

The protected area must be divided into sectors and zones in accordance with NZS 4512, sections 102, 201 and Fig 1. Each sector should have a Controller with an index panel marked with a diagram of the parts of the premises covered by that Controller. The diagram should include details of entry points and stairwells and should be approved by the Fire Service before installation. The diagram should be arranged so that it can be engraved within the illuminated area of the index.

The position of the Controller must be approved by the Fire Service before installation. If possible the Controller should be located out of direct sunlight as high temperatures shorten battery life. A shaded position also improves index panel LED visibility.

The Vigilant FP4000 is available in both front service and rear service versions.

Index panels are only available for 16 Zone Master/RZDU panels (both front and rear service). For any system of more than 16 zones the index is likely to require customisation and is therefore branch responsibility.

For details of display/index/extenders see section 3.7.

Where external batteries and charger are required they should be housed in a ventilated locked battery box, preferably not too far from the controller.

3.4 RESPONDERS, CIRCUITS, CABLING AND EOLS

All four circuits of any particular responder must be the same type (smoke for an ASR, thermal for an ATR or ARR). It is necessary therefore, to group like circuits in fours and connect them to inputs 1 to 4 of the appropriate types of responders located thoughout the premises. Plan the responder positions so that the circuit cable lengths to the responder are minimum, and the total loop cable length is also a minimum. Where the loop cabling is considerably heavier (ie, more expensive) it may be necessary to reduce loop length by bringing some responders (ie, the most out-of-the-way ones) closer to the controller and correspondingly increasing their circuit cabling length. Also, where zones do not conveniently divide into 4 it may be more convenient to have responders with unused circuits than to connect them to distant zones.

NOTE: From July 1997 a version of FP4000 responder software is available which allows an ASR to have thermal detectors, MCP, and smoke detectors all on the same circuit.

$1mm^2$ diameter cable is the smallest allowable by the regulations and $4mm^2$ is the largest the connectors will take.

In any part of the power loop where the resistance is greater than 7 ohms back to the resp in terminals the 9/10th rule applies. Therefore, it applies beyond the following wiring distances measured from the Resp 'IN' terminals.

200m for 1.0 sq mm
300m for 1.5 sq mm
500m for 2.5 sq mm
800m for 4.0 sq mm

3.4 RESPONDERS, CIRCUITS, CABLING AND EOLS (Cont'd)

The rule is as follows :

"Measuring backwards away from the Controller 'Resp In' terminals, the cable distance between a selected Responder and its next most distant neighbour must be less than 9/10th of the cable distance from the Controller to the selected Responder. This rule applies to every Responder in the system beyond the distances stated above." For further details see Section 4.3.1.

'FIRE' thermal circuits must have 3k3 EOLRs.

Any 'non-fire' thermal circuits must have 10k EOLRs and must be programmed at the controller (ref Programming Manual).

Smoke circuits have an option of EOL. The EOLR costs less than an AEOL, but draws more current and can only be used on circuits with less detector load (ref section 3.2 and section 3.6). All unused detector circuits should be normalised with an EOL.

3.5 ZONE MAPPING AND CONFIGURATION (PROGRAMMING)

Unless configured by the programming terminal to do differently, the controller will automatically map circuits to zones as follows:

Responder Address	Circuit No	Zone
1	1	1
1	2	2
1	3	
3		
1	4	4
2	1	5
2	2	6
"	"	"
"	"	"
127	4	508

In some cases it is desirable to map circuits to zones different from the above, and this can be programmed with the terminal. For example:

Where a zone has a thermal circuit and a smoke circuit both can be mapped to the same zone indicator.

Where there is a ’non-fire’ circuit (eg, sprinkler flow switch) in a zone it can be mapped to the same zone indicator as the fire circuit (eg, thermal circuit with manuals).

3.5 ZONE MAPPING AND CONFIGURATION (PROGRAMMING) (Cont'd)

DO NOT use FP4000 non fire inputs in such a way that the input is normally in the Alarm condition (i.e. the corresponding zone indicator is normally on). It interferes with the Self Test function of the FP4000. The Self Test will not run if any zone indicators are illuminated. Furthermore, if any circuit happens to be in Alarm, but is not mapped onto any indicator, the Self Test will run but it will fail.

Where dual hit zones are required, eg, two 'smoke' circuits in one zone each with flame detectors monitor one area and both circuits must activate before a zone alarm is activated.

When the controller is first switched on, or when it is later re-initialised by powering off and back on with the E2INIT test point shorted to 0V (and then the short is removed) it automatically checks the address and type of all the responders present in the loop, and the number of display boards connected to it. Circuits are mapped to zones as shown above and the circuits of any responder not present are disabled. Default configurations as detailed below are selected:

ARR Relays	
monitored evac/clean contacts	- clean contacts
	- no logic programmed
Circuits and Ancillary Outputs	
Latching/Tracking	- latching

3.5 ZONE MAPPING AND CONFIGURATION (PROGRAMMING) (Cont'd)

ATR, ARR Circuits
fire/non-fire - fire

ASR Circuits
gated/non-gated - gated
detector fault/mcb operation - detector fault

Zone Configuration
fire/non-fire - fire
latching/tracking - latching

No. of RZDUs
0 to 8 - 0

Evacuation Output
monitored/not monitored - not monitored

Charger Inhibit
Start time - 09:00 (9am)
Dates disabled - 01/01, 02/01 06/02, 25/04, 24/12, 25/12, 26/12.

The use of the programming terminal and further details of the different options that can be configured are described in the Programming and Diagnostics Manual.

Any options selected by use of the programming terminal will remain selected until they are changed or the Controller is re-initialised (programming memory is non-volatile).

3.6 LOOP CALCULATIONS

3.6.1 General

NZS 4512 requires that the FP4000 operate at a battery voltage of down to 19.2V. At this low voltage, it is still necessary to have 17V at a responder, and 17.3V at an ASR with REOLs to guarantee operation within the detector specifications.

For ATRs and ARRs with no evacuation load the current drawn does not increase under alarm conditions. For ASRs, however, it does. It is the alarm load therefore that is critical in any system with ASRs, or ARRs configured as evac circuits.

Under alarm, battery low or loop defect conditions the loop is powered from both ends. Under normal conditions, however, or if a break occurs at an end, the loop will only be powered from one end. It is necessary therefore, to calculate voltage drops such that responders at one end of the loop have enough voltage when their power is supplied only from the other end.

WARNING: Nothing other than responders should be connected to the loop 24V supply terminals.

NOTE: In the following section the new 2mA ASR counts the equivalent of 3 ordinary (1mA ASRs) or 9 ATR equivalents.

	Power Loop Cable Size			
Resp*	$1mm^2$	$1.5mm^2$	$2.5mm^2$	$4.0mm^2$
5	2955.	4446.	7388.	11821.
10	1463.	2202.	3659.	5854.
15	965.5	1452.5	2413.5	3862.
20	715.5	1076.5	1789.	2862.5
25	565.	850.	1413.	2260.5
30	464.	698.5	1160.5	1857.5
35	391.5	589.5	979.5	1567.5
40	337.	507.	843.	1349.
45	294.	442.5	735.5	1177.5
50	259.5	390.5	649.5	1039.
55	231.	347.5	578.	924.5
60	207.	311.5	517.5	828.5
65	186.5	280.5	466.5	746.
70	168.5	253.5	421.5	675.
75	153.	230.	382.5	612.
80	139.	209.	348.	556.5
85	126.5	190.5	316.5	507.
90	115.5	173.5	288.5	462.
95	105.	158.5	263.	421.5
100	96.	144.5	240.	384.
105	87.5	131.5	218.5	350.
110	79.5	119.5	198.5	318.
115	72.	108.5	180.5	288.5
120	65.	98.	163.	261.
125	58.5	88.5	147.	235.5
130	52.5	79.5	132.	211.
135	47.	70.5	117.5	188.5
140	41.5	62.5	104.	166.5
145	36.5	55.	91.	146.
150	31.5	47.5	79.	126.5
155	27.	40.5	67.5	108.
160	22.5	33.5	56.	90.
165	18.	27.	45.5	73.
170	14.	21.	35.	56.5
175	10.	15.	25.	40.5
180	6.	9.5	15.5	25.
185	2.5	3.9	6.5	10.

* Number of equivalent thermal responders

Note : Smoke responders count 3
Relay responders count 1

3.6.1 TABLE OF MAXIMUM LOOP LENGTHS IN METRES

3.6.2 Non Critical Systems

It is not necessary to carry out loop calculations if the system has:

Less than 31 ATR or ARR responders and
(or counting each ASR as 3 ATR)
No evacuation load drawn from loop at ARRs and
Loop length (end to end) is less than 475m and
Loop is wired in 1 sqmm cable

Therefore if the system has:

Evacuation load drawn from loop at an ARR or
More than 30 ATR or ARR responders
(counting each ASR as 3 x ATR) or
Loop length (end to end) greater than 475m

then a loop calculation will need to be performed to determine the correct cable size.

3.6.3 Loop Calculation

It is necessary to perform a loop voltage drop calculation to verify the system is within operational limits if:

Evacuation load is drawn from the loop at an ARR; or
More than 30 ATR or ARR are connected
(counting each ASR as 3 x ATR); or
Loop length (end to end) is greater than 475m

3.6.3 Loop Calculations (Cont'd)

The loop voltage drop calculation is performed to ensure that the minimum operating voltage is present at all responders on the loop when the battery voltage is lowest (19.2V), all smoke circuits are in alarm and all the evacuation load drawn from the loop is turned on.

The calculation has been simplified onto a graph shown in Fig 3.6.3.1 or is available as a BASIC program called LOOP. These detail the cable size necessary for a given number of responders, evacuation load and loop legnth.

Step 1: Total up the number of "Equivalent Thermal Responders" ie,

for each ATR or ARR count 1
for each ASR count 3
for each 5mA of evacuation current count 1

eg, A system of 10 ATR, 15ARR, 12ASR and 0.4 Amp of evacuation load is equal to Responder equivalent

$$= 10(ATR) + 15(ARR) + 12\times3(ASR) + \frac{400mA}{5mA}(Evac\ Load)$$

$$= 10 + 15 + 36 + 80$$

$$= 141$$

NOTE: For systems with more than 125 equivalent thermal responders the LOOP program or the equation in step 4 should be used to give a more accurate answer.

3.6.3 Loop Calculations (Cont'd)

Step 2: Determine the cable size needed from Fig 3.6.3.1 by intersecting the number of equivalent thermal responders and the loop length.

For our example in Step 1 a cable size of $4mm^2$ will be necessary for a cable length of 180m.

Step 3: If the position determined in Step 2 is above the $4mm^2$ limit then consult Fire Division Head Office for assistance. One solution that could be used is to add a special power supply in the Controller to boost the battery voltage when it is at a low level.

Step 4: For systems where the number of equivalent thermal responders is greater than 125 the LOOP program or the following equation should be used to get a more accurate answer. The voltage drop is equal to:

$$V = \{ (NT \times IT) + (NS \times IS) + IE\} \times \{0.75 \times (LR + (NT + NS) \times 0.01) + 0.6\}$$

Where
NT = number of ATR and ARRs
NS = number of ASRs
IT = ATR or ARR current (0.005Amp)
IS = ASR current (0.015 Amp)
IE = Evacuation current switched off LOOP (in amps)
LR = Loop resistance in ohms

34	ohms/km	1 sqmm
22.6	ohms/km	1.5 sqmm
13.6	ohms/km	2.5 sqmm
8.5	ohms/km	4.0 sqmm

3.6.3 Loop Calculations (Cont'd)

eg, LR = 6.9 ohms for 200m of 1 sqmm.
NOTE: The specified ohms/km is twice the cable resistance as there are two wires involved, +24V and 0V.

The following maximum voltage drops are allowable.
1.9V for a system with ASRs with REOLs
2.1V for a system with ASRs with only AEOLs
2.2V for a system with only ATRs and ARRs
eg,
For the previous example of 10 ATR, 15 ARR,
12 ASR, 0.4 Amps of evacuation load and a loop length 180m, the voltage drop using 4 sqmm wire is:

V = {(25 x .005) + (12 x .015) + 0.4} x {.75 x (1.53 + (25 + 12) x .01) + .6}
= {.705} x {1.825}
= 1.29 volts
which is within the limits above.

NOTE : The maximum evacuation load drawn from any ARR is 600mA and may only be drawn from the supply pad of Lk1 or Lk5 via the ARR relay contacts.

3.6.4 Responder to Responder Connections Limits

The Responder to Responder link line resistance must not exceed 150 ohms and capacitance must not exceed 275nF.

There is no significant advantage in using shielded data cable over standard TPS. Because of its lower capacitance TPS is better for data transmission.

FIG 3.6.3.1 EQUIVALENT ATRS VS TOTAL LOOP LENGTH

3.7 CONTROLLER/RZDU DISPLAYS, CABINETS AND INDEX

A master controller can have 0 to 8 RZDUs connected to it in order to repeat the master indications at up to 8 remote sites.

RZDUs may display different quantities of zones from the master and from each other. All displays, however, must start at zone 1 and proceed without gaps.

<u>To Calculate Display Board Quantity</u>

The number of zones that are to be indicated at each location must be determined. The smallest display has one board (16 zone indication). Displays are extended in increments of 16 zones (no gaps allowed).

Each display location needs the 1 master display board supplied with the unit plus up to 32 display extender boards. Calculate the number of extender display boards as follows:

$$\text{number of extender display boards} = \frac{\text{number of zones} - 16}{16}$$

Round up to the next whole number.

Alternatively table 3.7.1. can be used.

3.7 CONTROLLER/RZDU DISPLAYS, CABINETS AND INDEX (Cont'd)

To Calculate Extender Cabinet Quantity

At each display location, the master cabinet can house one 16 zone display. Extender cabinets are needed for displays of 17 to 528 zones. Each cabinet can house up to four 16 zone display boards. The number actually fitted to each will depend on the base index space required for engraving. Usually more than the minimum quantity of extenders will be required.

The minimum number of extender cabinets required to house the display boards can be calculated as follows:

$$\text{number of extender cabinets} = \frac{\text{number of extender display boards}}{4}$$

Round up to the next whole number.

Alternatively table 3.7.1 can be used.

Extender Cabinet Sizes

Extender cabinets are available in two sizes. Large extenders are the same size as the master cabinet. Small extenders are shorter. A typical arrangement is shown in Fig 4.2.1.1. Small extenders are intended to stack on top of the master cabinet or a large extender mounted alongside it.

3.7 CONTROLLER/RZDU DISPLAYS, CABINETS AND INDEX (Cont'd)

Index Panels

Index panels are only available for 16 zone Master/RZDU panels (both front and rear service). Because extender cabinets have great flexibility all systems over 16 zones require a custom index panel. This is branch responsibility for further details see Section 4.2.2.

Dimensions can be taken from any of the master index drawings 1888-39, 41, 43, 45.

Mimic Displays

A mimic output is available for each of the common DEFECT, NORMAL, FIRE and each of the 16 ZONE ALARM indications on the master display board. On extender display boards 16 ZONE ALARM outputs are available. The maximum load on any mimic output is 200mA.

RZDU Wiring

RZDUs are wired to the master by 3 core $1mm^2$ cable (if they all have their own mains power supply and battery). Spur/star connections are permitted of up to 8 RZDUs.

If an RZDU is powered from the master a 4 core connection is required. Two cores may be $1mm^2$ and the other 2 must be heavy enough to power the RZDU. An RZDU draws 1.1 Amps (per 10 display boards) in lamp test. The power cable must not drop more than 2.4 volts during lamp test.

3.7 CONTROLLER/RZDU DISPLAYS, CABINETS AND INDEX (Cont'd)

For a single RZDU this means the cable limits are:

$1mm^2$	=	60 metres
$1.5mm^2$	=	95 metres
$2.5mm^2$	=	160 metres
$4mm^2$	=	250 metres

Multiple RZDUs will require even heavier cable. Do not forget to include the RZDU power current in the battery calculations.

Minimum Cabinets	Display Boards/Zones			
Master		1/16		
Extender 1	1/32	2/48	3/64	4/80
Extender 2	5/96	6/112	7/128	8/144
Extender 3	9/160	10/176	11/192	12/208
Extender 4	13/224	14/240	15/256	16/272
Extender 5	17/288	18/304	19/320	20/336
Extender 6	21/352	22/368	23/384	24/400
Extender 7	25/416	26/432	27/448	28/464
Extender 8	29/480	30/496	31/512	32/528

Example: If a system requires 357 zone indications locate the next largest zone number (/Z) in the table ie, 368. From this note that 22 display extender boards are required to indicate this number of zones. Look across to the left hand column to see that at least 6 extender cabinets are required to house the 22 display extender boards.

Fit only 1 festoon index illumination bulb (to the left hand display board) in each extender cabinet.

TABLE 3.7.1 CALCULATION OF DISPLAY BOARD, EXTENDER CABINET QUANTITIES

3.8 EVACUATION LOAD AND ALERTING DEVICES

A range of 24 volt evacuation alerting sounders is available for use with the Vigilant FP4000. Fire bells are most commonly used, however in areas with high ambient noise levels, electronic sounders or beacons may be necessary. Specific installations may have special requirements. Note that NZS 4512 has mandatory requirements for evacuation sounder coverage.

If desired, a public address facility is available in the VIG 66 amplifier. This is described in the Technical Manual, Volume 6.3.

Evacuation devices may be connected to the master controller or to ARR outputs configured for evacuation control.

If the total evacuation load at the master and ARRs is greater than 2.5A, it will be necessary to have an external supply of 24V. This will require monitoring in accordance with NZS 4512. Refer to section 3.10 for battery calculations.

The maximum evacuation load at an ARR is 1A and at the master 2.5A. (Note the total evacuation load restriction of 2.5A above). Evacuation circuits may be monitored. If so then devices require diodes and EOL monitoring resistors, spurs cannot be wired, and ARR outputs must be used in pairs.

3.9 ANCILLARY OUTPUTS

Ancillary outputs are available at the Master, RZDU, and ARR. Many types of ancillary equipment can be driven from these outputs.

Each Master and RZDU ancillary output can drive a load of up to 200mA. Outputs pull low when active.

The Master and RZDU have 7 general purpose ancillary outputs available:

3 ancillary outputs labelled NORMAL-, DEFECT-, FIRE-.
These follow the states of the same name.

4 ancillary outputs labelled ANCIL 1-, ANCIL 2-, ANCIL 3-, ANCIL 4-. Each of these is configurable through the programming terminal and is asserted when the programmed conditions occur. (Refer to Programming and Diagnostics Manual).

The outputs at the RZDU follow those at the Master.

The ARR has 4 independently programmable voltage free 1 Amp single pole changeover contacts available for switching ancillary equipment. Refer to section 4.4 for hardware configuration of the ARR. Each of these sets of contacts is configurable through the programming terminal and is asserted when the programmed conditions occur.

3.10 BATTERY CALCULATIONS

3.10.1 General

A reliable power supply for a fire alarm system is of the utmost importance as the successful operation of the whole system depends on this device.

The calculations of battery and battery charger capacities below must be performed in order to ensure that the fire alarm system meets the requirements of NZS 4512. These requirements are:

> A non-Brigade connected system must run with the mains off in the non-alarm condition (with defect) for 72 hours followed by half an hour in the alarm condition (with evacuation load). The charger must then be able to recharge the nominal capacity of the battery within 24 hours (23 hours taking the charger timer into account) while the system is in the non-alarm condition (with defect).
>
> A Brigade connected system must be able to run with the mains off in the non-alarm condition (with defect) for 24 hours followed by half an hour in the alarm condition (with evacuation load). The charger must then be able to recharge the nominal capacity of the battery within 24 hours (23 hours taking the charger timer into account) while the system is in the non-alarm condition (with defect).

3.10.1 General (Cont'd)

In order to ensure compliance with NZS 4512, the battery charger used must be of a type approved by the Company Manager for the purpose. Currently approved battery chargers include the following:

Wormald Vigilant CV3 Range
Vigilant FP4000 Internal Charger
Wormald Vigilant 1870 Charger

External chargers may have their one hour inhibit synchronised with the FP4000 system clock by use of the CHGR INH- output at the Master and at each RZDU.

3.10.2 Battery/Charger Configuration

There are 3 possible battery and charger configurations with the FP4000:

A) Internal battery and charger for all supplies.

B) External battery and charger for all supplies.

C) Internal battery and charger for Controller Supply and external battery (and charger, if necessary) for evacuation supply.

The procedures in the sections below should be followed to decide which of the above configurations is applicable to each installation.

3.10.3 Standard Types

If the system is a standard type, as listed below, with no ancillary equipment, then the internal battery and charger (configuration A) may be used provided the evacuation load is not too large.

Calculate the total evacuation load (that is the total load that is switched on by the evacuation relay at the master and ARRs configured for evacuation when the Controller is in fire). Use the figures in Table 3.10.3.1 for current drawn by each type of device.

x bells	@	mA	=	mA
x sounders	@	mA	=	mA
x other	@	mA	=	________mA
Total evacuation load			=	________mA

For each of the standard types, there is a maximum allowable evacuation load shown in the corresponding graphs. Provided the evacuation load shown in the calculation above is less than the maximum shown in the graph, the internal battery and charger may be used and no more calculation is necessary. If this is not so then see sections 3.10.5 and 3.10.6.

3.10.3 Standard Types (Cont'd)

The standard types are defined as follows:

Non Brigade Connected (Local)

- Gives 72 hour non alarm plus 1/2 hour alarm
- No ancillary equipment
- Loop up to 250 metres
- Internal battery and charger
- One display board and bulb

Use the graph (fig 3.10.4.1) to calculate the system power requirements.

Brigade Connected (Not Mk VIII)

- Gives 24 hour non alarm plus 1/2 hour alarm
- No ancillary equipment
- Loop up to 2km
- Internal battery and charger
- No A2400
- One display board and bulb

Use the graph (fig 3.10.4.2) to calculate the system power requirements.

NOTE: On both of the above types, for extra displays and bulbs, add:
35mA per display
120mA per bulb

3.10.3 Standard Types (Cont'd)

To use the graphs (fig 3.10.4.1 and fig 3.10.4.2) allow:

1	RZDU powered from master	= 3 equivalent ATR load
1	Circuit modified for A2400	= 1/2 equivalent ATR load
1	Smoke Responder	= 1 equivalent ATR load

Plot the total switched evacuation load against the number of equivalent ATR loads used. If the point falls outside the curve, or if the system is not a standard one, see sections 3.10.4, 3.10.5 and 3.10.6.

The following are nominal ratings to be used in battery and charger Ampere-hour calculations. They have been adjusted to compensate for battery discharge characteristics and worst- case component values. Other figures should not be substituted. (Note that 1000mA = 1A)

Device	Non-Alarm Current (mA)	Alarm Device Current (mA)
Evacuation Alerting Devices		
24V Vigilant Bell	-	50 (av)
24V Pulnix Bell	-	15
FP4000 Standard Controller (door closed)		
Brigade Connected Main PCB and 1 display board	67	226
Local Main PCB and one display	51	210
Extender Display Board (1 bulb)	1	155
Extender Display Board (0 bulbs)	1	35
Festoon bulb (extras)	-	120
ASR (including detector current)	9	15
ATR	5	5
ARR	5	5
Loop (current per 1000m)	12	12
RZDU Main PCB and one Display Board	14	169
ASR Circuit modified for A2400 (each)	4	5
Brigade Interface		
1864-19, 1864-20 PCB	-	-
SAFE, Mk X, CM3, Benefis	-	-
MK VIII Transmitter	15	65
Ancillary Equipment		
1616-29 Battery Monitor	5	5 (Main Battery)
	7	7 (Monitored Battery)
1616-101-3 VICNET Modem	25	25
1862-22 RS232 Interface	5	5
24V Door Holder	50	-

TABLE 3.10.3.1 BATTERY CONSUMPTION FIGURES

FIG 3.10.4.1 STANDARD INTERNAL POWER SUPPLY CAPABILITY (CONNECTED)

FIG 3.10.4.2 STANDARD INTERNAL POWER SUPPLY CAPABILITY (LOCAL)

3.10.4 Conditions for Internal Battery and Charger

For a non-standard system, there are two conditions which must be satisfied in order to use the internal battery and charger; firstly the total discharge during the mains off period must not exceed the battery capacity (6500mAh) and secondly the charger must be able to restore full battery capacity during the next 23 hours as well as provide for the non-alarm load.

To calculate the total battery discharge, follow the procedure below. Use the figures in Table 3.10.3.1 for current drawn by each type of device.

1) Add up the total evacuation load on the battery (that is the total load on the battery that is switched on by the evacuation relay at the master and any ARRs configured for evacuation when the Controller is in fire):

x bells	@	mA	=	mA
x sounders	@	mA	=	mA
x other	@	mA	= ________	mA

Total evacuation load (EL) = _________mA

If the total evacuation load, EL, is greater than 2500mA, this is too much for the internal battery supply and an external battery, configuration B or C is required (see section 3.10.5).

3.10.4 Conditions for Internal Battery and Charger (Cont'd)

2) Add up the total non-alarm on the battery (that is the total load on the battery when the Controller is not in fire):

1 x Main PCB (local or connected) = mA
x Display Boards = mA
x ASR = mA
x ATR = mA
x ARR = mA
Loop (metres at 12mA per 1000m) = mA
Ancillary Equipment = ________mA

Total Non-Alarm Load (NL) = ________mA

3) Add up the total alarm load on the battery (that is the total load on the battery when the Controller is in fire excluding the load switched on by the evacuation relay):

1 x Main PCB (local or connected) = mA
x Display boards (with bulbs) = mA
x Display boards (no bulbs) = mA
x ASR = mA
x ATR = mA
x ARR = mA
Loop (metres at 12mA per 1000m) = mA
Ancillary Equipment = ________mA

Total Alarm Load (AL) = ________mA

3.10.4 Conditions for Internal Battery and Charger (Cont'd)

4) Choose the number of hours the Controller must operate with the mains off (H). For a Brigade connected Controller, H = 24 hours. For a local system H = 72 hours.

Mains off operating hours (H) = _______hours

5) Calculate the total discharge of the battery. This is the sum of (the non-alarm load x the required number of hours) plus (the alarm load plus the evacuation load x the half hour alarm period x the high discharge derating factor of 1.4) in milliampere hours. The total discharge (DIS) is therefore:

DIS = (NL x H) + (0.5 x 1.4 x (EL + AL)) mAh

To check if the internal battery/charger is suitable, refer to fig 3.10.4.1. Plot the point of the non-alarm load (NL) against total battery discharge (DIS). If this point falls within the boundary drawn, the internal battery and charger may be used and no more calculation is necessary. If the point falls outside the boundary, configuration B or C is required (see sections 3.10.5 and 3.10.6).

FIG 3.10.4.3 INTERNAL BATTERY/CHARGER CAPACITY GRAPH

3.10.5 External Battery for Evacuation Load Only

If desired, a separate battery may be used for the evacuation load only (Configuration B). The alternative is an external battery for all power supply (configuration C, section 3.10.6).

1. If configuration B is desired, first calculate the total evacuation load using the procedure in step 1 of section 3.10.4 above. If EL is greater than 5000mA then this is too much for the evacuation relay contacts and an interposing relay must be used. This relay should be normally de-energised and be powered off the switched evacuation supply. Include the current drawn by this relay in the alarm load calculation below.

2. Check that the internal battery and charger are sufficient for the non-alarm and alarm loads. To do this, follow through steps 2 - 5 in section 3.10.4 above with EL = 0 (since EL is being supplied by the external battery). Then refer to figure 3.10.4.1. Plot the point of the non-alarm load (NL) against total battery discharge (DIS). If the point falls outside the boundary drawn, the internal battery and charger are not

sufficient and configuration C is required (see section 3.10.6).

3.10.5 External Battery for Evacuation Load Only
(Cont'd)

3. If the internal battery and charger are sufficient, the next step is to choose an external battery (and charger, if necessary) for powering the evacuation load. Dry cell batteries are suitable for once-only use. Alternatively a lead-acid battery and charger is required.

Dry cell batteries (No. 6)	-	maximum evacuation load per 24V of cells in series is 1000mA.
Lead-acid batteries	-	use table 3.10.5.1 to determine the battery and charger combination required.

4. Even if configuration B is feasible, note that configuration C may in some cases prove to be more cost effective.

Evacuation Load (EL) in mA	Battery/Charger Combination required
up to 6,500	2 x 6.5Ah sealed lead-acid batteries is series with 1 Amp charger
up to 13,000	2 x SS3 batteries with 2 Amp (CV3) charger
up to 27,000	2 x SS5 batteries with 2 Amp (CV3) charger
up to 35,000	2 x SS7 batteries with 5 Amp (CV3) charger

TABLE 3.10.5.1 EVACUATION BATTERY/CHARGER COMBINATIONS

3.10.6 External Battery and Charger for all Supplies

An external battery and charger may be used for all supplies for a Vigilant FP Fire Alarm System (configuration C). This configuration may be forced by elimination of the other two (A and B), or it may prove a more cost-effective alternative to configuration B.

1. Calculate the total evacaution load using the procedure in step 1 of section 3.10.4 above. If EL is greater than 5000mA then this is too much for the evacuation relay contacts and an interposing relay must be used. This relay should be normally de-energised and be powered off the switched evacuation supply. Include the current drawn by this relay in the alarm load calculation below.

2. Calculate the alarm load, non-alarm load, and total battery discharge by following steps 2 - 5 of section 3.10.4 above. Include all loads as the system battery is supplying all power for the alarm system.

3. Choose a battery and charger combination by plotting the point of non-alarm load (NL) against total battery discharge (DIS) on figure 3.10.6.1. The combination required is the one for the region the point immediately falls within, or any combination for a region outside that. In no circumstances use a combination for a region that the plotted point does not fall inside on this graph.

FIG 3.10.6.1 EXTERNAL BATTERY/CHARGER CAPACITY GRAPH

3.11 BRIGADE CONNECTION

The Vigilant FP4000 has been designed to accommodate a variety of Brigade connection types. The requirements, configuration, and parts required for each of these are described in detail in section 4.3.5 of this manual. In brief, the Brigade connection configurations supported are:

Internal SAFE Transponder

SAFE Transponder 1643-1-1 connected to one FP4000 and mounted within the FP4000 cabinet. 1864-22 kit of parts needed for connection. Wiring from Transponder via loom to FP4000 screw terminals. Test jack on plug-in PCB (section 4.3.5.1).

Colocated SAFE Transponder

SAFE Transponder Complete 1643 mounted externally and shared between FP4000 and other equipment. Multicore wiring from FP4000 screw terminals to Transponder Box. Provision for test jack inside FP4000 on plug-in PCB (1864-20) if line loop-back required (section 4.3.5.1).

Internal Mk X Modulator

Mk X Modulator 1530-1 mounted within FP4000 cabinet. 1864-23 kit of parts needed for connection. Wiring from Modulator via loom to FP4000 screw terminals. Isolate resistors and potentiometers on plug-in PCB (section 4.3.5.2).

3.11 BRIGADE CONNECTION (Cont'd)

Common CM3 Mk X Modulator

Multicore wiring from FP4000 screw terminals to CM3. (section 4.3.5.3).

Internal Benefis Transmitter

Benefis Transmitter BS033 connected to one FP4000 and mounted within the FP4000 cabinet. 1864-24 kit of parts needed for connection. Wiring from Transmitter via looms to FP4000 screw terminals. Diodes inhibit fire and defect states on isolate (section 4.3.5.4).

Colocated Benefis Transmitter

Benefis Transmitter BS033 or equivalent mounted in external box and shared between FP4000 and other equipment. Multicore wiring from FP4000 screw terminals to Transmitter box. Kit of parts 1864-24 still necessary for connection. Diodes inhibit fire and defect states on isolate (section 4.3.5.4).

Externally Mounted Mk VIII Transmitter

Externally mounted 1207-1 Mk VIII Transmitter wired to 1250-1 Terminal Board in separate box, complete with standby battery and (optional) defect buzzer. Multicore wiring from FP4000 to Transmitter box. FP4000 isolate switch wired to isolate Transmitter (section 4.3.5.5).

Other Connection Types

A list of available contacts given in section 4.3.5.6.

3.12 EXTENDING AN EXISTING SYSTEM

To add one or more responders to an existing system it is necessary to wire them where required in the loop and allocate a unique address to each of the new responders.

Addresses can be pre-allocated if the extension is allowed for at the initial planning stage. A new responder can be set up to any unused address but it is recommended that after any pre-allocated addresses are used up the next highest address is taken for the next responder.

The system configuration must be changed with the programmer to include the system extensions (see Programming Manual).

Note that the battery calculations in 3.10 should be reworked to take into account the extra power required by the devices used on the extension.

3.13 PERIPHERAL EQUIPMENT

Printer
Required if hard copy of logged events and configuration are needed. The printer will need to have an RS232 serial interface. If the printer is to plug onto the modem port of the FP4000 then a 1862-22 RS232 Interface PCB (PA0445) will be required.

Programmer
Needed to change the configuration of the controller, otherwise the default configuration will apply (section 3.5). Not required to remain with the system.

3.14 ORDERING INFORMATION

A detailed list of component parts for the Vigilant FP4000 is given below, along with the appropriate ordering codes. The items are sectionalised for ease of reference.

3.14.1 Controller and Extenders

Quantity		
1	Master,FS	FB0154
	or Master,RS	FB0153
plus		
0,1,more	Large Extender, FS	FP0459
	or Large Extender, RS	FP0458
	or Small Extender, FS	FP0461
	or Small Extender, RS	FP0460
plus		
0 or 1	FS Master Index	FA1154
	or RS Master Index	FA1153
and/or		
	Indexes for Extender Cabinets (Std dwgs available, branch own supply)	
plus		
0,1,more	Display Board (one only supplied in Master, none in Extender)	PA0441
plus		
2	12V,6.5Ahr Sealed Lead Acid Batteries if internal batteries required (internal charger included in Master)	BA0005
or		

3.14.1 Controller and Extenders (Cont'd)

2	12V low loss Lead Acid Batteries
plus	24V charger (eg, FP0011)
and	Battery Box (FP0006 or FP0007) as appropriate
plus	Brigade connection equipment as detailed in section 4.3.5.

3.14.2 RZDUs and Extenders

Quantity			
1		RZDU,FS	FB0156
	or	RZDU,RS	FB0155
plus			
0,1,more	Large Extender,FS		FP0459
	or	Large Extender,RS	FP0458
	or	Small Extender,FS	FP0461
	or	Small Extender,RS	FP0460
plus			
0 or 1		FS Master Index	FA1154
	or	RS Master Index	FA1153
and/or			
		Indexes for Extended Cabinets (std dwgs available, branch own supply)	
plus			
0,1,more	Display Board		PA0441
		(one only supplied in RZDU, none in Extender)	
plus			
2		12V,6.5Ahr Sealed Lead Acid Batteries	BA0005
		if internal batteries required (internal charger included in RZDU)	
or			
2		12V Low Loss Lead Acid Batteries plus 24V charger (eg FP0011) and Battery Box (FP0006 or FP0007) or Powered from controller batteries	

3.14.3 Responders

Thermal Responder in Box	FP0454
Relay Responder in Box	FP0455
Smoke Responder in Box (1mA circuit current)	FP0456
Smoke Responder in Box (2mA circuit current)	FP0624
AEOL (1616-10)	PA0203
Contact Conversion Module (MCP on Smoke Cct)	PA0443
FP4000 Responder software V1.10 "combined operation" (for conversion of an existing ASR)	SF0173

3.14.4 Brigade Connection Equipment

PCB ASSEMBLY,1643-1-1 SAFE TRANSPONDER OEM	PA0230
FP,SAFE TRANSPONDER PLUG,TIME SLOT 0,1643-7-0	FP0151
FP,SAFE TRANSPONDER PLUG,TIME SLOT 1,1643-7-1	FP0152
FP,SAFE TRANSPONDER PLUG,TIME SLOT 2,1643-7-2	FP0153
FP,SAFE TRANSPONDER PLUG,TIME SLOT 3,1643-7-3	FP0154
FP,SAFE TRANSPONDER PLUG,TIME SLOT 4,1643-7-4	FP0155
FP,SAFE TRANSPONDER PLUG,TIME SLOT 5,1643-7-5	FP0156
FP,SAFE TRANSPONDER PLUG,TIME SLOT 6,1643-7-6	FP0157
FP,SAFE TRANSPONDER PLUG,TIME SLOT 7,1643-7-7	FP0158
FP,SAFE TRANSPONDER COMPLETE,1643	FP0149
PCB ASSEMBLY,1530-1,DBA2 MODULATOR	PA0158
PCB ASSEMBLY,BS033,8 STATE DIGITAL TRANSMITTER	PA0534
PCB ASSEMBLY,1207-1 VIC 1 ELECTRONIC TRANSMITTER	PA0033
PCB ASSEMBLY,1250-1 CONV MOD TERMINAL BOARD	PA0038
LABEL,1864-14-4,FP4 MK VIII PO LINE	LB0266
FP,VIGILANT FP4 SAFE INTERFACE KIT	FP0420
FP,VIGILANT FP4 MK X INTERFACE KIT	FP0421
FP,VIGILANT FP4 BENEFIS INTERFACE KIT	FP0422

3.14.5 Communication Devices

PCB ASSEMBLY,1616-101-2,MODEM 300 BD,CCITT,CM,H DUP	PA0405
PCB ASSEMBLY,1862-22,CMOS/RS232 INTERFACE	PA0445

4. INSTALLATION

4.1 INTRODUCTION

4.1.1 General

This section has been written to assist staff in installing a Vigilant FP4000 Fire Alarm System. Such staff should be suitably trained and have qualified supervision.

The procedures outlined are in compliance with Wormald Vigilant company practice and New Zealand Standard NZS 4512. The installer should be familiar with the appropriate sections of this manual and:

NZS 4512 : 1981 Automatic Fire Alarm Systems in Buildings
NZ Electrical Wiring Regulations, 1976
Wormald Vigilant Technical Manual Volume 5

Where other regulations are invoked, they should be heeded. If such regulations differ from the practice indicated in the documents listed above, the points of difference should be referred to Head Office.

The information given in this section is for information and assistance only. Installation points specific to the Vigilant FP4000 are described in detail, however general points are only covered briefly or not at all.

4.1.2 Pre-Installation Planning

Before a fire alarm system is installed, the Installer or Installation supervisor should establish that all the required planning has been done. This planning includes:

1. Approval of panel positions (master and RZDUs), zonal division, and mimic diagrams by all appropriate authorities.

2. Planning of all cable runs, cable lengths and types, voltage drops in cables, and requirements for conduit, clamps, etc.

3. Supply of correct Brigade connection device and equipment required for connection (if any).

4. Supply of correct number of Responders (Thermal, Smoke and Relay) and end of line devices (3k3 thermal, 10k non-fire, 27k smoke resistive end of line, 10k Evac Circuit, active end of line)

5. Supply of correct type of panels (Master, RZDU, Extenders, front or rear service).

6. Calculation of battery requirements done and correct battery (and box if necessary) supplied.

7. Calculation of battery charger requirements done and correct battery charger supplied.

8. Dedicated mains supply available at site.

4.1.2 Pre-Installation Planning (Cont'd)

9. Supply of correct type and number of alerting devices (24V).

10. Supply of correct type and number of detectors and marking labels.

11. Supply of correct type and number of manual call boxes.

12. Arrangement of special requirements with builders and electrical contractors where applicable.

4.1.3 Cabling

Cabling should be of no less than 1mm^2 cross sectional area, insulated, and either PVC sheathed or installed in conduit. Joins should occur only in enclosed terminal boxes, and it is important that all terminations be good ie:

- no bare wire protruding from terminal;
- no insulation inside the clamp part of the terminal;
- wire not cut or damaged during stripping;
- wire not soldered;
- wire not doubled back in terminals with strain relief clamps;
- all terminals firmly tightened but not overtightened;
- neat service loop adjacent to termination;
- coil of extra wire length in wall/ceiling to allow for alterations.

Note that cabling should comply with all points in NZS 4512, section 202. Note also that the responder terminal blocks have a maximum wire size of 4mm^2.

4.2 CABINETS

4.2.1 Controller and RZDU Cabinet Mounting

The Controller and RZDU positions must be approved before installation. It is also preferable to have the mimic diagrams approved, engraved, and fitted before installation, although this is not always possible.

Cable entry holes should be made before the cabinet is mounted. The master and display PCBs should be carefully removed to avoid damage. In all cases all burrs and debris must be removed from inside the cabinet. Holes must be fitted with grommets or filed to a rounded edge to avoid damage to wiring.

The Controller is normally mounted to a window sill, wall, or shelf by screws. The cabinet may be supported by the top, bottom, or a single side, or may be mounted on a pair of pillars mounted in the holes themselves. Holes should be carefully drilled in the cabinet to suit the requirements of the installation. The master and display PCBs should be carefully removed to avoid damage. All burrs and swarf must be removed from inside the cabinet.

The index may be fitted after the Controller is window mounted provided a 20mm gap is left between the cabinet front and the window. Carefully align the index over the LEDs and push the screws through the holes. Secure from the inside of the cabinet with 4 barrel nuts provided.

4.2.1 Controller and RZDU Cabinet Mounting (Cont’d)

Extender cabinets can be screwed side by side or above the master cabinet. Note that the large extender is the same physical size as the master cabinet. See fig 4.2.1.1.

FIGURE 4.2.1.1 EXTENDER CABINET MOUNTING

4.2.2 Index Panel

The index panel is supplied silkscreened with labels for the Normal, Defect, and Fire indicators. The zone Alarmindicators are unlabelled to allow for individual installation requirements. The installation supervisor must arrange for the approval and engraving of the mimic diagram with a plan of the protected premises plus any other required information. Dimensions for the front and rear service version of the index panels are given in drawings 1888-41 and 1888-39 respectively.

The index panel mimic diagram should be engraved and back-filled with black and/or red as appropriate. Minimum lettering height is 3mm. Note especially the limits of the area which is back-lit from inside the panel. Take note also of any local requirements for 'You Are Here' signs and the colours of the mimic diagram.

To allow for fitting of the index panel after the Controller is window mounted, a gap of 20mm should be provided between the window and the cabinet front. The index panel is slid along the window and located by the 4 screws to the holes in the front of the cabinet. Carefully align the indicators in the holes provided in the index panel and press them home. Secure the index from inside the cabinet with the 4 barrel nuts provided.

Single sheet index panels for multiple cabinet FP4000 systems are possible only for rear service systems.

Use drawings 1888-38 and 1888-42 for dimensions and allow 2mm extra on every join. See Figure 4.2.2.1.

FIG 4.2.2.1 MAKE UP OF SINGLE SHEET INDEX DIMENSIONS

4.2.3 Responder Cabinet Mounting

The responder cabinet is usually fitted out of sight, for example, in a ceiling space. It should be placed to facilitate and minimize wiring. It may be mounted in any position (horizontal, vertical, upside down). Make sure enough service access is provided.

Cable entry should be decided on before mounting. There are 2 holes fitted with bungs at one end. If these holes are to be used for cable entry then the bungs should be removed and grommets fitted in their place. If cable entry is desired through the base (or opposite end), the PCB should be carefully removed and the appropriate ’knockouts’ should be removed and replaced with grommets.

The responder cabinet is fixed to its mounting surface with 4 screws. The mounting surface should be marked, drilled and tapped to M4.

If the mounting surface is metal the case may be electrically isolated by first removing the PCB and enlarging the 4 mounting screw holes to 6.35mm and fitting a 1/4 inch rubber grommet (HW0027) to each hole. The cabinet is then screwed to its mounting surface with four M4 panhead machine screws.

All responders must be labelled. If non-standard responder boxes are used make sure a label is put on the outside of the responder and that it includes the following words :

"FIRE ALARM RESPONDER. FAILURE TO ISOLATE WILL CALL THE FIRE BRIGADE"

It should also include the responder number and type.

4.3 WIRING

```
* * * * * * * * * * * * * * * *
*                             *
*          WARNING            *
*  This equipment contains    *
*  STATIC SENSITIVE DEVICES   *
*                             *
*  Use Antistatic Procedures  *
*       When Handling         *
*                             *
* * * * * * * * * * * * * * * *
```

4.3.1 Responders

The responders are wired to the master or each other with 4 wires. Two wires carry power and two carry communications (refer to section 3 for determining wire size).

In general, the RESP OUT port of the master is connected to the IN port of the first responder. The OUT port of the first responder is connected to the IN port of the second responder and so on. The OUT port of the last responder is connected to the RESP IN port of the master. Refer to figure 4.3.1.1(a).

4.3.1 Responders (Cont’d)

The lengths of wiring between the responders and the panel must conform to the 9/10ths rule under the following circumstances.

In any part of the loop where the power loop resistance back to "Resp In" terminals is over 7 ohms, that means beyond the following wiring distances, measured from the "Resp In" terminals :

200m for 1.0 sq mm
300m for 1.5 sq mm
500m for 2.5 sq mm
800m for 4.0 sq mm

(If the loop wire length is less than these distances the rule does not apply)

The rule is as follows :

"Measuring backwards away from the Controller ’Resp In’ terminals, the cable distance between a selected Responder and its next most distant neighbour must be less than 9/10ths of the cable distance from the Controller to the selected Responder. This rule applies to every Responder in the system beyond the distances state above.

4.3.1 Responders (Cont'd)

In a diagram :

This situation is wrong :

FIG 4.3.1.1(b) 9/10ths RULE CABLE LENGTH EXAMPLES

FIGURE 4.3.1.1(a) RESPONDER LOOP WIRING

4.3.2 Detector Circuits

The detectors are wired to the responders (thermal to ATR and smoke to ASR) see fig 4.3.2.1. Detector circuit wiring must comply with NZS 4512 and with company policy as detailed elsewhere. Unused thermal circuits on an ATR must be terminated on the ATR PCB with 3k3 resistors (CR25/SFR25 or equivalent) between the line connections. Unused circuits on an ASR must be terminated on the ASR PCB with resistors (CR25/SFR25 or equivalent) between the line connections.

The lines must be megger tested but this must NOT be done with the lines connected to the FP4000 responder. Connect the detector lines only after megger testing the bare wire ends.

Core to core testing of smoke circuits should NOT be done with a megger as some smoke detector bases contain electronics. Megger test from core to earth with both circuit wires shorted together.

The thermal circuit inputs of the Vigilant FP4000 ATR will function with any normally closed, potential-free contacts as inputs. The following detector types are suitable:

- VIC 1 Detector
- Vigilant ’Butterfly’ Detector
- Manual Call Point
- Detector Type 1756

The smoke circuit inputs of the Vigilant FP4000 ASR are designed specifically to operate with 2-wire, 20V normally open detectors. Polarity must be strictly observed. Normally closed clean contact detectors may also be connected on the inputs of ASRs with "combined" mode software fitted.

4.3.2 Detector Circuits (Cont'd)

Manual call points with normally closed contacts may be connected to ASR inputs using the PA0443 Contact Conversion Module. Where this module is used ASR circuits must be configured by programming terminal selection for manual call point operation. Refer to Fig 4.3.2.3. (Note that dirt-sensing detectors cannot be used on circuits with MCPs fitted). An ASR with "combined" mode software fitted may have manual call points fitted without a contact conversion module but only on circuits that have resistor end of line.

Note that an ASR must be specially modified to use the A2400 detector. Only one A2400 pair may be connected per circuit.

Detectors, call points, and their end-of-line devices must be mounted, labelled, and wired in accordance with NZS 4512 and company policy. Some types require special wiring and labelling and this should be noted. Sample detector wiring arrangements are shown in figs 4.3.2.1 through 4.3.2.5.

The physical wiring of thermal circuits is to pairs of terminals on the ATR circuit board. Unused circuits must be normalised with 3k3 resistors as detailed above.

The physical wiring of smoke and "combined" circuits is to pairs of terminals on the ASR circuit board. Polarity must be observed strictly.

4.3.2 Detector Circuits (Cont'd)

Detectors should be numbered as follows:

zz/rr/c/dd

Where zz is the zone number
rr is the responder number
c is the circuit number on that responder
and dd is the detector number on that circuit.

Note : For detectors with selectable integration (e.g. Cerberus F910, R910), the long integration option (tab externally visible) must not be selected unless the smoke circuit is configured as instant
(i.e. non-gated).

FIG 4.3.2.1 DETECTOR CONNECTIONS TO RESPONDER

FIG 4.3.2.2 DETECTOR WIRING

FIG 4.3.2.3 MANUAL CALL POINT WIRING TO ASR

NOTE: On a "combined" circuit a manual call point without contact conversion module is allowed only with a resistor end-of-line. A circuit with a resistor end-of-line may have manual call points either with or without a contact conversion module. The wiring of a call point with a contact conversion module is shown in Fig 4.3.2.3 and the circuit must be programmed to have the call point option enabled.

NOTE 2: For butterfly thermal detectors it is essential to have the terminal labelled B "nearest" to the responder, as shown in the diagram.

FIG 4.3.2.4 ASR WITH "COMBINED" CIRCUIT OPERATION, RESISTOR END-OF-LINE

NOTE 1: With an active end-of-line, manual call points without contact conversion modules are not allowed. A manual call point with a contact conversion module requires the circuit to be programmed at the panel to have the call point option enabled.

NOTE 2 : For butterfly thermal detectors it is essential to have the terminal labelled B "nearest" to the responder.

FIG 4.3.2.5 ASR WITH "COMBINED" CIRCUIT OPERATION,
ACTIVE END OF LINE

4.3.3 Power Supply and Fuses

4.3.3.1 General

The mains connection to the Vigilant FP4000 Master or RZDU must be permanently wired on a labelled circuit exclusive to the Fire Alarm System. The incoming mains wiring should enter the enclosure as specified in fig 4.3.3.1, should enter the mains chassis via the bottom grommet and be connected to the terminal block provided. A mains isolate switch is included in the FP4000 as is a current- limiting PTC thermistor which makes a mains input fuse unnecessary. The mains wiring must be done by a Registered Electrician and a Permit must be obtained from the local Supply Authority. The main switchboard fuse should not be fitted until the system is ready for power-up testing.

WARNING: Should it be necessary to move the equipment, it is necessary to disconnect the Telecom network connection before disconnecting the power lead or any separate earth lead. Similarly when reconnecting the equipment it is necessary to connect the power lead or earth lead before connecting to the Telecom network.

Should the equipment ever suffer physical damage which results in the internal parts becoming accessible in normal use then the equipment should be immediately disconnected until repaired or otherwise disposed of. In general it is recommended that the mains earth connection should be removed last.

FIGURE 4.3.3.1 MAINS WIRING

4.3.3.2 Internal Supply

Normally the Vigilant FP4000 Master or RZDU will be used with 2 series-connected 12V internal sealed lead-acid batteries (6.5 Ah rating). A battery charger suitable for this size battery is included as part of the FP4000 circuitry.

The batteries are located free-standing in the bottom left of the cabinet (looking in the door) as shown in Fig 4.3.3.2 below. Connection is made using the battery leads supplied to the screw terminals labelled 'BATTERY +' and 'BATTERY -'. Observe correct polarity (fuse F1, 10 Amp, will blow if battery polarity is reversed - no other damage should occur). If all is well, leave battery leads disconnected until testing time.

The RZDU may be powered from the master (J4 terminals VRZDU+,0V) however the preferred supply is from its own batteries and charger.

The responders do not have an internal power supply.
They are supplied from the loop (Master J4 terminals +VL1,0V and +VLN,0V).

FIG 4.3.3.2 INTERNAL BATTERY CONNECTIONS

4.3.3.3 External Supply

If an external battery supply is required the battery must be mounted separately and have its own external battery charger. The configuration for an external supply is shown in fig 4.3.3.3 below. A maximum evacuation load of 2.5A may be supplied using the first configuration, however a resistive evacuation load of 5A may be supplied using the second configuration. The evacuation return, in the second case, should be taken back to the battery (as shown) and not via the Controller 0V terminals.

If the external charger is to be inhibited by the Vigilant FP4000 battery charger timer, then the CHGR INH- output must be connected to a suitable point in the external charger circuitry. The CHGR INH- output is an open collector transistor type, switching on (low) to inhibit the charger (see Specifications, section 2.9 for details). (Connect to terminal "D" on PCB of CV3 Chargers).

The Ampere-hour capacity of the battery must be sufficient for the alarm and standby loads and the charger must be sufficiently rated to recharge the battery in 23 hours. See section 3.10 for details of battery calculations.

SINGLE CABLE TO CONTROLLER

SEPARATE CABLE FOR INCREASED EVACUATION LOAD

FIG 4.3.3.3 EXTERNAL POWER SUPPLY WIRING

4.3.3.4 Fuses

There are four fuses on the master circuit board:

Fuse, F1, 10 Amp, fuses the battery supply to the Controller.

The only connections not fused are PB9 and PB10 which are available for battery load testing. Fuse F1 will blow, isolating the battery, if the battery polarity is reversed.

Indication of the failure of F1 will be given by the failure of the controller supply when battery charger is inhibited during the 24 hour automatic test cycle.

Fuse F2, 5 Amp, fuses the Controller supply to the evacuation output at J4.

Fuse F3, 2 Amp, fuses the Controller supply to the ancillary outputs at J1.

Fuse F4, 2 Amp, fuses the Controller supply to the RZDU supply at J4.

All fuses are 20x5mm.

All fuses MUST be replaced with fuses of identical size and rating. Under NO circumstances substitute fuses of a higher rating.

There are 3 fuses on the RZDU. They are F1, F3 and F4 as above. The responders do not have fuses.

4.3.3.5 External Battery Monitoring

The connections for monitoring an external battery (eg, evacuation supply) are shown is fig 4.3.6.2. This connection is described in detail in section 4.3.6.2.

4.3.4 Alerting Devices

The Vigilant FP4000 master and ARR are suitable for use with a wide variety of evacuation alerting devices (the RZDU has no evacuation output). These include bells and sounders up to a maximum alarm load of 2.5 Amp in the case of the master (unless an external supply is provided as per section 4.3.3.3) or 0.6 Amp in the case of the ARR. Inductive loads (eg, bells, relays) must be suppressed (eg, 1N4004 diode or 0.1u, 2.5kV capacitor in the case of clearline bell) as per Fig 4.3.4.11.

4.3.4.1 Connection to Master

The main FP4000 master circuit board has 5 screw terminal connections available for the connection of alerting devices. The Controller is shipped with R59,61 fitted. The functions of the screw terminals are shown below.

Screw Terminal	R59,61 Fitted	R59,61 Removed
J4-13 NC/0V	0V	NC
J4-14 C/E+	evac+	COMMON
J4-15 NO/+24V	+24V	NO
J4-16 E/E-	evac-	EVAC
J4-17 +24V	+24V	+24V

4.3.4.1 Connection to Master (Cont'd)

The alerting devices are normally connected between evac+ (J4-14) and evac- (J4-16).

By removing R59,61 the evacuation relay contacts become uncommitted changeover contacts. This arrangement would suit applications with a separate evacuation supply. (Contact ratings may be found in the specifications, section 2.9). For evacuation loads over 5A an interposing relay must be used as shown in fig 4.3.4.7. below.

Link R60 connects an 0V evacuation supply snubber circuit. This link is installed as standard and must remain fitted if link R59,61 are fitted (ie, internal evacuation supply). The snubber may be used with an external evacuation supply up to 24V, if desired. In situations where the evacuation alerting devices are common to both the FP4000 and a sprinkler DBA, they must be able to be activated by either or both. Suggested wiring diagrams for this function is shown in figs 4.3.4.5 and 4.3.4.6 below.

NOTE:Spur wiring is not permitted for monitored evacuation circuits.

FIG 4.3.4.1 MONITORED EVACUATION WITH INTERNAL SUPPLY

FIG 4.3.4.2 UNMONITORED EVACUATION WITH INTERNAL SUPPLY

FIG 4.3.4.3 MONITORED EVACUATION WITH EXTERNAL SUPPLY USING FP4000 SNUBBER (COMMON 0V)

FIG 4.3.4.4 UNMONITORED EVACUATION WITH EXTERNAL SUPPLY (NO COMMON 0V, NO SNUBBER)

FIG 4.3.4.5 MONITORED DBA/FP4000 COMMON EVACUATION WIRING

FIG 4.3.4.6 UNMONITORED DBA/FP4000 COMMON EVACUATION WIRING

FIG 4.3.4.7 UNMONITORED EVACUATION WITH INTERPOSING RELAY FOR LARGE LOADS

FIG 4.3.4.8 UNMONITORED EVACUATION CLEAN CHANGEOVER CONTACTS

4.3.4.2 Connection to ARR

The ARR has 4 relays which can be selected in pairs as monitored Evacuation Outputs or as individual relay outputs with 'clean contacts'. This selection is done by programming the Controller, and by soldering wire links to the ARR pcb. When chosen as an Evacuation circuit both relays in the pair automatically turn on during Fire or Trial Evac. When chosen as individual relays an Output Logic expression has to be programmed for each one (ref Programming Manual).

Fig 4.3.4.9 shows the wiring of a Monitored Evacuation circuit. Wire links Lk1-4 must be fitted and soldered for Evac Circuit 1 (Lk5-8 for Evac Circuit 2). The diodes and EOLR must be fitted to allow monitoring of the circuit for short or open circuit. This is done from the 5V supply using the two 'normally closed' contacts. Current sense circuitry checks for current flow after the Evac circuit has been turned on.

If the relays are used to operate ancillary equipment (eg, lift control) then they must be used in clean contact form ie, Lk1-4, 5-8 not fitted.

FIG 4.3.4.9 ARR MONITORED EVACUATION WITH INTERNAL SUPPLY

FIG 4.3.4.10 ARR MONITORED EVACUATION WITH EXTERNAL SUPPLY

FIG 4.3.4.11 SUPPRESSION OF EVACUATION LOADS

4.3.5 Brigade Connection

4.3.5.1 SAFE

Connection of the Vigilant FP4000 to SAFE Brigade alarm receiving equipment is by means of a SAFE Transponder. Because two alarm control devices may be connected to one SAFE Transponder, there are two different configurations which must be considered separately; the Internal Transponder and the Colocated Transponder.

(a) **Internal Transponder**

An Internal Transponder is used for the connection of a single Vigilant FP4000 Controller to a SAFE Transponder, which is therefore located within the FP4000 cabinet.

(i) A kit of parts required for this configuration is available. To order quote:

FP0420 FP,1864-22,VIGILANT FP4 SAFE INTERFACE KIT

This contains:

1 x PA0419 PCB ASSEMBLY,1864-20,FP4 SAFE TEST JACK PCB
1 x LOOM,1864-22,FP4 SAFE INTERFACE LOOM
4 X HW0053 HARDWARE,PCB STANDOFF,PCM18
10 x Cut lengths of colour coded wire

Also required is a Transponder. To order quote:

PA0230 PCB ASSEMBLY,1643-1-1 SAFE TRANSPONDER,OEM

4.3.5.1 SAFE (Cont'd)

(ii) Time Slot Select Header

In consultation with the Fire Service, the correct Time Slot Select Header must be procured.
Details are given below:

FP0151 FP,SAFE TRANSPONDER,PLUG,TIME SLOT 0,1643-7-0
FP0152 FP,SAFE TRANSPONDER,PLUG,TIME SLOT 1,1643-7-1
FP0153 FP,SAFE TRANSPONDER,PLUG,TIME SLOT 2,1643-7-2
FP0154 FP,SAFE TRANSPONDER,PLUG,TIME SLOT 3,1643-7-3
FP0155 FP,SAFE TRANSPONDER,PLUG,TIME SLOT 4,1643-7-4
FP0156 FP,SAFE TRANSPONDER,PLUG,TIME SLOT 5,1643-7-5
FP0157 FP,SAFE TRANSPONDER,PLUG,TIME SLOT 6,1643-7-6
FP0158 FP,SAFE TRANSPONDER,PLUG,TIME SLOT 7,1643-7-7

The arrangement and wiring of this interface option is shown in fig 4.3.5.1 below. The following points should be noted:

- The Transponder is Telecom line-powered. All wiring from the FP4000 to the Transponder must be isolated from the FP4000 and from ground. The Brigade Connection terminals on the FP4000 provide this isolation and the method of wiring must preserve it.

FIG 4.3.5.1 INTERNAL SAFE TRANSPONDER WIRING

4.3.5.1 SAFE (Cont'd)

- The Telecom line polarity is not important (the isolation of it is).

- The Test Jack PCB should be installed as shown, however it will function correctly installed either way.

- The Telecom line should be wired, but not be finally connected to the Transponder until after initial testing.

(b) **Colocated Transponder**

Two fire alarm systems (eg, FP4000 and sprinkler) are connected to one Transponder which is mounted in a box external to both the FP4000 panel and DBA box.

(i) The following parts are required:

1 x FP0149 FP,SAFE TRANSPONDER COMPLETE,1643
(in box).
1 x Correct time slot header (see (a) (ii) above)
7 core multicore 1.0mm^2 TPS cable 600/1000V grade insulation for wiring from the Transponder box to the Alarm Controller or DBA (5 metres maximum per run).
0.2 sq mm remit wire lengths as required.

4.3.5.1 SAFE (Cont'd)

If a Telecom line loop into the FP4000 cabinet is required, the following additional part will be required.

1 x PA0419 PCB ASSEMBLY,1864-20,FP4 SAFE TEST JACK PCB

(ii) The arrangement and wiring within the FP4000 cabinet is shown in fig 4.3.5.2 below. The following points should be noted:

- The Transponder connections (via multicore) are isolated from the FP4000 and from ground. The method of wiring must preserve this isolation.

- The Telecom line polarity is not important (the isolation of it is).

- The Test Jack (if fitted) should be installed as shown, however it will function correctly installed either way.

(iii) The arrangement and wiring in the Transponder box is shown in fig 4.3.5.3 below. The following points should be noted:

- All wiring is at line potential and should not be earthed (isolation must be preserved).

- A suitable mounting place should be found for the box. Note the 5 metre maximum wiring length to each of the FP4000 and DBA.

4.3.5.1 SAFE (Cont’d)

- Wiring of the Telecom line back to the panels is shown although this is not always required.

FIG 4.3.5.2 COLOCATED SAFE TRANSPONDER (FP4000 WIRING)

FIG 4.3.5.3 COLOCATED SAFE TRANSPONDER WIRING

4.3.5.1 SAFE (Cont’d)

- The Telecom lines should be wired, but not finally connected to the Transponder until after initial testing.

  The wiring of the Transponder inputs depends on the nature of the fire alarm Controllers connected to it. Two examples of wiring are given in fig 4.3.5.4 below.

4.3.5.2 Mk X

Connection of the Vigilant FP4000 to Mk X Brigade alarm receiving equipment is by a 1530-1 modulator mounted within the FP4000 cabinet.

A kit of parts required for this connection is available.
To order quote:

FP0421 FP,1864-23,VIGILANT FP4 MK X INTERFACE KIT

This contains:

1 x PA0417 PCB ASSEMBLY,1864-19-1,FP4 MK X
ISOLATE PCB
1 x LOOM,1864-23,FP4 MK X INTERFACE LOOM
4 x HW0053 HARDWARE,PCB STANDOFF,PCM18
1 x LB0262 LABEL,1864-14-1,FP4 MK X LINE
CONNECTION
4 x Cut lengths of colour coded wire

FIG 4.3.5.4 COLOCATED SAFE TRANSPONDER INPUT WIRING

4.3.5.2 Mk X (Cont'd)

Also required is a Modulator. To order quote:

1 x PA0158 PCB ASSEMBLY,1530-1,DBA2 MODULATOR

The arrangement and wiring of the connection is shown in fig 4.3.5.5 below. The following points should be noted:

- The Modulator is Telecom line-powered. All wiring from the FP4000 to the Modulator must be isolated from the FP4000 and from ground. The Brigade Connection terminals on the FP4000 provide this isolation and the method of wiring must preserve it.

- Note the Telecom line polarity (A leg, B leg, Earth). The Telecom line should be wired but not finally connected until after initial testing.

- The Isolate PCB should be installed as shown.

FIG 4.3.5.5 INTERNAL MK X MODULATOR WIRING

4.3.5.3 CM3

Connection of the Vigilant FP4000 to a Mk X Common Modulator (CM3) is by fixed wiring.

The arrangement and wiring of the connection is shown in fig 4.3.5.6 below. In addition the following item is required:

1 x PA0418 PCB ASSEMBLY 1864-19-2 BENEFIS ISOLATE

The following points should be noted:

- The CM3 is line powered. All wiring from the FP4000 to the CM3 should be 1.00mm^2 TPS cable 600/1000V grade (multicore preferred).
- The diodes on the 1814-19-2 Isolate PCB must be linked out.
- The FP4000 Test switch has no effect.
- The FP4000 Isolate switch signals Defect to the CM3 and prevents the FP4000 signalling Fire to the CM3.
- Wiring <u>MUST</u> be to input 1 of the CM3. Only one FP4000 may be connected per CM3 in this manner.
- The wiring to the CM3 should be done but connection to the CM3 should not be made until after initial testing.

FIG 4.3.5.6 CM3 WIRING

4.3.5.4 Benefis Benecoda

Connection of the Vigilant FP4000 to Benecoda receiving equipment is by means of a BS033 Digital Transmitter. Two types of receiving equipment are catered for; the Benecoda Mk III which uses the Brigade Test switch and the Benecoda Mk II which requires the Test input to be normalised (shorted to common). The connection options are both covered in Figs 4.3.5.7, 4.3.5.8 and 4.3.5.9.

Because two alarm control devices may be connected to one Transmitter, there are also two configurations which must be considered separately; the Internal Transmitter and the Colocated Transmitter.

(a) **Internal Transmitter**

An Internal Transmitter is used for the connection of a single Vigilant FP4000 Controller to a Benefis Transmitter, which is therefore located within the FP4000 cabinet.

A kit of parts required for this configuration is available. To order quote:

FP0422 FP,1864-24,VIGILANT FP4 BENEFIS INTERFACE KIT

4.3.5.4 Benefis Benecoda (Cont'd)

This contains:

1 x PA0418 PCB ASSEMBLY,1864-19-2,FP4 BENEFIS ISOLATE PCB
1 x LM0021 LOOM,1616-43,VIC 2 BENEFIS I/F
1 x PA0429 PCB ASSEMBLY, 1864-31,FP4 BENECODA TEST SOCKET
4 x HW0137 HARDWARE,PCB STANDOFF,RICHCO LMSP-10-01
4 x Cut lengths of black remit wire
2 x Cut lengths of orange and blue remit wire

Also required is a Benefis Digital Transmitter. To order quote:

PA0534 PCB ASSEMBLY,BS033,8 STATE DIGITAL TRANSMITTER

The arrangement and wiring of this interface option is shown in fig 4.3.5.7 below. The following points should be noted:

- The Digital Transmitter is Telecom line-powered. All wiring from the FP4000 to the Transmitter must be isolated from the FP4000 and from ground. The Brigade Connection terminals on the FP4000 provide this isolation and the method of wiring must preserve it.

- The Telecom line polarity is not important (the isolation of it is).

FIG 4.3.5.7 INTERNAL BENEFIS TRANSMITTER WIRING

4.3.5.4 Benefis Benecoda (Cont'd)

- The Isolate PCB should be installed as shown, however it will function correctly installed either way.

- The Telecom line should be checked, but not connected until commissioning.

- The Controller and Transmitter should be tested prior to connection. This can be done with a Benecoda Testmeter plugged into the sockets on the Test Socket Board.

(b) **Colocated Transmitter**

Two fire alarm systems (eg, FP4000 and sprinkler) are connected to one Transmitter which is mounted in a box external to both the FP4000 panel and DBA box.

A Benefis Isolate PCB is required. To order quote:

PA0418 PCB ASSEMBLY, 1864-19-2,FP4 BENEFIS ISOLATE PCB

The arrangement and wiring within the FP4000 cabinet of this interface option is shown in figs 4.3.5.8 and 4.3.5.9 below. All points for (a) above should be noted and in addition the following:

- Wiring to the Colocated Transmitter should be multicore 1.0mm^2 TPS cable 600/1000V grade insulation.

4.3.5.4 Benefis Benecoda (Cont'd)

- The wiring run to the Transmitter should not exceed 5 metres.

- Wiring within the Colocated Transmitter itself depends on the installation and is covered in the Technical Manual Volume 1, Section 1.4.9.

- The Telecom line should be wired, but not finally connected until after initial testing.

FIG 4.3.5.8 COLOCATED BENEFIS TRANSMITTER (FP4000 WIRING)

FIG 4.3.5.9 COLOCATED BENEFIS TRANSMITTER WIRING

4.3.5.5 Mk VIII

Connection of the Vigilant FP4000 to Mk VIII receiving equipment is by means of an externally mounted 1207-1 Single Input Electronic Transmitter. The Transmitter is mounted external to the FP4000 cabinet as there is insufficient space inside to house the Transmitter and its associated standby battery.

To configure this interface, the following parts are required:

- 1 x PA0418 PCB ASSEMBLY,1864-19-2 FP4 BENEFIS ISOLATE PCB
- 1 x PA0033 PCB ASSEMBLY,1207-1 VIC 1 ELECTRONIC TRANSMITTER
- 1 x PA0038 PCB ASSEMBLY,1250-1 CONV MOD TERMINAL BOARD
- 1 x Suitable mounting box for Transmitter and battery
- 1 x Auxiliary battery for Transmitter (12V dry cell)
- 1 x Sundry mounting screws, wire, etc
- 1 x 24 volt Sounder/Buzzer
- 1 x LB0266 LABEL,1864-14-4,FP4 MK VIII PO LINE
- 1 x Diode, Zener, 12V, 3 Watt

A suitable location should be found for the Transmitter box and the 1250-1 terminal board should be mounted in the box along with the auxiliary Transmitter battery. No specific details are given as the arrangement will be installation dependent. The wiring of the external Transmitter box is shown diagrammatically in fig 4.3.5.10 below. Isolation must be preserved between the Telecom lines and the rest of the wiring.

FIG 4.3.5.10 MK VIII EXTERNAL TRANSMITTER WIRING

4.3.5.5 Mk VIII (Cont'd)

The wiring within the Vigilant FP4000 cabinet is shown in fig 4.3.5.11 below. The solder connection to the DA test point should be noted in particular. Also note that both the diodes on the 1864-19-2 Benefis Isolate PCB must be shorted out (solder link).

A 12 volt, 3 watt zener diode must be installed on the 1250-1 terminal board instead of the link (or in the D3 position). This drops the panel 24V supply to the 12V required by the transmitter.

The defect sounder should be mounted where it is most likely to attract attention. This may be in either the FP4000, or the Transmitter box, or some other suitable location.

The Telecom line should be wired, but not finally connected to the Controller until after initial testing.

4.3.5 Other

A range of voltage-free relay and switch contacts are available for the purpose of remote connecting the Vigilant FP4000. Individual connection arrangements should be designed for specific requirements on a case-by-case basis. The contacts available are listed below. Ratings for each set are detailed in the Specifications in section 2.9 of this manual.

4.3.5.6 Other (Cont'd)

DEFECT : Duplicated changeover relay contacts. NC and C contacts screw terminal.
NO contacts vero pin ('DA') and pad ('DB').

FIRE : Duplicated changeover relay contacts. NC and C contacts screw terminal.
NO contacts vero pin ('FA NO') and pad ('FB NO').

BRIG TEST : Duplicated changeover switch contacts. NC and C contacts screw terminal. NO contacts pads ('BTA' and 'BTB').

BRIG ISOLATE : Duplicated changeover switch contacts.
NC and C contacts direct screw terminal. NO contacts via connector J2 to screw terminal (straight through by use of 1864-19-2 PCB Assembly with diodes both linked out).

The reader is referred to the following drawings for more information:

1888-5-1	Main PCB Circuit
1864-19	Mk X, Benefis Isolate PCB Circuit
1864-20	SAFE Test Jack PCB Circuit

FIG 4.3.5.11 MK VIII FP4000 WIRING

4.3.6 Ancillary Connections

4.3.6.1 Ancillary Outputs

The Vigilant FP4000 Master and RZDU provide the following ancillary outputs:

NORMAL-
DEFECT-
FIRE-
ANCIL 1-
ANCIL 2-
ANCIL 3-
ANCIL 4-

Also provided are +VANC (+24V via the Ancillary isolate switch and fuse F3) and 0V.

These outputs drive low (open collector - see section 2.9)
when active and may be used to drive ancillary equipment either directly or via interposing relays. The maximum loading on the +VANC terminals is 1 Amp.

Current drawn from +VANC must be taken into account in the battery capacity calculations.

See fig 4.3.6.1 for an example of ancillary output wiring.

FIG 4.3.6.1 ANCILLARY OUTPUT WIRING (TYPICAL)

4.3.6.2 External Defect Input

The Vigilant FP4000 Master and RZDU provide an External Defect screw terminal input as standard. A low on this input (below 5V, see section 2.9) will cause the Controller to go into the Defect state.

The External Defect input is designed to facilitate the use of an external battery monitor. This input allows an external battery monitor to generate a defect on battery low. This would be the case, for instance, if the evacuation supply was an external 24V battery with separate charger and voltage monitor. A suitable battery monitor is the 1616-29 (PA0278). A typical wiring diagram for this unit is shown in fig 4.3.6.2a below. The current drawn by the monitor must be taken into account in the battery capacity calculations.

An alternative battery monitor system for remote batteries is shown in Fig 4.3.6.2b.

The external battery monitor is usually mounted in a convenient place inside the FP4000 cabinet. A pushbutton switch should be wired as shown to allow resetting of the external battery defect LED on the battery monitor. This pushbutton should also be mounted in a convenient location inside the FP4000 cabinet.

NOTE: The 0V tie may be omitted if complete isolation of the battery is required. In this case the "Charger Inhibit" will not work.

FIG 4.3.6.2a EXTERNAL BATTERY AND MONITOR

FIG 4.3.6.2b REMOTE BATTERY AND MONITOR

4.3.6.3 Local Defect Buzzer

In the case of local configuration (no Brigade connection, LK1 installed). The FP4000 internal buzzer sounds if the Controller is in the defect state. In situations where this would not be sufficiently loud to attract attention, provision has been made for the connection of an external (defect) sounder. In the case described, the Brigade Connection Defect relay contacts are closed for 0.5 seconds every 20 seconds to drive an external sounder. A typical wiring diagram for a local defect buzzer is shown in fig 4.3.6.3 below. The buzzer should be located where staff are likely to hear it and it should be clearly labelled ’FIRE ALARM DEFECT BUZZER, ADVISE FIRE ALARM SERVICE PERSONNEL’ or equivalent approved legend.

FIG 4.3.6.3. LOCAL DEFECT BUZZER WIRING

4.3.6.4 Serial Port

The Vigilant FP4000 has been provided with a serial port to enable future connection to other equipment. The operation of the serial port is supported in V1.00 software only to the extent that it can be configured as the printer port.

The serial port connection is to a 12 way 0.156IN connector, J6. This connector is pin-compatible with 1616-101 series VICNET modems and the CMOS/RS232 Interface 1862-22 (PA0445).

Pin allocations and signal descriptions for J6 are given in table below. All signals are 5V logic levels.

The current drawn by a modem must be taken into account in the battery capacity calculations.

A 1616-101 VICNET Modem may plug on directly.

If a serial printer is to be connected to this port, an 1862-22 RS232 interface should be used.

Pin	Signal Name	Signal Description
1	+V	+12V or +24V supply via LK3 (see section 4.4.2.4)
2	+5V	+5V supply
5	POL	Polarising key
7	RxD	FP4000 Receive Data. Pullup (100k to +5V). Connected to U6-10.
8	TxD	FP4000 Transmit Data. Connected to U6-11.
9	RTS-	Request to Send (active low). Used to key modem on. Connected to U6-12.
10	DCD-	Data Carrier Detect (active low). Signal from modem indicating data presence. Pullup (100k to +5V). Connected to U6-7.
12	0V	Ground

TABLE 4.3.6.4.1 SERIAL PORT SIGNAL DESCRIPTION

4.3.6.5 Programmer Port (Master)

The FP4000 Master has been provided with a programmer port to enable a programming terminal to be plugged in so that the system can be software configured. Refer to Programming and Diagnostic Manual for details.

The programmer port connection is to a 4 way 0.156 in connector J9. Pin allocations are as follows:

Pin	Signal Name	Description
1	0V	Signal 0V
2	-	Polarising position
3	Tx	Transmit Data
4	Rx	Receive Data

All signals are 5V logic levels.

A loom is available for the connection to a 9 pin D connector as used on Toshiba T1000 laptops and many similar computers (LM0041).

4.3.6.6 Display Extensions

The FP4000 system can have up to a maximum of 33 display boards daisy-chained together using one standard display cable per board. Every system has one 1888-6-1 display board (with the common indicators fitted). This is always wired so that it is the furthest display board away from the main board. In the case where the 1888-6-1 is the only display board then it is connected directly to the main board. The Master is shipped with one 1888-6-1 display board fitted.

4.3.6.6 Display Extensions (Cont'd)

To extend a system, turn off the power unplug the 1888-6-1 display board and remove it from its 4 white plastic mounting fixtures. Remount it in an extender cabinet in the furthest away position. Up to 4 display boards can be fitted in an extender cabinet.

In its place (beside the main board) fit an extender display board 1888-6-2. Other extender display boards may be fitted 'between' these two boards to make a larger system.

All display boards are interconnected with a standard display cable. The connectors have polarising keys and only fit in one position.

On systems with more than 10 display boards it is necessary to daisy-chain the supply to the boards to minimise voltage drops across supply tracks on the display boards. Connector J8 is used. Use $1mm^2$ wire. Current drawn by display boards must be taken account of, especially the festoon lamp. Do not use more than one festoon lamp per cabinet. Remove all extras.

Refer to 4.3.6.6.1 and 4.3.6.6.2 for examples of how to wire an extended system.

FIG 4.3.6.6.1 DISPLAY EXTENSIONS (EXAMPLE 1)

FIG 4.3.6.6.2 DISPLAY EXTENSIONS (EXAMPLE 2)

4.3.6.7 Mimic Outputs

The FP4000 has one mimic output for each of the following states:

- NORMAL
- COMMON DEFECT
- COMMON ALARM
- 16 ZONE ALARM

These outputs are implemented on the display boards. Display board 1888-6-1 has all of the above outputs available. The extender display board 1888-6-2 has only the 16 ZONE ALARM output available.

Also provided are +V and 0V.

These outputs are identical and drive low for 50mS every 500mS (open collector - see section 2.9) and may be used to drive indicators on a custom mimic panel. The maximum loading on each mimic output is 200mA. External daisy-chained power wiring to J8 is required for systems which use mimic outputs.

Display boards, when shipped, are not fitted with mimic connectors J3,4,5,6,7. These must be fitted as necessary.

Current drawn by mimic outputs must be taken into account in the battery capacity calculations. See Fig 4.3.6.7.1 for an example of mimic output wiring.

FIG 4.3.6.7.1 MIMIC OUTPUT WIRING

4.3.6.8 RZDU Port

Up to a maximum of 8 RZDUs can be connected to a Master via a 4-wire connection. They may be star wired to the Master, daisy-chained or a combination of both.

The RZDU port connection is to a 4-way screw terminal J4. Pin allocations are as follows:

Pin	Signal Name	Description
1	+VRZDU	Non-preferred supply
2	0V	NP Supply/Data 0V
3	Tx	Transmit Data
4	Rx	Receive Data

The RZDU has an on-board battery charger and will normally be fitted with its own batteries, therefore its power is not normally supplied by the Master (though it can be, via pins 1 and 2, in the non-preferred arrangement).

In the preferred arrangement wiring between Master and RDZUs will be 3 wire (communications only). See Fig 4.3.6.8.1.
In the non-preferred arrangement where power is supplied by the Master, two 2-core TPS cables will be required, the Tx, Rx pair being 1mm^2 and the +VRZDU, 0V pair is calculated (see section 3.7).

If in special cases isolated signalling between Master and RZDU is required (e.g. via a modem) an earth wire between pin 2 of the "AC" molex connection (panel 0V) to the mains earth point in the RZDU should be installed (this is normally omitted to prevent multiple earthing of the electronics).

FIG 4.3.6.8.1 RZDU WIRING

4.3.6.9 Defect Buzzer Cancel Input

The FP4000 Master and RZDU provide a Defect Buzzer Cancel screw terminal labelled Def Buz Can-. Switching this input below 5V cancels the internal and external local defect sounders. Refer to Fig 4.3.6.9.1.

4.3.6.10 External Panel Reset Input

The FP4000 Master and RZDU provide an External Panel Reset screw terminal labelled Panel Res-.

Switching this input below 5V resets the panel and is equivalent to pressing the internal panel reset button. Refer to Fig 4.3.6.10.1.

4.3.6.11 External Sounder Output

The FP4000 Master and RZDU provide an External Sounder Output screw terminal labelled Ext Sndr-.

This output drives low (open collector - see section 2.9) when active and may be used to drive an external sounder, in synchronization with the internal sounder, either directly or indirectly via an interposing relay.

Current drawn must be taken into account in the battery capacity calculations. Refer to Fig 4.3.6.11.1.

FIG 4.3.6.9.1 DEFECT BUZZER CANCEL

FIG 4.3.6.10.1 EXTERNAL PANEL RESET

FIG 4.3.6.11.1 EXTERNAL SOUNDER WIRING

4.3.7 Ancillary Outputs from ARR

Small loads (max 600mA) may be powered from any one ADR. These loads must be connected via one of the ARR relays as follows and cannot be monitored.

The 24V supply must be taken from the solder pad of Lk1 (RL2) or Lk5 (RL4) nearest to the centre of the board, or in case of using RL1 fit Lk1 RL3 fit Lk5.

This supply point is isolated from the loop by diodes. The 0V may be connected directly to the 0V terminal of the loop.

Relays Locking On

It is possible, although unlikely that an ARR Relay may lock on in the operated position. This can happen if you accidentally short out the power supply tracks on a responder for instance. To force a relay back to its normal position follow the procedure below :

To turn RL1 off short D25 band (cathode) to zero V.
To turn RL2 off short D26 band (cathode) to zero V.
To turn RL3 off short D27 band (cathode) to zero V.
To turn RL4 off short D28 band (cathode) to zero V.

FIG 4.3.7.1 ANCILLARY ARR OUTPUT (CAN ONLY BE UNMONITORED)

4.3.8 To Connect Logging Printer to an FP4000

To connect a logging printer to an FP4000 either for permanent connection or for a demonstration proceed as follows :

1. Make sure the FP4000 programming facility is logged out.

2. The serial port board inside the OKI Microline 172 printer can be used with same settings as for T1000 for a simple demonstration. For a permanent connection, or for a critical demonstration the correct serial port set-up is actually :

   SW1 All ON except 4 and 7
   SW2 All ON except 1 and 8

   (If the printer forgets characters or gets lines mixed up, then you need to change the settings).

3. Plug the cable between FP4000 and printer and off you go (i.e. generate an event and the printer should print it).

4.4 HARDWARE CONFIGURATION

This section refers to hardware configuration only. Software configuration of the system can be done through the programming terminal and the reader should consult the Vigilant FP4000 Programming and Diagnostic Manual.

4.4.1 Responders

NOTE: This MUST NOT be done while the Responder is powered up. Responder configuration is determined at power up only.

4.4.1.1 ATR

The address of the responder is first determined (ref to section 3) and then the responder is configured to this address by selectively cutting out diodes. These 7 diodes are labelled ADDRESS WEIGHTING 1, 2, 4, 8, 16, 32, 64 on the PCB. For example, to select address 37, cut out diodes 1, 4, 32 (1 + 4 + 32 = 37).

NOTE : If ATR is of old stock (pre July 1990) and R67 is installed on the board SNIP IT OUT!

4.4.1.2 ASR

Configure the address as in the ATR above. In addition, the type of end of line device must be determined (refer to section 3.4). If an active end of line is to be used then no further action need be taken.

If a resistor end of line is to be used, then diodes D32-35 and resistors R112-115 must be cut out for circuits
1 - 4. See table below:

Note : Responder must be powered down.

For Circuit	Remove
1	D32,R112
2	D33,R113
3	D34,R114
4	D35,R115

Note : Responder must be powered down.

See next page for use of an A2400 beam smoke detector with an ASR.

Use of A2400 Beam Smoke Detector

An A2400 detector pair can be used with an ASR provided that the circuit it is connected to is modified as per the following:

1. Fit a 120E resistor across the 301E resistor R62 (circuit 1), R79 (circuit 2), R90 (circuit 3) or R101 (circuit 4).

2. Fit a 100E resistor across the 330E resistor R112 (circuit 1), R113 (circuit 2), R114 (circuit 3), R115 (circuit 4).

3. Fit label LB0284 to the top of the ASR pcb and tick the box (or boxes) showing which circuits have been modified.
   Care should be taken when fitting the resistors. Ensure that the resistor leads or solder do not short to adjacent tracks or components.

The A2400 modification kit contains one label and 4 of each of the resistors allowing up to all four circuits to be modified.

Colour code	100E	brown, black, brown
	120E	brown, red, brown

WARNING: The A2400 requires a supply voltage of greater than 18V. As the ASR drops 1V from line to detector, there is very little allowable loop drop at a battery voltage of 19.2V.

For all systems a voltage booster will be required. Contact Head Office.

An active end of line must be used on A2400 detector circuits.

4.4.1.3 ARR

Configure the address as in the ATR above. In addition, if the ARR is to be used for monitored evacuation, then fit wire links as follows:

For evac circuit 1 (uses relays RL1 and RL2),
fit LK1, 2, 3, 4

For evac circuit 2 (uses relays RL3 and RL4),
fit LK5, 6, 7, 8

Note : If ARR is of old stock (pre July 1990) and R67 is installed on the board SNIP IT OUT!

4.4.2 Master and RZDU Links and Tabs

See Figure 4.4.2.1 for location of links.

4.4.2.1 Local (LK1)

The Local link, LK1, must be installed for a local Master only; that is one that is not remotely connected. The installation of this link disables the Brigade signalling and isolation switch and enables local defect sounding.

This link must not be installed for a remotely connected Master. The RZDUs do not have this link.

4.4.2.2 Non-Latching (LK2)

The Non-Latching link, LK2, labelled NLT is installed by test personnel in order to configure the Master for non- latching test operation (see section 5.12). The link is door interlocked and must not remain installed in normal operation. The RZDUs do not have this link.

4.4.2.3 Evacuation Supply (R59,61)

The Evacuation Supply link resistors, R59,61 are installed in the Master only. These supply +24V via fuse, F2 and 0V, to the evacuation relay common terminal. These links must be altered if an external evacuation supply is used (see section 4.3.4 for details).

4.4.2.4 Serial Port Supply (LK3)

The Serial Port Supply link, LK3 selects between +12V (left) and +v (right). The Master is shipped with the link hardwired in copper in the +12V position. The RZDU and responders do not have this link.

+12V This is the default (as shipped) position and is suitable for connection of a VICNET modem (1616-101-3) or an RS232 Interface (1862-22) to J6.

+v This position is for connection of 24V transmitting devices and is selected by cutting the copper between left and centre holes and soldering in a hardwire link between the centre and right holes.

4.4.2.5 Programmer Port Baud Rate (LK13, LK14)

There are 2 baud rate select links LK13, LK14. The Master is shipped with neither link fitted (9600 baud).

To select 300 baud, solder a wire link across LK13 (LK14 not linked).

To select 1200 baud, solder a wire link across LK14 (LK13 not linked).

The RZDUs do not have these links.

4.4.2.6 Evacuation Clamp (R60)

The Evacuation Clamp link resistor, R60, is installed on the Master as standard. This connects a 36V earth- referenced snubber circuit to the switched evacuation load terminals (C/E+, E/E-). This link may need to be removed for some types of evacuation loads (see section 4.3.4 for details). The RZDUs do not have this link.

4.4.2.7 Memory Select LK6, 8, 9, 10, 11, 12

These links are implemented on the Master and RZDU to enable different memory combinations and expansion for future applications.

LK6 Fitted when shipped. Memory select $0800 - $0FFF signal.

LK8,9,10 Fitted in NORM position when shipped. Select other (EXP) position only if fitting memory expansion board.

LK11 Fitted in C256 position when shipped. Select other (C513) position if '4 pages of 16K ROM' chip fitted in future to expand ROM from 32K to 64K.

LK12 Not fitted when shipped. Fit LK12 only if fitting memory expansion board.

4.4.2.8 Lamp Test (PB7,8)

These tabs are fitted to Master and RZDU to test that all the indications are working correctly. Shorting the 2 tabs (PB7,8) labelled lamp test will make the LEDs come on for a time then off, on, off, etc. For large systems the display boards are switched on in stages so that not all indications are illuminated at the same time. Removing the short terminates the test.

4.4.2.9 RZDU Address (A0,1,2)

These links are used to configure the RZDU address on an RZDU. They are not used on a master and are clipped out when shipped.

To configure an RZDU address use the table below. Note that the maximum number of RZDUs that can be wired to a Master is 8 and each must have its own unique address in the range 1 to 8 inclusive.

RZDU	Clipped Out	Fitted
1	-	AO,A1,A2
2	A0	A1,A2
3	A1	A0,A2
4	A0,A1	A2
5	A2	A0,A1
6	A0,A2	A1
7	A1,A2	A0
8	A0,A1,A2	-

4.4.2.10 E2INIT

To initialise the system connect the E2INIT pin to 0V with a clip lead. Power down, wait a few seconds and power up. Remove the clip lead. The system will take 1 to 2 minutes to initialise.

4.4.2.11 EEPROM (Configuration Memory) Write Enable (lk15)

This link is installed on the Master as standard from Issue A onward.

It enables to write or alter the program in the master via the programming terminal, and should be removed after commissioning of the system so that ’accidental’ changes cannot occur.

If the program has to be changed this link must be put back in.

FIG 4.4.2.1 LINKS, INDICATORS AND CONTROLS

4.4.3 Potentiometers

There are 5 potentiometers on the Master PCB, 3 on the RZDU and one each of the 3 types of responders. These are factory preset to values determined by the relevant standards.

DO NOT ADJUST THE POTENTIOMETERS

Adjustment of the potentiometers in the field will NOT cure any problems, it will only hide real problems which may prevent the signalling of a genuine fire.

POTENTIOMETERS MUST ONLY BE SET IN THE FACTORY

4.4.4 Brigade Signalling (Mk X)

The Mk X Modulator (1530-1) and Interface PCB (1864-19-1) require configuration. All other transmitting devices require no special configuration. The Mk X interface can only be adjusted when the Controller is operating, however the procedure is described here for convenience.

Place a milliammeter in series with each leg of the line in turn, and with the Controller normal and the Brigade Isolate switch normal, adjust R1 (A leg) and R7 (B leg) on the Modulator for 2.8mA line current.

Isolate the Brigade Isolate switch. If Isolate Zone signalling is required, adjust the potentiometers on the 1864-19-1 PCB for 3.5mA line current. If Isolate Zone signalling is not required, adjust the potentiometers on the 1864-19-1 PCB fully clockwise and cut both links on that PCB (line current approx 1mA).

4.5 POWER UP AND INITIAL TESTING

4.5.1 Power Up and Normal

When the Master is installed and configured with all links, the responders have been wired, the detector circuits have been connected to responders, RZDUs, (if any) and all other wiring is complete, the FP4000 system is ready for power-up and initial testing. The initial testing should be done on battery power so the switchboard mains fuse should remain disconnected. The Telcom line should not be connected to the Brigade signalling device (if fitted) yet.

Put the Self-test, Brigade Isolate and Brigade Test switches on the PCB into the normal (down) state. Put the Ancillary Isolate and Silence Alarms switches in the up position. Check that other Ancillary equipment is disconnected or unpowered. Fit a wire jumper lead between E2INIT and 0V. Connect fully charged battery observing correct polarity (note fuse will blow if battery polarity wrong). Watch for warning signs (eg, smoke, fuses glowing).

Remove jumper lead. The system should begin its initialisation sequence: the self test indicator will flash for a time and then the top row of lights on the display board will flash for some time and then stop. When the self test indicator goes out press Reset. Only the Silence Alarms and Ancillary Isolate indicators should be on. Now put the two internal switches in the normal position. The green normal light on the display board should start flashing.

4.5.1 Power Up and Normal (Cont'd)

If this is not so use section 5.6.2 to find out what abnormal condition is being indicated and correct the problem.

The operation of the RZDU(s) can be checked by switching (say) the Master Ancillary Isolate switch on and checking that the indicator status is transferred to the RZDU(s).

4.5.2 Initial Tests

Initial testing should follow the format of the commissioning test, section 6.1, however some aspects should be tested as the system is installed (eg, cables).

The mains supply should be connected and the operation of the battery charger checked (27V across battery, Mains indicator on).

When other functions are correct the Telecom line should be connected and the Brigade signalling tested (see section 4.4.4 for setting up MK X).

All aspects of operation should be thoroughly tested before final acceptance testing.

5. OPERATION

5.1 DETECTOR CIRCUITS

Detector circuits may be either thermal, smoke or combined type. The operation of these types is quite different.

A thermal circuit uses detectors with normally closed contacts and an end-of-line resistor. Connection is to an ATR or ARR. The state of the detector line is sensed under software control. When the detector on a circuit opens, a fire or non-fire alarm condition is latched in software. Section 5.2 describes the fire condition. Should a thermal circuit go to a low resistance state, this is sensed and a defect condition is registered in software. Section 5.3 describes the defect condition.

A smoke circuit uses detectors with normally open contacts and an active or resistive end-of-line device. Connection is to an addressable smoke responder (ASR). Operation may be either gated or non-gated as configured with the plug in programming terminal. The gating can reduce the risk of false alarms.

A version of software is available which provides "combined" circuit operation on an ASR and allows both smoke detectors and thermal detectors on the same circuit and this is described further below.

In gated mode, when a detector on a smoke circuit closes, the interface detects the fact and starts an 8 second gating delay during which the detectors are reset. If the detector (or another on the same circuit) closes again during a further 45 second period, then an alarm is latched in software, otherwise the circuit returns to normal.

5.1 DETECTOR CIRCUITS (Cont'd)

If a circuit is configured in the non-gated mode (see programming and diagnostic manual), then that circuit goes into alarm immediately on the first detector closure.

The active end-of-line provides current pulses on the circuit, which are detected by the interface. If the circuit goes open these pulses will not be detected, and after 3 seconds a defect will be registered in software.
Re-application of these pulses will cancel the defect condition (the indication only is latched).

Smoke circuits may be gated or non-gated. Thermal circuits are always non-gated.

Groups of circuits can be mapped onto the same zone such that before the zone can go into alarm 2 circuits in the group must be in alarm. These groups are known as dual hit groups.

For more information on detectors refer to sections 2.3 & 2.4.

"COMBINED" CIRCUIT OPERATION
A special version of ASR software is available which has "combined" circuit operation.

Any of the four circuits may have any combination of smoke detectors, thermal detectors or manual call points, all on the same circuit. On a combined circuit, open circuit is always treated as instant alarm. Short circuit is either defect, or an instant alarm (if the call point option has been enabled for the circuit in programming at the panel).

The operation of smoke detectors on a combined circuit is as described previously, and may be either gated or non-gated, latching or non-latching.

5.1 DETECTOR CIRCUITS (Cont'd)

When a thermal detector operates it goes open circuit. On a combined circuit this is treated as instant alarm. For a circuit with an active end of line there is a delay of 3.5 seconds before the open circuit condition is detected. With a resistor end-of-line this delay is 0.6 seconds. The programming of a circuit as gated or non-gated does not affect the thermal detector/open circuit which is always instant alarm.

MANUAL CALL POINTS ON COMBINED CIRCUITS
When a manual call point is operated it goes open circuit which can be converted into a short circuit by a contact conversion module. On a combined circuit with a resistor end-of-line, a manual call point may be used directly as an open circuit is treated as instant alarm with a 0.6 second delay.

On a combined circuit with an active end-of-line, the delay to open circuit alarm is 3.5 seconds which, while acceptable for thermal detectors, is too long for manual call points. A contact conversion module must be used with each MCP, and the circuit programmed at the panel to enable the call point short circuit instant alarm option.

A combined circuit with a resistor end-of-line may have any combination of smoke detectors, thermal detectors, MCPs without contact conversion modules, (and MCPs with contact conversion modules if the software MCP option is enabled).

A combined circuit with an active end-of-line must not have MCPs without contact conversion modules, but may have any combination of smoke detectors, thermal detectors, and MCPs with contact conversion modules.

5.2 FIRE ALARM

When a fire circuit is sensed to be in the alarm state, either immediately or after a gating delay, the controller latches into the fire state. The evacuation relay turns on activating the alerting devices. If the controller is Brigade connected the fire relay will de-energise signalling a fire to the Brigade Signalling Device.

Fire indication is provided by both internal and external flashing red indicators. Separate indicators are provided for each zone in addition to one which indicates the fire state. Reference to these indicators and the index panel will tell the Brigade in which area of the premises the fire was detected. If the controller power fails, the normally energised fire relay will drop out sending a fire call via the Brigade Signalling Device. If power is restored, the fire and battery low indicators will be on but no zone indicators will be on.

To assist the Brigade at night, the index panel is illuminated from the rear when the controller is in the fire state.

If smoke detectors with indicators are fitted, the indicator of the detector which activated will be pulsed while the controller is in the fire state.

5.3 DEFECT

When a circuit is sensed to be in the defect state or the 21V on an ASR drops below 18V, or the external defect input is asserted, or the battery voltage is low, or processor operation is detected to be abnormal (watchdog or self-test), or an automatic test-fire fails, or there is an RZDU, LOOP, or EVACUATION defect, the controller will enter the defect state. If the controller is Brigade connected the defect relay will energise signalling a defect to the Brigade Signalling Device. If the controller is not Brigade connected the internal buzzer will sound and the defect relay will pulse.

Indication is provided by both internal and external flashing amber indicators. Separate internal indicators are provided for the individual zones, for battery low, loop defect, RZDU defect and evacuation defect.

The defect state and external indication is non-latching. If the source of defect is removed, the defect condition will be cancelled. The separate internal indicators, however, do latch to provide a historical record of defect sources. These may be cancelled by pressing the Panel Reset switch. The defect state and indications cannot be cleared by Panel Reset if the source of the defect is still present.

5.4 AFTER A FIRE ALARM

When the fire alarm from the Vigilant FP4000 has served its purpose, the signal to the Brigade may be stopped by operating the Brigade Isolate switch. The evacuation alerting devices may be silenced by operation of either the internal Silence Alarms switch or the external Silence Alarms keyswitch (Brigade Use Only).

If the detector which operated is resettable, then the system may be restored to normal by pressing the Panel Reset switch. For example, if the smoke has been cleared from the detector, and there is no fire damage to the circuit, then a smoke circuit may be reset this way.

In the case of non-resettable detectors, such as the VIC 1 detector, the activated detector must be replaced before the controller can be reset to normal. If the circuit cannot be restored immediately, it is suggested that the circuit be shorted out at the responder input terminals (a smoke circuit should be left open). Pressing the Panel Reset switch will then reset the fire state and leave the system in the defect state (buzzer will sound, if non- connected, when the cabinet door is shut).

After the fire state has been cleared, the Brigade Isolate and Silence Alarms switches should be returned to the normal positions. If the door is closed with any of these switches on, the buzzer will sound.

5.5 SELF-TEST

For service use, the Vigilant FP4000 may be put into a self-test mode of operation. To select this mode the Brigade Isolate or Brigade Test switch must be isolated or the local link (LK1) must be installed, and the Self Test switch must be switched to the Self Test position.

The controller will not go into the self test mode if any of the following conditions are present:

the Panel Reset switch is pressed

the controller is in the fire state

there are any circuit defect or alarm indications

the battery voltage has gone low during the 1 hour charger inhibit period and the 1 hour period has not elapsed (charger indicator flashing - can be reset with Panel Reset)

the Controller is performing an automatic test-fire

If the qualifying conditions are still present when the preventing conditions are removed, the controller will go into the self-test mode immediately. Other conditions may be present and the self-test will still operate (eg, battery low), however the defect indication from this may confuse the operator.

5.5 SELF TEST (Cont'd)

On entering Self Test (ST) mode the Controller performs 4 main functions:

Each Responder is put into ST mode

Each RZDU is put into ST mode

The Controller begins an internal memory test

The Controller begins a sequence of Brigade signalling: DEFECT, FIRE, NORMAL, DEFECT, FIRE, NORMAL, ...etc.

Note that ST at each Responder, RZDU and Master Controller is independent of all other self tests, taking place at the same time (though asynchronously).

The yellow SELF TEST indicator on the Master circuit board flashes until the test is complete. Maximum time for a test is 60 seconds. The indicator turns on steady when the test has passed or flashing rapidly (buzzer pulsing) if any test fails. (Refer section 5.6.2).

Every responder tests each of its 4 circuits in turn by applying a test-defect and a test-fire to each circuit sequentially. The test applied to any circuit must be seen to cause the expected change of state within 3.5 seconds. When the test signal is removed the circuit under test must return to normal with 0.5 seconds or the test fails.

5.5 SELF TEST (Cont’d)

When all four circuits have been tested the responder tells the master and repeats the self test cycle continuously (1,2,3,4,1,2,...) until either the test fails or the test is stopped by panel reset at the master.

If ST fails at any responder then ST is halted at that responder and maintains any test signals applied to the circuit under test. During self test mode the zone alarm and defect indicators at the master, function as for normal operation. In addition however a zone defect indicator will latch on flashing if a corresponding circuit under test failed to detect either the test-fire or the test-defect condition. Pressing panel reset aborts the self test, however the test will restart if the qualifying conditions are still present.

The RZDU, like the Master, performs an internal memory test. The RZDU Self Test indicator (local indication only) flashes to show that a test is in progress. If the RZDU test passes, the indicator will come on steady. If a ST fails at the RZDU the indicator will flash rapidly, and the buzzer will pulse rapidly. The normal indicator will also flash rapidly to indiate internal memory failure.

If any ST fails then the master ST indicator flashes rapidly and the buzzer sounds rapidly. If the NORMAL indicator is also flashing rapidly, this means that internal memory has failed at the master.

5.5 SELF TEST (Cont'd)

The signalling of DEFECT, FIRE or NORMAL at the Master Controller may be suspended at any time by returning the self-test switch to normal. This has no affect on the progress of the self-tests at responders or RZDUs which will continue independently.

To exit ST mode, the self-test switch should be returned to the normal position. Pressing panel reset will then return the FP4000 to normal operating mode.

5.6 INDICATORS

5.6.1 External Indicators

There are 19 external indicators mounted on the master display board. These are located through the controller index panel on which they are labelled. The indicators and colours are as follows:

1	Normal	(green)
1	Common Defect	(amber)
1	Common Fire	(red)
16	Zone Alarm	(red)

All indicators are solid-state LED types and are flashed when they are illuminated. The 16 Zone Alarm indicators are labelled according to installation requirements which may vary from place to place. Their function remains the same, however, to indicate an alarm state on the individual zones.

The external indicators have identical functions to the internal indicators with the same labels. These functions are described in section 5.6.2 below. The Common Defect, Normal, Fire and the 16 Zone Alarm indicators have mimic output drivers (connectors J3 to J7 when fitted). These can be used to drive remotely mounted indicators (eg, on a mimic diagram).

5.6.1 External Indicators (Cont'd)

The internal index illumination bulb operates to back-light the index panel when the controller is in the fire state. The bulb mounts in clips on the display board. To replace the bulb the display board must be released from its mounting. The bulb is a 24V, 3 watt, 6x31 'festoon' type.

The bulb's illumination in the fire state is inhibited by the operation of any of the master or RZDU Silence Alarms switches. The index illumination bulb is also turned on by lamp test or by operation of Trial Evacuation switch at the master or at any RZDU. The bulb operates regardless of the cabinet door position.

5.6.2 Internal Indicators

There are 38 internal indicators mounted on the display pcb plus an index illumination bulb. There are 9 internal indicators mounted on the Master/RZDU main board. As a power-conserving measure, some internal indicators are extinguished when the cabinet door is closed. The function of each indicator is described below.

NORMAL

The Normal indicators (green, labelled 'NORMAL' external and internal) are on flashing regularly when the controller is in the normal operational state. They
are illuminated regardless of the cabinet door position.

The Normal indicators are off if:

the controller has lost all power

the controller is in Defect or Fire

the Brigade Isolate switch is isolated

the Ancillary Isolate switch is isolated

any of the Silence Alarm switches are in the silence position

the Brigade Test switch is in test

the Self Test switch is in test

5.6.2 Internal Indicators (Cont'd)

any Trial Evacuation switch is on at master or RZDU

the Defect Buzzer Cancel input is asserted (low)

the Panel Reset switch is pressed

the Panel Reset input is asserted (low)

the non-latching test link is installed

the controller is self-testing

processor operation has ceased (watchdog active, indicator on)

the latched watchdog indicator is on

no responders are connected

any foreign responders or RZDUs are detected

The Normal indicators are on steady during lamp test. They flash irregularly together with the self-test indicator and buzzer if a processor internal memory test (part of self-test) fails. They flash rapidly during EEPROM write (system initialisation).

5.6.2 Internal Indicators (Cont'd)

DEFECT

The Defect indicators (amber, labelled 'DEFECT' external and 'COMMON DEFECT' internal) indicate that a defect is present in the system. They are illuminated regardless of the cabinet door position.

The Defect indicators are on flashing if:

any thermal circuit is low resistance
(zone defect indicator also on)

any smoke circuit is high resistance or short circuit (not MCP circuits) or active
end-of-line pulses are no longer received
(zone defect indicator also on) the 21V supply at any ASR is low (zone defect indicators also on)
there is a responder loop defect (loop defect indicators also on) any External Defect input is asserted low any External Silence Alarms switch is operated any display board has failed or is unplugged there is a monitored evacuation circuit fault (evacuation defect indicators on also)

5.6.2 Internal Indicators (Cont'd)

the internal memory test has failed any RZDU has failed or is disconnected alarm processing has been stopped using the programming terminal an EEPROM write error has occurred a Defect is signalled as part of self test there is defect at any RZDU the battery voltage is low (battery low indicator on also) the battery voltage has gone low during the 1 hour charger inhibit period and the 1 hour period has not elapsed (charger back on, battery voltage may now be normal, charger indicator flashing also) the most recent automatic test-fire failed (one or more zone defect indicators will be flashing corresponding to the circuits which failed the test).

5.6.2 Internal Indicators (Cont'd)

The Defect indicators are on steady:

during lamp test

if processor operation has ceased (watchdog active, indicator on, buzzer sounding)

The Defect indicators flash rapidly during EEPROM write (system initialisation).

FIRE

The COMMON Fire indicators (red, labelled 'FIRE' external and 'COMMON FIRE' internal) indicate the fire state in the system. They are illuminated regardless of the cabinet door position.

The Fire indicators are on flashing if:

any fire circuit is in alarm (ie, thermal circuit high resistance, or non-gated smoke circuit low resistance, or gated smoke circuit low resistance during 45 second gating period; zone alarm indicator also on)

any fire zone has been in alarm since the controller was last reset (zone fire indicator also on)

5.6.2 Internal Indicators (Cont’d)

the battery voltage is or has been very low since the controller was last reset (battery low indicator on)

fire is signalled as part of self test

The fire indicators are on steady during lamp test. They flash rapidly during EEPROM write (system initialisation).

ANCILLARY ISOLATE

The Ancillary Isolate indicator (yellow, labelled ’AI’ internal only) indicates that all ancillary outputs including those at ARR responders, are isolated.

The Ancillary Isolate is on flashing if Anc Isolate switch is in the isolate position. It is on steady during lamp test.

COMMON NON-FIRE ALARM

The Common Non-Fire Alarm indicator (yellow, labelled ’NF’ internal only) indicates that one or more non-fire zones are in the alarm state.

The Non-Fire Alarm indicator is on flashing if any non-fire zone is in alarm (red zone alarm indicator also on). It is on steady during lamp test.

5.6.2 Internal Indicators (Cont'd)

SILENCE ALARMS

The Silence Alarms indicator (yellow, labelled 'SA' internal only) indicates that evacuation sounders have been silenced.

The Silence Alarm indicator is on flashing:

if either of the silence alarms switches at the master is on

The Silence Alarms indicator is on steady:

if any RZDU silence alarms switch is on.

The Silence Alarms indicator is on steady during a lamp test.

5.6.2 Internal Indicators (Cont'd)

ZONE ALARM

The 16 Zone Alarm indicators (red, with installation-specific index labels external and labelled 'ALARM Z n' internal) indicate alarm states (fire or non-fire) on their corresponding zones. They are illuminated regardless of cabinet door position.

A Zone Alarm indicator is on flashing if:

a circuit mapped to that zone is in alarm (ie, thermal circuit high resistance, or non-gated smoke circuit low resistance, or gated smoke circuit low resistance during 45 second gating period)

a circuit mapped to that zone has been in alarm since the controller was last reset (unless circuit and zone are tracking)

(Note: the common fire indicator will be off if only non-fire zones are in alarm; the Common Non-Fire indicator will be on instead).

The Zone Alarm indicators are on steady during lamp test.

5.6.2 Internal Indicators (Cont'd)

ZONE DEFECT

The Zone Defect internal indicators (yellow, labelled 'DEFECT Z n') indicate defect states on their corresponding zones. They are illuminated only while the cabinet door is open.

A Zone Defect indicator is on flashing if:

any responder circuit mapped to that zone, is in the defect state

ie, the corresponding circuit, configured thermal, is low resistance, or

the corresponding circuit, configured smoke, is high resistance, or finds end-of-line pulses are no longer received, or has its 20V supply low, or is short circuit (not MCP circuits),

or: the corresponding circuit has been in one of the two conditions described above since the controller was last reset, or

automatic test-fire has failed for a circuit mapped to that zone

The Zone Defect indicators are on steady during lamp test.

5.6.2 Internal Indicators (Cont'd)

WATCHDOG

The Watchdog internal indicator (yellow, labelled 'W-DOG') indicates operation of the processor watchdog. It is illuminated steady if the processor watchdog has activated since the panel was last reset, and has failed twice to restart the processor within the following 10 seconds. The processor may or may not be operating if this indicator is on. If the processor is not operating the controller is forced into a defect state and the buzzer is sounded continuously. The Watchdog indicator operates regardless of the position of the cabinet door and is not affected by lamp test.

LOOP DEFECT (Master Only)

The Loop Defect internal indicator (yellow, labelled 'LOOP DEF') indicates the responder loop defect condition. It is only illuminated when the cabinet door is open.

The Loop Defect indicator is on flashing if:

loop power fail was detected at the master

any responder power relay is open

there is a monitored relay defect

any responder is in scan fail

there is a communications break on any channel for any responder in a dual loop system.

5.6.2 Internal Indicators (Cont'd)

The Loop Defect indicator is on steady:

during lamp test

if a foreign responder has been detected.

The Loop Defect indicator flashes rapidly for approximately 30 seconds after powerup until full responder communications is established.

POLLED (RZDU Only)

The Polled internal indicator (green, labelled 'POLLED') flashes each time an RZDU is polled by the Master. It is only illuminated when the RZDU door is open. The Polled indicator is on steady during lamp test.

RZDU DEFECT (at Master)

The RZDU Defect internal indicator (yellow, labelled RZDU DEF') indicates Remote Display defects. It is only illuminated when the cabinet door is open.

The RZDU Defect indicator is on flashing if:

there is a defect condition at any RZDU

there is a defect in any monitored aspect of
the RZDU communications link

5.6.2 Internal Indicators (Cont'd)

The RZDU Defect indicator is on steady:

during lamp test

if any foreign RZDU is detected.

RZDU DEFECT (At RZDU)

The RZDU Defect indicator is flashing if at that RZDU:

the External Defect input is asserted (low)

there is a display fault (Fault indicator also on steady)

the battery voltage is low (Battery low indicator also flashing)

the battery has gone low during the 1 hour charger inhibit period and the 1 hour period has not elapsed (charger back on, battery voltage may now be normal, charger indicator flashing).

The RZDU Defect indicator is on steady during lamp test.

5.6.2 Internal Indicators (Cont'd)

EVACUATION DEFECT

The Evacuation Defect internal indicator (yellow, labelled 'EVAC DEF') indicates a defect in the monitored evacuation outputs. It is only illuminated when the cabinet door is open.

The Evacuation Defect indicator is on flashing if:

current does not flow through the master monitored evacuation circuit when evacuation is switched on

current flows through the master monitored evacuation circuit when evacuation is not switched on

the master monitored evacuation circuit is open circuited while evacuation is switched off

the master monitored evacuation circuit is short circuited while evacuation is switched off

the master evacuation relay did not operate when evacuation is switched on.

The Evacuation Defect indicator is on steady:

if any of the above occurs on a monitored ARR evacuation circuit

during lamp test.

5.6.2 Internal Indicators (Cont'd)

BATTERY LOW (Master or RZDU)

The Battery Low internal indicator (yellow, labelled 'BATT LOW') indicates the battery low condition. It is only illuminated when the cabinet door is open.

The Battery Low indicator is on flashing if:

the battery voltage is below the battery defect voltage of 24.4V (defect indicator also on)

the battery voltage has been below the battery defect voltage since the panel was last reset.

The Battery Low indicator is on steady during lamp test.

5.6.2 Internal Indicators (Cont'd)

CHARGER (Master or RZDU)

The Charger internal indicator (red, labelled 'CHARGER') indicates the state of the battery charger and timer.
It is only illuminated when the cabinet door is open.

The Charger indicator is on steady:

during lamp test

during the charger 1 hour inhibit period provided the battery voltage remains above the battery low voltage.

The Charger indicator is on flashing for the remainder of the charger 1 hour inhibit period if the battery voltage has dropped below the battery low voltage during the inhibit period (controller in defect also for this period).

5.6.2 Internal Indicators (Cont'd)

SELF TEST (Master or RZDU)

The Self Test internal indicator (yellow, labelled 'SELF TEST') indicates the progress of a self test. It is only illuminated when the cabinet door is open.

The Self Test indicator is on flashing:

if there is a self test in progress and it has not yet passed.

It is on steady:

during lamp test

if a self test has passed.

The Self Test indicator is on (interrupted rapid flash) if a self test has failed (Buzzer also pulsing rapidly). The Self Test indicator is on (continuous rapid flash) if there is a system re-initialization in progress.

MAINS (Master or RZDU)

The Mains internal indicator (green, labelled 'MAINS') is illuminated steady when the mains supply is present. This indicator operates regardless of the cabinet door position and is not affected by lamp test. If a fault has caused the protective PTC thermistor to operate, the Mains indicator will be off even though the mains is on. In this case leave the mains supply off for 5 minutes to reset the thermistor.

5.6.2 Internal Indicators (Cont'd)

FAULT (Master)

The Fault internal indicator (yellow, labelled 'FAULT') is only illuminated when the cabinet door is open.

The fault indicator is on steady:

during lamp test

if there is a display defect.

The fault indicator is flashing:

if the master finds there are no responders connected to it.

The fault indicator is on with a rapid flash:

if there is a fatal EEPROM error.

5.6.2 Internal Indicators (Cont'd)

FAULT (RZDU)

The Fault internal indicator (yellow, labelled 'FAULT') is only illuminated when the cabinet door is open.

The fault indicator is on steady:

during lamp test

if there is a display defect.

The fault indicator is flashing:

if the RZDU stops receiving polls from the master (scan fail).

5.6.2 Internal Indicators (Cont'd)

BUZZER

The internal buzzer sounds to indicate a variety of abnormal conditions within the controller and system.

The buzzer is on pulsing, slowly ('beep-pause-beep-pause') if the cabinet door is closed with any of the following:

the Brigade Isolate switch isolated

either of the Silence Alarms switches in the silence position

the Brigade Test switch in the test position

the Ancillary Isolate switch in isolate

the Trial Evacuation switch on at master or any RZDU

the Panel Reset switch pressed or the external Reset signal asserted (low)

the non-latching test link installed

the Defect Buzzer Cancel input asserted (low)

the watchdog latch set (Watchdog indicator on)

no responders connected

5.6.2 Internal Indicators (Cont'd)

a self-test in progress (or has been halted)

the Self Test switch in test

if the controller is in the defect state and is not Brigade connected (ie, local link installed) and the Defect Buzzer Cancel input has not been asserted low.

The buzzer is on pulsing rapidly ('blip-de-blip-de') if any part of a self-test fails.

The buzzer is on steady during a lamp test or during the 20 second watchdog timeout defect period (retriggerable).

RESPONDER STATUS (at Responder)

The Responder Status indicator (red, labelled 'STATUS') indicates responder operation and communication.

The Responder Status indicator gives single flashing if the Responder control software is operating but no messages are being received from the Master.

The Responder Status indicator gives double flashes if the Responder control software is operating and messages are being received from the master.

5.7 CONTROLS

5.7.1 External Controls

TRIAL EVACUATION

The external Trial Evacuation control is a key-operated switch located on the door of both Master and RZDUs. It activates the evacuation output on the master and ARR outputs configured for evacuation control thus sounding the evacuation alerting devices. All index panels are also illuminated. The purpose of this control is to allow the building supervisor to conduct a trial evacuation of the premises.

The Trial Evacuation control at the master or any RZDU operates regardless of the position of any of the Silence Alarms switches at the master or any RZDU. The key cannot be removed in the active position. Brigade Signalling is unaffected.

SILENCE ALARMS

The external Silence Alarms control is a key-operated switch which de-activates all evacuation outputs, turns off the index illumination and signals defect to the Brigade. This will prevent the controller sounding the alerting devices when in the fire state. The switch is for the use of Brigade personnel only in order to turn the alarms off after the detection of a fire. The key may be removed in either position. The buzzer will sound if this switch is operated with the cabinet door closed.

5.7.2 Internal Controls

RESET

The Panel Reset pushbutton switch is used to reset the controller. The following historical latches are cleared:

Fire State
Circuit Alarm (Fire and Non-Fire)
Zone Alarm (Fire and Non-Fire)
Zone Defect indicator
Zone Alarm indicator
Watchdog
Loop Defect
RZDU Defect
Evacuation Defect
Battery Low (Defect)
Battery Very Low (Fire)
Charger Inhibit
Self-Testing
Fault
Auto-Self-Test

All latches are overriden by the set condition so that if any of the above conditions are still present (eg, detector operated, battery low) the controller will not reset.

The Panel Reset switch also resets a self-test back to the start of the test sequence (if self-test mode is active), or clears the self-test altogether (if stopped). Any test-fail information is also cleared.

5.7.2 Internal Controls (Cont'd)

The charger timer is also reset by the Panel Reset switch. A defect condition sensed during a current charger inhibit period is cleared.

Smoke circuits are clamped for approximately 3 seconds when Panel Reset is pressed. This resets any operated smoke detectors.

Operation of Panel Reset allows old historical data in history memory to be overwritten by new events.

SELF TEST

The Self Test switch is used in conjunction with the Brigade Isolate switch or Brigade Test switch or local link to initiate a self-test of the system. The operation of the self-test procedure is described in detail in section 5.5 above. The buzzer will sound if this switch is left operated with the cabinet door closed.

SILENCE ALARMS

The internal Silence Alarms switch de-activates all evacuation outputs and turns off index illumination (unless trial evacuation is switched on). This will prevent the controller sounding the alerting devices when in the fire state. The buzzer will sound if this switch is left operated with the cabinet door closed.

5.7.2 Internal Controls (Cont'd)

ANCILLARY ISOLATE

The ancillary isolate switch disconnects the ancillary power and negates the activation of all ancillary outputs. The buzzer will sound if this switch is left operated with the cabinet door closed.

BRIGADE ISOLATE

The Brigade Isolate switch isolates the Brigade signalling (if fitted). The method of isolation differs according to the signalling device fitted. For a Brigade connected controller the self-test and non-latching test functions will only operate with this switch on.

The buzzer will sound if this switch is left operated with the cabinet door closed.

BRIGADE TEST

The Brigade Test switch is used with SAFE or Benecoda MKIII connected systems only. Operating this switch signals a TEST condition. The buzzer will sound if this switch is left operated with the cabinet door closed.

LINKS

These are described in detail in section 4.4.2.

5.7.2 Internal Controls (Cont'd)

POTENTIOMETERS

There are 5 potentiometers on the Master board. These adjust the following parameters (preset values in brackets)

CURRENT LIMIT (VR1) : Loop current limit (2.5A/end)
ADJ BATT LOW (VR2) : Battery Low Voltage (24.4V) ADJ BATT V. LOW (VR3) : Battery Very Low Voltage (19.2V)
CHARGER VOLTAGE
ADJUST (VR4) : Charger Voltage (27.4V) O/C ADJUST (VR5) : Open Circuit Loop Voltage (17.0V)

VR1 and VR5 are not fitted to an RZDU.

There is 1 potentiometer (P1) on each of the Responders. This sets the +5V supply to 5.0 volts.

These potentiometers are factory set to the voltages prescribed in the relevant standards. They should NOT be adjusted in the field.

ON/OFF SWITCH

The On/Off toggle switch interrupts the phase connection of the incoming mains supply. The Mains On indicator will go on and off with operation of this switch. Great care must be taken not to inadvertently leave this switch off as the battery will go flat. There is no door interlock to give a warning of this.

5.8 INPUTS TO MASTER

5.8.1 External Defect (RZDU also)

The External Defect input (screw terminal, labelled 'EXT DEF-') is provided to allow an external battery monitor to place the controller in the defect state. The controller will remain in defect as long as this input is asserted low. No latched indication is provided. See also section 4.3.6.2.

5.8.2 Defect Buzzer Cancel (RZDU also)

The Defect Buzzer Cancel input (screw terminal, labelled 'DEF BUZ CAN-') is provided to allow cancellation of local defect sounders (internal and external). The defect buzzer will be cancelled when this input is momentarily asserted low. A new defect will restart the local defect buzzer.

5.8.3 Panel Reset (RZDU also)

The Panel Reset input (screw terminal, labelled 'PANEL RES-') is provided so that the panel may be reset from outside the cabinet. The panel is reset by momentary contact closure to ground. Operation is the same as pressing the internal Panel Reset switch.

5.8.4 Serial Port

The Master has been provided with a serial port (12 way molex pins labelled 'VICNET MODEM') to enable future connection to other equipment. This serial port implements two inputs : Receive Data (RxD) and Data Carrier Detect (DCD-). For further details see section 4.3.6.4.

5.8.5 RZDU Port (RZDU also)

This port (RZDU) is for supply of 24 volt power (Note: External source preferred) and serial communications to and from the RZDUs. The port has a receive input (screw terminal labelled RX).

5.8.6 Responder Ports

These ports (RESP IN and RESP OUT) are for supply of 24 volt power and serial communications to and from the responders. Each responder port has a receive input (screw terminal labelled RX1 or RX2).

5.8.7 Programmer Port

This port (PROGRAMMER) is to enable a terminal to be connected to the Master. It has a receive input (molex pin J9-4) and data 0V (molex pin J9-1). Refer to section 4.3.6.5 for further details.

5.9 OUTPUTS FROM MASTER

5.9.1 Ancillary Outputs (RZDU also)

A set of ancillary outputs are provided (screw terminals, labelled NORMAL-, DEFECT-, FIRE-, ANCIL 1-, ANCIL 2-, ANCIL 3-, ANCIL 4-). These are active low open collector signals capable of driving ancillary equipment. Details are given in section 4.3.6.1 and specifications in section 2.9. A switched ancillary supply (screw terminals, labelled 'VANC+') is also provided.

5.9.2 Battery Charger Inhibit (RZDU also)

The external charger inhibit output (screw terminal, labelled 'CHGR INH-') is used to disable an external charger during the charger one hour inhibit period. Details of the operation of this function are given in section 5.10.

5.9.3 Brigade Signalling and Local External Defect

Brigade signalling is by means of relays (Fire and Defect) and switch contacts (Brigade Test and Brigade Isolate). The Fire relay is normally energised and is de-energised to signal a fire. This provides power 'fail to fire' operation. The Defect relay is normally de-energised and is energised to signal a defect. Switch contacts depend on the positions of the switches (note door interlock on switch not 'normal') and the plug-in PCB for the Brigade Isolate switch.

5.9.3 Brigade Signalling and Local External Defect (Cont'd)

A non-connected (local) controller has both Fire and Defect relays de-energised to conserve power. The Defect relay pulses on defect in this case to allow the connection of an external defect buzzer where the controller is located away from personnel. For further details see section 4.3.6.3.

For details of the Brigade signalling connections, refer to the circuit diagrams and to section 4.3.5.

5.9.4 Serial Port

The Master has been provided with a serial port (12 way molex pins labelled 'VICNET MODEM') to enable future connection to other equipment. The serial port implements two outputs : Transmit Data (TxD) and Request To Send (RTS-). For further details see section 4.3.6.4.

5.9.5 Responder Ports

These ports (labelled RESP IN and RESP OUT) are for supply of 24 volt power and serial communications to and from the responders. Each responder port has a transmit output (screw terminal labelled TX1 or TX2).

5.9.6 RZDU Port (RZDU also)

This port (labelled RZDU) is for supply of 24 volt power and serial communications to and from the RZDUs. The port has a transmit output (screw terminal labelled TX).

5.9.7 Programmer Port

This port (PROGRAMMER) is to enable a terminal to be connected to the Master. It has a transmit input (molex pin J9-3) and data 0v (molex pin J9-1). Refer to section 4.3.6.5 for further details.

5.9.8 External Sounder Output

The External Sounder Output (screw terminal, labelled EXT SNDR-) is used to drive an external sounder in synchronism with the internal sounder.

5.10 BATTERY CHARGER AND SENSING

The internal battery charger is designed for constant voltage standby operation in conjunction with two 6.5Ah sealed lead-acid batteries. A feature of the charger is the automatic inhibit function.

Every 24 hours the charger is shut down for a period of 1 hour during which the controller operates on the batteries alone. During this 1 hour period the internal charger indicator is illuminated and the CHGR INH- output is asserted.

If the battery voltage drops below the defect voltage (24.4V), the controller goes into the defect state. In order to preserve the battery the charger is then turned back on and the CHGR INH- output is de-asserted even though the 1 hour period has not yet elapsed. The battery voltage will generally rise again once the charger is reconnected, however the defect condition is maintained until the end of the 1 hour period and the charger indicator flashes to signal that a battery low defect has occurred during the current 1 hour period.

The charger timers are reset by the Panel Reset switch.
Within the accuracy of the processor clock, the charger is switched off at the same time every day. This time defaults to 9:00am and is adjustable via the programming terminal.

Note also that the charger is not inhibited on Saturday and Sunday or on specific public holidays (provided the time and date have been set). Details of this are contained in the Programming and Diagnostic Manual.

5.10 BATTERY CHARGER AND SENSING (Cont'd)

There are two battery sensing voltages; battery low is set at the defect voltage (24.4V) and battery very low is set at the fire voltage (19.2V). The battery very low sense has a hardware latch which can only be reset by the Panel Reset switch once set. The battery low sense (and hence the defect state generated) follows the battery voltage.

Below the battery low voltage, set at 24.4V nominal, the controller is in the defect state. The battery low indicator is latched on flashing and can only be reset by the Panel Reset switch.

Below the battery very low voltage, set at 19.2V nominal, the controller is latched into the fire state. The battery low indicator is also latched on flashing and both may be reset by the Panel Reset switch.

5.11 WATCHDOG

Processor operation is monitored by a watchdog circuit. If, for any reason, normal processor operation ceases, or the +5V supply falls below normal, the watchdog will reset the processor. Operation should, ideally, then proceed as normal.

If the processor requires resetting twice within a 10 second period, operation is considered not to be normal and a watchdog timeout is activated. A watchdog timeout will last a minimum of 20 seconds, during which time the following actions are taken:

- the processor is repeatedly reset
- the Watchdog indicator is latched on (may only be turned off by operation of Panel Reset)
- the Defect indicators are illuminated
- the ancillary defect output is asserted low
- the Defect signalling relay is energised
- the buzzer is sounded continuously
- fire is not signalled (unless the power fails)
- all other outputs and indicators are de-activated (except Watchdog and Mains indicators)

5.11 WATCHDOG (Cont'd)

If during a watchdog timeout, processor operation is restored continuously for longer than 20 seconds, the watchdog actions will cease and the controller operation will revert to normal. The Watchdog indicator, however, will remain illuminated until reset by the Panel Reset switch.

5.12 NON-LATCHING MODE

For service use, the Vigilant FP4000 may be put into non-latching mode of operation. To select this mode the Brigade Isolate switch must be isolated or the local link (LK1) must be installed and the non-latching test (NLT) link LK2 must also be installed.

The controller will not go into non-latching mode if any of the following conditions are present:

the controller is in the fire state

the controller is self-testing or has a self-test fail

the controller is performing an automatic test-fire

the battery voltage has gone low during the 1 hour charger inhibit period and the 1 hour period has not elapsed (charger indicator flashing - can be reset with Panel Reset)

there are any zone defect or zone alarm indications.

If the qualifying conditions are still present when the preventing conditions are removed, the controller will go into non-latching mode immediately.

5.12 NON-LATCHING MODE (Cont'd)

In the non-latching mode the fire state is not latched, however alarm (and defect) conditions on individual zone circuits are latched. All smoke detector circuits become non-gated. If a fire circuit goes into alarm, the controller will go into the fire state, the evacuation devices will sound, and the Fire indicators will flash.
If the circuit goes back out of alarm, normally the alarm state would latch, however, in non-latching mode the state is cleared but the Zone Alarm indicator remains flashing to indicate that an alarm has occurred.

A smoke detector latches when it senses smoke. In this case the controller leaves the detector circuit in alarm
for 2 seconds, during which time the bells ring (if it is a fire circuit) and the detector indicator will illuminate (if fitted). The detector circuit is then reset (clamped).
The non-latching mode allows a single service person to test all detectors and manual call points on a circuit.
In each case for a fire circuit the bells should sound only as long as the device is operated (or, in the case of a smoke circuit, until the device is reset). When all devices on a circuit have been operated the controller should be checked to ensure that only the one Zone Alarm indicator is on (more than one could indicate that a detector or manual call point was incorrectly labelled or wired). The indicators may be turned off by pressing Panel Reset.

5.12 NON-LATCHING MODE (Cont'd)

The controller must not be left with the NLT link installed. This may prevent the signalling of a real fire. The buzzer will sound if the cabinet door is closed with this link installed.

5.13 AUTOMATIC TEST-FIRE

Regularly the Master automatically requests each responder to test each of its detector circuits in turn to check that it is still capable of sensing an alarm. This test is attempted at the beginning of the hour the charger is inhibited. Once completed, or failed, the test is not attempted again until the next charger inhibit hour.

The automatic test-fire will not run if any of the following conditions are present:

the Panel Reset switch is pressed

the controller is in the fire state

the controller is self-testing or has a self-test fail

the controller is in the non-latching mode

any Zone Defect or Zone Alarm indicator is on.

If the preventing conditions are removed during the charger inhibit hour, the automatic test-fire will run immediately.

5.13 AUTOMATIC TEST-FIRE (Cont'd)

Each responder places a test-fire signal on each of its circuits in turn, and the circuit must go into the alarm condition within 2 seconds or the test fails for that circuit. Once the alarm condition is entered, the test- fire signal is removed and the circuit must go back to normal within 2 seconds or the test fails for that circuit.

The test-fire progresses through all 4 circuits once. Any detector circuits which fail have their corresponding zone defect indicators turned on steady. The controller is put into the defect condition also. The controller will remain in the defect condition until the automatic test-fire is run again (next time charger inhibited).
If all circuits pass, the defect condition will be cleared, however the zone defect indicators will remain on. These may be cleared by pressing the Panel Reset switch.

The test fire signal generated by the automatic test-fire is not latched or passed on to the Brigade or evacuation signalling. In the unlikely event of a real fire occurring during an automatic test-fire, the time taken to detect the real fire would be approximately 3 seconds longer than normal. The fire and automatic test-fire fail conditions would occur simultaneously at that point. A fire on a circuit other than the one being tested would be detected without delay.

5.14 OWNER INSTRUCTIONS

The following page is a copy of the owner instructions which are included with each Vigilant FP4000. These instructions should be given to the building owner, or agent, who supervises the commissioning of the controller.

The letter contains important instructions on the safe use, care and eventual disposal of ionisation smoke detectors. It is a requirement of the law that this information is passed on to the owner/operator of the system.

6. COMMISSIONING, REGULAR, AND ANNUAL TESTING

6.1 COMMISSIONING

The object of the commissioning test is to find any aspects of the installation that are incorrect and to check that all aspects of the fire alarm system are functioning correctly.

The form of the initial survey testing is the same as the annual survey testing. This testing must be completed and the relevant survey report completed before the system is inspected by the appropriate authorities. Systems which are not Brigade connected are required to be commissioned in the same way as Brigade connected systems.

Details of the survey procedure are contained in the Wormald Vigilant Maintenance Manual, Section 1, Fire Alarm Systems.

At some stage during commissioning complete details of the system must be written down (use the label inside the cabinet door for smaller systems).

Also a printout of the configuration database (use the IN/AL command in the programming terminal) must be affixed inside the master cabinet. This is to keep a permanent record of the programming in case the main pcb needs to be replaced.

6.2 REGULAR TESTING

Tests should be made on every FP4000 fire alarm system at regular intervals to ensure continued operation.

For details of regular test procedures, refer to Wormald Vigilant Maintenance Manual, Section 1, Fire Alarm Systems.

6.3 ANNUAL TESTING

An annual survey should be performed on every FP4000 fire alarm system to check both the continued function of the system and that the building has not been changed in a manner which affects the system.

For details of annual survey procedures, refer to Wormald Vigilant Maintenance Manual, Section 1, Fire Alarm Systems.

7. SPARES AND DRAWINGS

7.1 SPARES

A detailed list of spare parts for the Vigilant FP4000 is given below, along with the appropriate ordering codes. The items are sectionalised for ease of reference. Please note that the presence of a listing here does not guarantee the availability of spares.

CONTROLLER NORMAL ORDERING

FP,FP4000 MASTER REAR SERVICE	FP0450
FP,FP4000 MASTER FRONT SERVICE	FP0451
FP,FP4000 RZDU REAR SERVICE	FP0452
FP,FP4000 RZDU FRONT SERVICE	FP0453
FP,FP4000 LARGE EXTENDER CABINET,REAR SERVICE	FP0458
FP,FP4000 LARGE EXTENDER CABINET,FRONT SERVICE	FP0459
FP,FP4000 SMALL EXTENDER CABINET,REAR SERVICE	FP0460
FP,FP4000,SMALL EXTENDER CABINET,FRONT SERVICE	FP0461
FP,FP4000 INDEX REAR SERVICE	FA1137
FP,FP4000 INDEX FRONT SERVICE	FA1138
FP,FP4000 RESPONDER,THERMAL	FP0454
FP,FP4000 RESPONDER,RELAY	FP0455
FP,FP4000 RESPONDER,SMOKE	FP0456
PCB ASSEMBLY,1888-6-2,FP4000 DISPLAY EXTENDER	PA0441
FP,VIGILANT FP4 SAFE INTERFACE KIT	FP0420
FP,VIGILANT FP4 MKX INTERFACE KIT	FP0421
FP,VIGILANT FP4 BENEFIS INTERFACE KIT	FP0422

7.1 SPARES (Cont’d)

BATTERY,12V,6AH,YUASA NP6-12 (actually 6.5Ah)	BA0005
RESISTOR,CR25,3K3 (ATR FIRE)	RR0039
RESISTOR,CR25,10K (ATR NON FIRE)	RR0045
RESISTOR,CR25,27K (ASR REOL)	RR0050
PCB ASSEMBLY,1616-10,VIC 2 ACTIVE END OF LINE	PA0203
CONTACT CONVERSION MODULE (MCP ON SMOKE CCT)	PA0443
LOOM,1888-58,FP4000 PROG PORT TO 9 PIN SERIAL	LM0041

BRIGADE CONNECTION EQUIPMENT

PCB ASSEMBLY,1643-1-1 SAFE TRANSPONDER OEM	PA0230
FP,SAFE TRANSPONDER PLUG,TIME SLOT 0,1643-7-0	FP0151
FP,SAFE TRANSPONDER PLUG,TIME SLOT 1,1643-7-1	FP0152
FP,SAFE TRANSPONDER PLUG,TIME SLOT 2,1643-7-2	FP0153
FP,SAFE TRANSPONDER PLUG,TIME SLOT 3,1643-7-3	FP0154
FP,SAFE TRANSPONDER PLUG,TIME SLOT 4,1643-7-4	FP0155
FP,SAFE TRANSPONDER PLUG,TIME SLOT 5,1643-7-5	FP0156
FP,SAFE TRANSPONDER PLUG,TIME SLOT 6,1643-7-6	FP0157
FP,SAFE TRANSPONDER PLUG,TIME SLOT 7,1643-7-7	FP0158
FP,SAFE TRANSPONDER COMPLETE,1643	FP0149
PCB ASSEMBLY,1530-1,DBA2 MODULATOR	PA0158
PCB ASSEMBLY,BS033,8 STATE DIGITAL TRANSMITTER	PA0534
PCB ASSEMBLY,1207-1 VIC 1 ELECTRONIC TRANSMITTER	PA0033
PCB ASSEMBLY,1250-1 CONV MOD TERMINAL BOARD	PA0038
SOUNDER,BUZZER,TONALERT 24V	
LABEL,1864-14-4,FP4 MK VIII PO LINE	LB0266
LABEL,1888-53,FP4000 CIRCUIT LOCATION (INSIDE DOOR)	LB0288

7.1 SPARES (Cont'd)

ANCILLARY EQUIPMENT

PCB ASSEMBLY,1616-29,VIC 2 BATTERY MONITOR PA0278
PCB ASSEMBLY,1616-101-2,MODEM,300 BD,CCITT,CM,H DUP PA0405
PCB ASSEMBLY,1862-22,CMOS/RS232 INTERFACE PA0445
FP,DOOR HOLDER,24V DC FP0101

SAFE INTERFACE SPARES

PCB ASSEMBLY,1864-20,FP4 SAFE TEST JACK PCB PA0419
HARDWARE,PCB STANDOFF,PCM18 HW0053

MK X INTERFACE SPARES

PCB ASSEMBLY,1864-19-1,FP4 MK X ISOLATE PCB PA0417
HARDWARE,PCB STANDOFF,PCM18 HW0053
LABEL,1864-14-1,FP4 MK X LINE CONNECTION LB0262

BENEFIS INTERFACE SPARES

PCB ASSEMBLY,1864-19-2,FP4 BENEFIS ISOLATE PCB PA0418
LOOM,1616-43,VIC 2 BENEFIS I/F LM0021
PCB ASSEMBLY,1864-31,FP4 BENECODA TEST SOCKET PA0429
HARDWARE,PCB STANDOFF,RICHCO LMSP 10-01 HW0137
LOOM,1616-44,VIC 2 BENEFIS PO LINE CONNECTOR LM0022

7.1 SPARES (Cont’d)

CONTROLLER ELECTRICAL SPARES

COIL,L420,FP4000 MAINS,28V,40VA	CL0420
CONNECTOR,MINI JUMP (Links)	CN0123
LAMP,24V,3W,6X31,FESTOON (index illumination)	LP0044
FUSE,20X5,10A (Fuse 1)	FU0030
FUSE,20X5,5A (Fuse 2)	FU0017
FUSE,20X5,2A (Fuse 3,4)	FU0025
CONNECTOR,WAGO,5MM,237-136,3 WAY (Ancillary)	CN0208
PCB ASSEMBLY,1888-5-1,FP4000 MASTER PCB	PA0437
PCB ASSEMBLY,1888-5-2,FP4000 RZDU PCB	PA0438
PCB ASSEMBLY,1888-6-1,FP4000 DISPLAY	PA0439
PCB ASSEMBLY,1888-7,FP4000 REGULATOR	PA0440
SWITCH,KEYSWITCH,BULGIN SM320 C/W KEYS (Trial Evac)	SW0012
SWITCH,KEYSWITCH,BULGIN SM324D (Sil alarms)	SW0093
SWITCH,MICROSWITCH V3L-2106-D8 (door sense)	SW0030
SWITCH,TOGGLE,CLIPSAL 30M (MAINS)	SW0084

CONTROLLER MECHANICAL SPARES

HARDWARE,PCB STANDOFF,PCM6 (main PCB to case)	HW0052
FABRICATION,1861-9,VIGILANT 4 RETAINER (barrel nut)	FA1076
FABRICATION,1888-59,FP4000 MN BD SUPPORT PLATE (N)	FA1143
HARDWARE,LOCK L&F,KEYED 60124	HW0042
HARDWARE,KEY,L&F 60124	HW0036
LITERATURE,1888-47,VIG FP4000 OWNER INSTRUCTIONS	LT0053
SCREW,M3X10 BUTTONHEAD (index panel fixing)	SC0142

7.1 SPARES (Cont'd)

RESPONDER ELECTRICAL SPARES

PCB ASSEMBLY,1888-1,FP4000 THERMAL RESPONDER	PA0433
PCB ASSEMBLY,1888-2,FP4000 RELAY RESPONDER	PA0434
PCB ASSEMBLY,1888-3,FP4000 SMOKE RESPONDER	PA0435

RESPONDER MECHANICAL SPARES

FP4000, RESPONDER BOX (NO PCB) INCL FITTINGS	FP0457
LB, LABEL, 1888-22, FP4000 T/S RESP. WIRING	LB0283
FP, FABRICATION, 1888-20, FP4000 RESPONDER CASE	FA1139
FP, FABRICATION, 1888-21, FP4000 RESPONDER COVER	FA1140
HW, HARDWARE, PCB STANDOFF PBR10	HW0130
HW, HARDWARE, BODYPLUG PLASTIC, 1" OD	HW0168
SCREW, MACHINE, PH, M3 X 6 MM ZP	SC0041

7.2 DRAWINGS

The following drawings appear in this section
(some in reduced form) :

Size	Number	Title
A1	1888-1	Addressable Thermal Responder Schematic
A1	1888-2	Addressable Relay Responder Schematic
A1	1888-3	Addressable Smoke Responder Schematic
A1	1888-5	Master Schematic (3 sheets)
A1	1888-5-2	RZDU Schematic (2 sheets)
A1	1888-6	Display Schematic
A4	1888-7	Regulator Schematic
A3	1888-28	FP4000 Block Diagram
A1	1888-38	Master Index R.S. Mechanical
A1	1888-40	Master Index F.S. Mechanical
A1	1888-42	Small Extender Index R.S. Mechanical
A1	1888-44	Small Extender Index F.S. Mechanical
A1	1888-48	Power Supply Chassis Assembly
A1	1888-49	Master R.S. Assembly
A1	1888-50	Master F.S. Assembly
A4	1888-58	Programmer Port - Toshiba T1000 Loom
A2	1841-18	Contact Conversion Module