

BT SERIES OPERATIONAL MANUAL

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BT SERIES FIRE ALARM SYSTEM

1. SYSTEM DESCRIPTION

1.1. General Description

Requirements for Automatic Fire Alarm Systems in buildings for New Zealand are covered under NZS4512. The BT Fire Alarm System is designed to comply with the requirements of NZS4512: 2010. The BT Fire alarm System uses the PIC16F877 microcontroller and consists of a Master PCB and a Zone Display PCB.

Front and rear service cabinets are available. (BT5 series only)

1.2. Limitations

This product is user programmable. System operation can be defined in detail which could prevent the system from meeting statutory or other requirements. The manufacturer cannot accept responsibility for the suitability of functions set by the user during programming.

1.3. Master Alarm PCB

This board provides the following functions:

Power supply (5, 12 and 24 V DC), battery charger/timer.

Detector circuits.

Control function (reset system, silence alarm, evacuation etc).

Transmitter connections

Sounder circuits

On board configuration programmer (BT5 Series Only)

Walk test Function

DBA sprinkler input.

On board Auxiliary change-over fire and defect relays

1.4. Zone Display Board

This board provides system status indication and facilitates connection of the panel mounted key switches to the system.

1.5. Power Supply

The BT system's power supply is designed for 12V operation and provides a charging current of 500mA to the sealed lead acid battery.

The zone circuit operates on 24V DC generated by the panel. The sounder circuit operates on 12V DC.

1.6. Zone Circuits

All devices, such as thermal detectors, smoke detectors and manual call points are installed and wired to the BT system Zone inputs. The zones can be configured for many different options (refer system programming)

The zone can be configured so that smoke detectors on the circuit call the brigade or are local only. If smoke detectors are local only the alerting devices pulse, and the activation can be reset by the external key switch.

The circuits must be terminated with an end of line resistor with a value of 6.8k 5% - 1/4 watt or greater.

1.7. Smoke Detector Limitations

The total quiescent current of all detectors on each zone circuit must be less than 1.5mA to ensure correct operation.

For example:

3000PLUS/OP smoke detector quiescent current = 36uA. ($1.5\text{mA}/36\text{uA}=40$). Therefore, up to 40 no. 3000PLUS/OP type smoke detectors may be connected to the zone circuit.

1.8. Sounder circuits

Two sounder circuit outputs are provided, each capable of driving a 2A load (4A total). These circuits each require a 22k 5% EOL resistor to give a system normal indication. If either circuit is open or shorted, a defect signal is given. The sounder circuits are programmable (refer system programming)

1.9. Sounder Silence (internal)

A Silence Switch on the Master PCB can isolate the sounders independently of the Brigade silence key switch. This is used for testing and servicing purposes. When the sounder circuit is isolated the bell relay will not respond to fire conditions thus enabling the system to be tested without disturbing the building occupants. If this switch is not in its normal position, a buzzer will sound if the cabinet door is closed.

1.10. Isolate Switch (on SGD)

This switch provides a normally closed contact for connection to the isolate input of an SGD. It is used to isolate the system from the remote-receiving centre during testing. If it is not in its normal position a buzzer will sound if the cabinet door is closed.

1.11. Test Switch (on SGD)

This switch provides a normally closed contact for connection to the test input of a SGD. It is used to send test signals to the remote-receiving centre. If it is not in its normal position a buzzer will sound if the cabinet door is closed.

1.12. Door Switch

This switch operates if the cabinet door is closed and is used to sound the buzzer if any of the internal switches are not in their normal position. The panel door switch also silences the defect buzzer when the door is open.

1.13. Fault Indicators

Fault indicators are provided on the BT system for the following:

Sounder Circuit Defect:

An open or short circuit on the sounder circuit will cause defect.

Battery Low Defect:

If the battery voltage is below 12.2V a battery low defect will be given.

Zone Circuit Defect:

If an abnormally high or low impedance condition is detected on a zone circuit.

24V converter failure:

If the step up voltage regulator has failed, a defect is signalled

Absence of Zone Display Board:

If the zone display board is not connected to the Master Board, a system defect will be generated.

Watchdog Defect:

If the microcontroller fails, or is removed from the board, a defect signal will be generated.

DBA input defect:

If the DBA input is open circuited, a defect signal will be indicated.

Battery Check Defect:

If the battery is disconnected, a battery low defect will be given.

Firmware and configuration data Checksum Defect:

If the firmware or configuration data is changed/corrupted a system defect will be generated.

Please refer to 'Displaying latched defects' section to determine which defect/s are present on the system

1.14. Fire Indicator

The BT system is in the fire condition when the following conditions have been detected.

Zone Detector Operated.

MCP / Thermal or smoke detector operated will cause a fire signal.

DBA input operated.

A short circuit on the DBA input will result in the alerting devices activating and sprinkler LED light.

1.15. Fire Signal Relay

A Relay on the Master PCB is used to send a fire signal to the SGD. If any manual/heat or smoke set to call brigade activates this relay is operated. This relay is programmable (refer system programming)

1.16. Defect Signal

A normally energised relay output is provided to signal the SGD. If any defect signal occurs this output is operated.

1.17. Auxiliary Fire and defect Relays

Relays are provided on the Master PCB for use by ancillary services such as air conditioning systems, security and lift controllers etc. The auxiliary fire relay is operated under various alarm conditions and provides both normally closed and normally open contacts. The auxiliary defect relay (BT5 Only) is normally energised, de-activating on any defect condition and provides normally closed or open contacts.

If the auxiliary defect relay is to be used, fit a link to the jumper (Item 12 in Appendix) on the top right of the master PCB. – BT5 ONLY

The auxiliary fire relay is programmable (refer system programming) – BT5 Only

1.18. Fuse Protection

Fuse 1 Battery fuse	5A
Fuse 2 Sounder	4A BT1 3A
Fuse 3 230v input block	2A

1.19. Watchdog Circuit

A watchdog circuit monitors the microprocessor function. In the event of processor failure, the Watchdog circuit will attempt to restart the program. **Repeated unsuccessful attempts to reset the program result in a defect signal being generated within 60 seconds.**

1.20. Checksum Testing:

A firmware and configuration data checksum test is performed on reset and every 24hours.
A failure of these tests (corrupted data) will generate a defect signal (see

1.21. Brigade Transmitter:

A 5-pin connector on the top of the master PCB is provided for connection to a brigade signal generating device (SGD). This provides normally closed connections for fire, defect, test and isolate to allow the BT5 to be connected to the Fire Service.

If a brigade transmitter is installed, fit a link to the jumper (Item 12 in Appendix) on the top right of the master PCB.

Note that should an SGD be fitted, the Defect Output terminal is not permitted to be used as it may interfere with the proper operation of the SGD.

2. SPECIFICATIONS

2.1. Cabinet

Spacious Powder coated mild steel enclosure.

Cabinet Dimensions 320mm (W) x 390mm (H) x 110mm (D)

2.2. Power Supply

Mains input: 207v – 253 Hz AC only (230V nominal +/- 10%). Transformer Primary 230V AC
Secondary 12V AC maximum current 1A.

Battery Limitations:

Normal standby current is 60mA or 80mA if Brigade connected. Refer to battery calculation sheet in appendices to calculate the battery capacity required.

Automatic Charger Inhibit:

For approximately 30 minutes every 24 hours, the charger output voltage is reduced to 11.4V. If the battery voltage falls below 12.2V during this test period, a **defect** warning is given.

PCB non-alarm current (SGD not fitted): 60mA BT5; 30mA BT1

PCB non-alarm current (SGD fitted): 80mA BT5; 50mA BT1

PCB alarm current (maximum): 450mA BT5; 150mA BT1

Charger output current: 0.5A

2.3. Detection circuits

End of line: 6.8k 5% resistor, ¼ watt or greater.

Circuit current: 3.0 mA BT5 ; 2.6mA BT1 Nominal

Max cable loop resistance 50R

Smoke detector reset: Supply interrupted for 0.5 second.
Alarm verified for 4 seconds.

Thresholds: Open circuit = defect
5-12V clamp = smoke fire
2V clamp = heat/mcp fire
Short circuit = defect

2.4. Sounder circuits

End of line: 22k 5% resistor, ¼ watt or greater (see section 1.7).

Maximum Sounder Load 4A BT5; 3A BT1

NOTE

These lines are monitored using a small current in reverse polarity to normal. For this reason it is necessary to connect the sounders via diodes if not built into the sounder. IN4007 DIODES ARE RECOMMENDED.

2.5. DBA input circuit

End of line: 10k 5% resistor ¼ watt or greater

Thresholds: Open circuit = defect
 Short circuit = active

3. SYSTEM OPERATION

3.1. Reset System

To reset the system after a fire press the '**RESET**' button on the Master PCB. This will return the system to normal. Zones that have been isolated by the brigade silence switch will be re-enabled, and latched defect status cleared.

A smoke reset switch on the outside of the cabinet is available as an option. This switch is for authorised personnel on site to reset non brigade calling smoke detectors only. Activating this switch has no effect on mcp/heat or brigade calling smoke detectors

3.2. Isolating System

The sounders may be isolated by turning off either '**SILENCE**' switch on the Master PCB or '**BRIGADE SILENCE**' switch on the outside of the cabinet. Auxiliary relay can be isolated by turning off the Aux switch on the PCB **NOTE**

Operating the Brigade Silence Key switch will cause a **defect** signal to be sent and any zone/s in alarm to be isolated.

3.3. Evacuation

To conduct a trial evacuation, activate the **key switch on the outside of the cabinet**. The sounders will operate without calling the Brigade. This will override any other condition.

3.4. Walk Test facility

This feature allows for a single person testing of circuits. When in the test mode if a detector is activated the sounders will operate and the associated zone LED will latch. As soon the detectors reset, the sounders will turn off but the zone LED will remain latched. Smoke Verification is disabled during Walk-Test Mode which allows for quicker testing.

To enter the test mode, activate the walk test/configure switch on the Master PCB.

3.5. Configuration options

BT5

Comprehensive configuration options are provided, please refer to system programming section.

BT1

Two options are provided by fitting shorting link pins:

Smoke Local

If this link is fitted, smoke detectors call the brigade and activate the sounders normally. If the link is not fitted smoke detectors do not call the brigade and activate the sounders in a pulsing/alert mode.

Auxiliary fire relay

If the link is fitted to the left two pins (local smoke) the relay activates on local smoke detectors only (or when sounders activated on pulsed mode). If the link is fitted to the right two pins (common) the relay activates on heat /MCP and smoke detectors programmed to call brigade (or when the sounders activate in standard mode.)

4. SYSTEM PROGRAMMING - BT5 ONLY

4.1. System Programming

To enter programming mode, firstly activate walk test / configure switch. Then press and hold both select and enter pushbuttons for 5 seconds until the programmer display lights up.

Notes

Follow the programming sequence chart below to configure options.

Non latching smoke detector option will only work if the smoke detectors are also set to non brigade calling (local) in that zone.

System options 1997 or 2003 mode. Configuring the panel for 97 mode means the zone circuits will generate a heat / MCP alarm on open circuit condition. This is to allow the panel to be used as a replacement in buildings where the system was installed to NZS4512:1997.

Display flashes: one flash indicates moving forward through the menu structure (enter). Two flashes indicates moving back through the menu structure (escape).

After you press enter having selected the zone / function, the display decimal points will show the current saved option.

When exiting, if programmer write enable link is on display will flash three times and configuration data will be updated to reflect the changes made. If write enable link is off display will blank immediately and configuration will remain as before programming session.

To exit programming mode, de-activate walk test / configure switch. Press reset for any saved changes to take effect.

4.2. Programming Sequence chart

A	B	C	D	E	F	G
ENTER PROGRAM MODE	PRESS SELECT TO CHOOSE MENU	PRESS ENTER	PRESS SELECT TO CHOOSE ZONE / FUNCTION	PRESS ENTER	PRESS SELECT TO CHOOSE OPTION (DISPLAY DECIMAL POINTS)	PRESS ENTER
	0 0 EXIT	CHANGES SAVED IF LINK ON CHANGES DISCARDED IF LINK OFF				
	1 0 ZONES BRIGADE CALL		1 0 ESCAPE TO B 1 1 ZONE 1 1 2 ZONE 2 1 3 ZONE 3 1 4 ZONE 4 1 5 ZONE 5		N Y N Y N Y N Y N Y	
	2 0 ZONES OPERATE SOUNDERS		2 0 ESCAPE TO B 2 1 ZONE 1 2 2 ZONE 2 2 3 ZONE 3 2 4 ZONE 4 2 5 ZONE 5		N Y N Y N Y N Y N Y	
	3 0 AUX RELAY ACTIVATE ON HEAT / MCP		3 0 ESCAPE TO B 3 1 ZONE 1 3 2 ZONE 2 3 3 ZONE 3 3 4 ZONE 4 3 5 ZONE 5 3 6 DBA / EVAC		N Y N Y N Y N Y N Y N Y	
	4 0 AUX RELAY ACTIVATE ON SMOKE		4 0 ESCAPE TO B 4 1 ZONE 1 4 2 ZONE 2 4 3 ZONE 3 4 4 ZONE 4 4 5 ZONE 5		N Y N Y N Y N Y N Y	
	5 0 SMOKE DET. LOCAL (NON BRIGADE CALLING)		5 0 ESCAPE TO B 5 1 ZONE 1 5 2 ZONE 2 5 3 ZONE 3 5 4 ZONE 4 5 5 ZONE 5		N Y N Y N Y N Y N Y	
	6 0 SMOKE DET. LATCHING		6 0 ESCAPE TO B 6 1 ZONE 1 6 2 ZONE 2 6 3 ZONE 3 6 4 ZONE 4 6 5 ZONE 5		N Y N Y N Y N Y N Y	
	7 0 SYSTEM OPTIONS		7 0 ESCAPE TO B 7 1 97 / 03 MODE 7 2 AUX RELAY AND / OR* 7 3 NON LATCHING PULSE BELL*		03 OR N	97 AND Y

* = Future implementation

Bold type indicates default option panel is configured with from factory

4.3. Displaying latched defects

BT5

Press and hold select pushbutton in system programmer when panel is in normal run mode (i.e. not walk test) and any latched defect codes will be displayed in sequence.

To clear latched defects, press reset.

01	Zone 1
02	Zone 2
03	Zone 3
04	Zone 4
05	Zone 5
06	DBA
07	Sounder
10	Battery
11	Link to display board/ system checksum error
12	Zone/s isolated by silence alarms key switch
13	20V step up converter failure

BT1

Defect LED are on main board

To clear latched defects, press reset.

CCT
 Sounder
 Battery
 System
 DBA

5. COMPATIBLE DEVICES

The following devices are permitted for use with this panel:

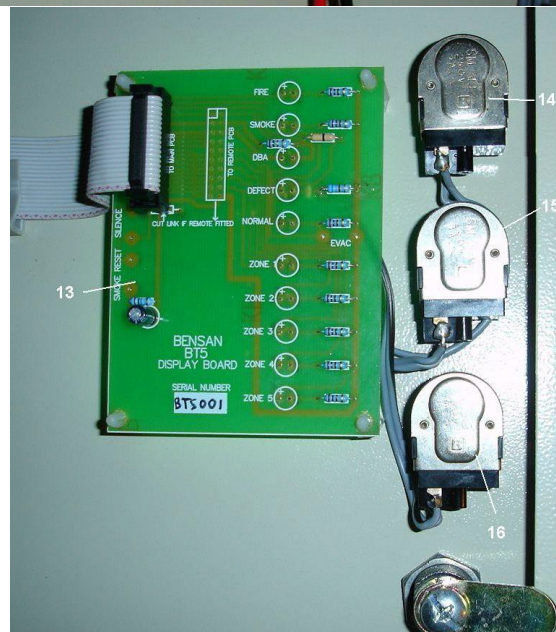
Brand	Model	Type	Listing #
Protec	3000PLUS/OP	Conventional Optical Smoke Detector	BS/325
System Sensor	2151AUS	Conventional Photo-Optical Smoke Detector	NI/308
System Sensor	2151	Conventional Photo-Optical Smoke Detector	SS/328
System Sensor	2151BPI	Conventional Photo-Optical Smoke Detector	PI/339
Protec	3000/MCP/NZ	Conventional Indicating MCP	BS/323
Pertronic	CPPIN-3	Conventional Indicating MCP	PI/644
Pertronic	CPPIN-3T	Conventional Indicating MCP - Testable	PI/646
Pertronic	CPPIN-3TWP	Conventional Weatherproof Indicating MCP - Testable	PI/651
Protec	3000PLUS/TEMP56	Conventional - Fast Response Rate of Rise Thermal Detector	BS/202
Protec	3000PLUS/TEMP64	Conventional - Medium Response Thermal Detector	BS/203
Thermocable	Various	Linear Heat Detection Cable *1 *2	Various
Protectowire	Various	Linear Heat Detection Cable *1 *2	Various
Honeywell	5057	Conventional Fixed Temp Heat Detector 58°	NI/223
Honeywell	5076	Conventional Fixed Temp Heat Detector 77°	NI/224
Honeywell	5057WP	Conventional Fixed Temp Heat Detector 58° Weatherproof	NI/225
Honeywell	5076WP	Conventional Fixed Temp Heat Detector 77° Weatherproof	NI/226
Pertronic	IHDB-3	Indicating Heat Detector, Blue, 57C	PI/232
Pertronic	IHDBE-3	Encapsulated Indicating Heat Detector, Blue, 57C	PI/234
Pertronic	IHDY-3	Indicating Heat Detector, Yellow, 77C	PI/233
Pertronic	IHDYE-3	Encapsulated Indicating Heat Detector, Yellow, 77C	PI/235
Pertronic	IHDB-V	Indicating Heat Detector, Blue, 57C	PI/238
Pertronic	IHDBE-V	Encapsulated Indicating Heat Detector, Blue, 57C	PI/242
Pertronic	IHDBR-V	Indicating Heat Detector, Blue, c/w Remote Output, 57C	PI/240
Pertronic	IHDY-V	Indicating Heat Detector, Yellow, 77C	PI/239
Pertronic	IHDYE-V	Encapsulated Indicating Heat Detector, Yellow, 77C	PI/243
Pertronic	IHDYR-V	Indicating Heat Detector, Yellow, c/w Remote Output, 77C	PI/241
Pertronic	IHDBLKEK-V	Encapsulated Indicating Heat Detector Kit, Black	PI/246
Pertronic	THDB-57C	Thermister Heat Detector, Blue, 57C	PI/256
Pertronic	THDB-57C-WP	Thermister Heat Detector, Blue, 57C, Weatherproof	PI/257
Pertronic	THDBR-57C	Thermister Heat Detector, Blue, c/w Remote Output, 57C	PI/258
Pertronic	THDB-77C	Thermister Heat Detector, Yellow, 77C	PI/259
Pertronic	THDB-77C-WP	Thermister Heat Detector, Yellow, 77C, Weatherproof	PI/260
Pertronic	THDBR-77C	Thermister Heat Detector, Yellow, 77C c/w Remote Output, 57C	PI/261
Protec	61-986-103	ProPoint Plus 2 Pipe Optical/CO/Enhanced Heat Aspirating Smoke Detector	BS/335
Protec	61-986-105	ProPoint Plus 3 Pipe Optical/CO/Enhanced Heat Aspirating Smoke Detector	BS/336
Protec	61-986-104	ProPoint Plus 4 Pipe Optical/CO/Enhanced Heat Aspirating Smoke Detector	BS/337
Protec	61-986-16	Cirrus Pro 200 Aspirating Smoke Detector	BS/338
Firebeam Company	Firebeam PLUS	Optical Beam Smoke Detector	BS/345
Firebeam Company	Firebeam XTRA	Optical Beam Smoke Detector	BS/348
Vitech	730-3xx Series	Signal Generating Device (SGD)	LK/500
Vigilant/Tyco	Mini-Gen MK2	Tone Generator (AS220 with Voice)	VF/419
Ampac	6010-0015	20watt 12v OWS Amplifier	AC/423

6. APPENDICES

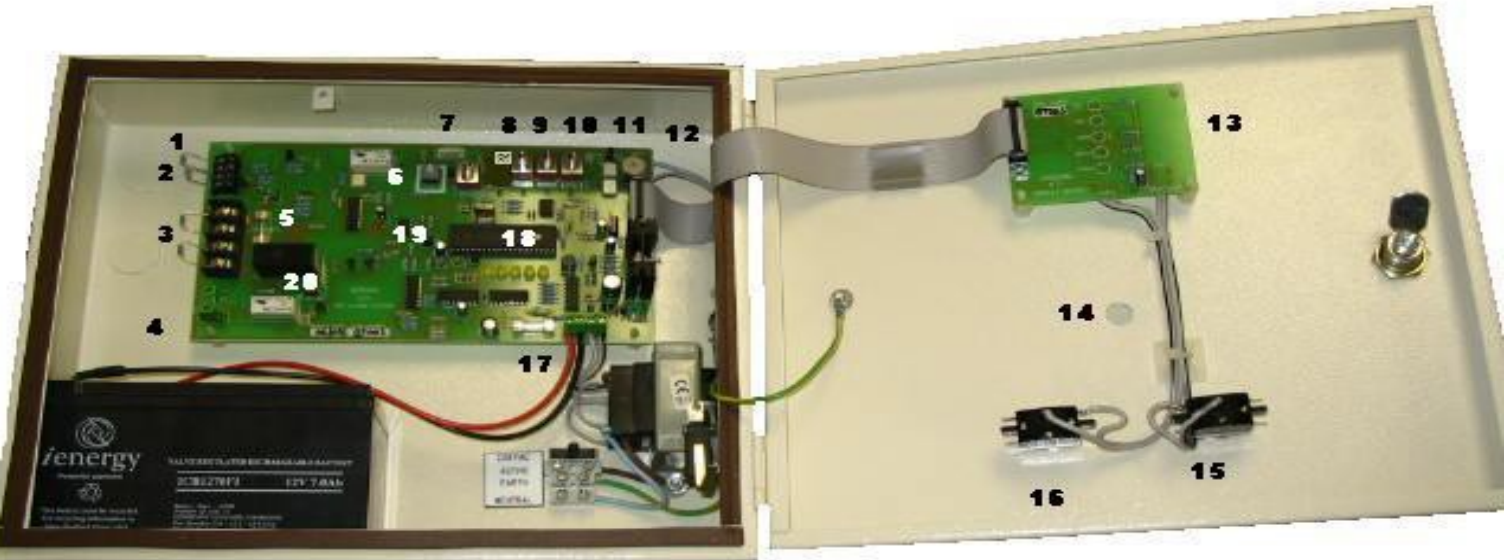
6.1. PANEL LAYOUT DIAGRAM BT5



Number	Description
1	DBA input (10K Ω EOL)
2	Zone Inputs (6.8K Ω EOL)
3	2 x Sounder Circuits (22K Ω EOL, 4A Max)
4	Auxiliary Fire Relay (N/C, N/O, 2A Max @ 24VDC)
5	Sounder Circuit Fuse (4A)
6	Reset Switch
7	SGD Connection (See 12 to enable)
8	Defect Relay-Output (See 12 to enable)
9	Walk Test Switch
10	Silence Switch
11	Aux Isolate Switch
12	SGD Fitted Link
13	Zone Display Board
14	Smoke Reset Switch if fitted – Optional Accessory
15	Trial Evacuation Bulgin Keyswitch
16	Brigade Silence Alarms Bulgin Keyswitch
17	Battery Fuse (5A)
18	System programmer
19	Programmer write enable link



6.2. PANEL LAYOUT DIAGRAM BT1



Number	Description
1	DBA input (10K Ω EOL)
2	Zone Input (6.8K Ω EOL)
3	2 x Sounder Circuits (22K Ω EOL, 3A Max)
4	Auxiliary Fire Relay (N/C, N/O, 2A Max @ 24VDC)
5	Sounder Circuit Fuse (3A)
6	Reset Switch
7	SGD Connection (See 12 to enable)
8	Defect Opto-Output (See 12 to enable)
9	Walk Test Switch
10	Silence Switch
11	Aux Isolate Switch
12	SGD Fitted Link
13	Zone Display Board
14	Smoke Reset Switch if fitted – Optional Accessory
15	Trial Evacuation Bulgin Keyswitch
16	Brigade Silence Alarms Bulgin Keyswitch
17	Battery Fuse (5A)
18	Defect indication LEDs (CCT, Sounder, Batt, System & DBA)
19	Smoke Local Link <ul style="list-style-type: none"> Remove Link - Brigade not called and Sounder Pulse mode activated when smoke detector activates. Install Link – Brigade called and Standard Sounder mode activated when smoke detector activates.
20	Auxiliary Fire Relay Link <ul style="list-style-type: none"> Select SMK – Aux Fire Relay activated by Non-Brigade Calling Smoke (Activates during SounderPulse mode only) – See 19 above Select Common - Aux Fire Relay activated by Brigade Calling Zone (Activates during StandardSounder mode only) – See 19 above
240V Mains Termination	240V Fuse (2A)

6.3. BATTERY CALCULATION SHEET

The minimum battery size is calculated using the following formula

Min Battery = $(24 \times IQ) + (0.5 \times IA) / 1000$ Ah Where:

24 = standby time in hours (72 hours for non-brigade)

IQ = quiescent current of panel (80mA with SGD fitted, 60mA without SGD fitted). IA = alarm current of panel in mA

Example 1

Panel with SGD fitted and alarm load of 2A Min Battery = $(24 \times 80) + (0.5 \times 2,000) / 1000$

Min Battery = $1,920 + 1000 = 2,920 / 1,000 = 2.92$ Ah - 3.00 Ah Battery (rounded)

Example 2

Panel with no SGD fitted and alarm load of 2A Min Battery = $(72 \times 60) + (0.5 \times 2,000) / 1000$

Min Battery = $4,320 + 1,000 = 5,320 / 1,000 = 5.4$ Ah Battery – 7.0 Ah Battery (rounded)

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