TECHNICAL MANUAL

Issue 2.4

FT420

Conventional Fire Alarm System

MA425 **Oct 2018**

DOCUMENT HISTORY

Manual		Description	Software		Written By	Checked By
Rev No.	Date		Rev. No.	Date		
Draft 1	30/8/07	Change LED indicating patterns. Fill in power consumption data. Fill in dimension and weight. Attach the mounting details. Change configuration data.	V0 – V1.4		W.Z	A.S
Draft 2	1/10/08	Minor changes			W.Z	A.S
Draft 3	12/4/10	Change PCB revisions for EMC Update manual, add components list and circuit schematics for CSIRO			W.Z	A.S
1	15/4/10	Remove CSIRO info and update	V1.5		M.R	A.S
1.1	12/5/10	Update Manual for the 1st production run	V1.5		M.R	A.S
1.2	24/5/10	Remove features under development and update software version to V1.6. The LED test in V1.6 is performed by pressing for 5 seconds the disable external strobe button rather than pressing silence buzzer and alarm devices buttons simultaneously in V1.5.	V1.6		C.A	A.S
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2.0	15/7/11	Review manual and update previous revisions to software V2.1.0. Removed PA volume control and High/Low Priority Zone Alarm. Add 3 minutes delay between alert & evac and fix up software issues in SUB886	V2.1.0	25/7/11	E.T. / C.A.	A.S.
		Add Gaseous extinguishing system Fix up 20 zone system with OWS	V2.2.1	18/4/12	W.Z.	A.S.
2.3	28/8/12	Add new output tab in PC S/W Combine Alarm Post Delay and Quiet Alarm Extend Gas Control New configuration file format and rectify some issues Fix up PC config. Software (V2.3.1)	V2.3.0 / V2.3.1	28/8/12 21/9/12	W.Z. / A.S.	A.S.
		Add one hour option for Delayed mains fail Rectify zone disablement function Update manual to include FT420-AL2000 config. Software V1.1	V2.3.2 / V1.1 A2000	11/3/14	A.S. / W.Z.	A.S.
2.3.3	10/6/16	Add latching PSU LED (PC Config. Still V2.3.2) Update Manual to remove Alarm 2000 section Update drawing F714 to Iss 6 and F770 to Iss 3 & rectify figure 20	V2.3.3	10/6/16	A.S.	A.S.
2.4	26/10/19	Change logo and minor update	V2.3.3	10/6/16	A.S.	A.S.

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1 INTRODUCTION

1.1 Important Information

Brooks FT420 Control and Indicating Equipment (CIE) is highly integrated and flexible and is available with 4 to 20 conventional zone circuits. It is designed to comply with the Australian standard AS7240.2 and AS7240.4. The FT420 system was tested and approved under the CSIRO ActivFire scheme. The system should be correctly configured and installed to suit the site specific applications.

Brooks shall under no circumstances be liable for any incidental or consequential damages arising from loss of property or other damages or losses owing to the failure of Brooks products beyond the cost of repair or replacement of any defective products.

Brooks reserves the right to make product improvements and change product specifications at any time. While every precaution has been taken during the preparation of this manual to ensure the accuracy of its contents, Brooks assumes no responsibility for errors or omissions.

WARNING!

- Improper operation of the CIE may result in serious injury including death, damage or loss of property and equipment and interruption to the site normal functions.
- Contact the Fire Brigade immediately in alarm condition regardless of whether the CIE is equipped with fire Alarm Signalling Equipment (ASE) or automatic fire protection equipment.
- Always install, maintain, service and operate the Brooks CIE according to all the relevant standards and regulations, the site emergency plans and the equipment operation instructions.
- Any controls provided by the CIE are for emergency protection and warning purposes only. Do not rely on the CIE to operate external equipment for any other purposes.
- The Brooks CIE monitors the wiring conditions by using end of line devices. It is however not capable of detecting the internal conditions of any associated external equipment unless the system is specially arranged to monitor those conditions. The external equipment shall be operated and maintained according to its own specific operation and maintenance procedures.

1.2 Overview

This manual provides technical information to properly configure, install, wire and maintain the Brooks Firetracker FT420 Conventional CIE system and its related options. It is highly recommended that the manual be used together with the FT420 CIE Operations Manual. Please contact Brooks for additional technical support or comments if necessary.

The FT420 technical manual presents the following chapters:

Chapter 1: Provides general information and highlights CIE features.

Chapter 2: Details system architecture, jumper settings and terminations of each system module.

Chapter 3: Describes major functions of CIE, connection diagrams and wiring requirements.

Chapter 4: Shows the system configuration methods.

Chapter 6: Lists guidelines for CIE installation and commissioning.

Appendix A: Contains forms for recording the CIE Pre-Commissioning results

Appendix B: Contains CIE General Information, CIE Maintenance History and Block wiring diagrams.

1.3 Features

Brooks Firetracker FT420 provides a highly integrated and configurable system for applications where both reliable detection and occupant warning systems are required. The features of FT420 are as follow:

1.3.1 Reliable Fire Protection and Beyond

The system performance meets and exceeds the latest fire protection equipment standards AS7240.2 and AS7240.4.

The system is capable of providing the following functions within its architecture.

- From 4 to 20 zones of fire alarm detection circuits. Alarm zones can also be used as a generic input from flow switches, security, chemical hazard and any compatible inputs.
- Controls and indicators for an Ancillary Control Facility (ACF), External Strobes and Alarm Devices (NAC circuit) are standard features together with a Magnetic Door Holder (MDH) fused circuit input and output connection1.
- Optional expandable controls for multiple supervised speaker circuits, multiple 24V supervised alarm outputs and other control devices.
- Optional integrated Occupant Warning System (OWS) with multiple tones and voice messages, supervised speaker circuit, supervised trigger input, PA and supervised dual strobe output.
- Optional Alertcom features.
- Optional Gaseous extinguishing system integration.

1.3.2 Simple and Clear User Interface

The CIE modular and intuitive user interface significantly simplifies the system operations. All the system conditions are indicated by well-grouped LED indicators. All the system operations are available via momentary push-button switches.

As there are no LCD menus to navigate through, the CIE is easy to use and minimises confusion and hence, reduces the response time in emergency conditions.

1.3.3 Optional Configuration of Zone Inputs and Controls

Each zone input has a number of optional configuration features such as non-DBA alarm, non-latching alarm, Alarm Verification Facility (AVF), short circuit on alarm and Alarm Post Delay Facility for AS1668 fire fan control applications.

Each zone input circuit can function as:

- A fire alarm zone input,
- Sprinkler flow switch and monitored valve input,
- Clean contact input or pre-selected tone trigger input of the Brooks Alertcom functions.

Each zone input state can also drive any of the programmable system conditions and controls. Different combinations of the settings are available to suit a large number of specific applications.

Note: Zone configuration can only be achieved when the FT420 configuration software and PC serial adapter programming unit are available*2*. Refer to Chapter 4 in page 60.

[1] External 24V supply must be connected to the MDH input refer to Chapter MDH outputs page 44 for more details.
[2] Ensure firmware compatibility between system firmware and PC configuration software

1.3.4 Optional Relay Boards and Speaker Zoning

In addition to the normal alarm zoning, the CIE supports additional programmable relay outputs (non-supervised) using 8 relay expansion board SUB885 which can be utilised to control ancillary equipment by independent zones or zone mimic.

If an OWS is used in the FT420, the speaker output can be split into 4 speaker zones using a four supervised output expansion board SUB886.

1.3.5 Simple Configurations

A user friendly system configuration utility simplifies the installation and on-site service process. Authorised installers can easily configure all the system parameters via PC configuration software and serial adapter unit, refer to Chapter 4.

1.3.6 Brooks Alertcom

By adding expansion boards, the FT420 CIE is capable of providing a complete Alertcom manual and automatic triggering system which includes the following features:

- **Multiple tone and voice messages**
  A total of up to ten tones and/or voice messages can be activated, based on the system conditions.
- **Visual alarm indications**
  The Alertcom is capable of providing both audible and visual warnings in alarm and manual conditions. Its monitored dual strobe output controls the visual indications for both alert and evacuation conditions separately.
- **Automatic Alertcom system with manual tone selections**
  Up to eight tones can be broadcasted based on the associated monitored trigger inputs or the manual selections on the front display. It can be used not only for the emergency warnings, but also for general message broadcasts, such as the school and lunch bells.
- **PA**
  Public addressing can be broadcasted
- **Auxiliary audio input**
  Remote desktop microphone announcements or background music can be broadcasted when the auxiliary audio input is enabled and the CIE is in quiescent conditions.

1.3.7 Gaseous Extinguishing System[3]

The new firmware V2.3, is now able to integrate Brooks Gaseous extinguishing system in the standard FT420 configuration. The Brooks series of warning signs, local control stations and voice / messages horns or speakers can be connected to the gas interface module to offer a complete gaseous extinguishing system as well as detection system. Refer to Chapter 3.10 page 50 and Figure 40 page 77.

[3] Software version => V2.3.x must be used

1.4 Specifications

Table 1 General Specifications

Feature		Specification
Mains Power Supply		230VAC (86-265VAC), 150W (5.5 Amp), requirement is based on the CIE power supply calculations, refer to Chapter 3.12 page 54.
Backup Battery		2 x 12V. Battery capacity is based on the CIE power supply calculations. Refer to Chapter “Power Supply Calculations” page 55
Access Security		Access Level 1: All the LED indicators are viewable through the locked transparent front door. Access Level 2: All the controls are accessible by opening the front transparent door using a 003 key. Access Level 3: The control and indicating circuits are behind the front plate. To repair the CIE or upgrade its firmware, the technician needs to open the outer door and unscrew the inner door. Access Level 4: All the system configurations require special hardware and PC software. No configuration is available during normal operations (Access Level 1 & 2).
Operating Temperature		0°C to +40°C.
Operating Humidity		5-95%, non-condensing.
IP Rating		IP31
Enclosue Material		Zinc anneal steel powder coated oyster with a tinted lockable acrylic front door
Enclosure	Small	480 (High) X 450 (Wide) X 220 (Deep) mm
	Medium	630 (High) X 450 (Wide) X 220 (Deep) mm
	Large	920 (High) X 450 (Wide) X 220 (Deep) mm
Compliance		**CIE:** Conforms to AS7240.2-2004 and AS7240.4-2004 **OWS:** Meet the requirements of clause 3.22 of AS1670.1-2004 and clause 1.4.1, 1.4.4, 4.3.3 and 4.3.5 of AS1670.4-2004 Alert tone and message meet the requirements of ISO 7731 Evacuation tone and message meet the requirements of ISO 8201 Gaseous extinguishing system meets the requirements of AS4214
Applications		Normally used in Class 2, 3, 4, 5 & 6 buildings, can also be used to protect hazardous locations using intrinsically safe detectors/ MCP’s via galvanic isolator. Installed to in-door environment only. Upon request it can be fitted inside IP65 enclosure.

2 HARDWARE

2.1 General

2.1.1 System Architecture

A basic Firetracker FT420 Conventional CIE includes:

- ✓ Main Control Board (SUB880),
- ✓ Main Display Driver Board (SUB881),
- ✓ Main Display Board (SUB882),
- ✓ Battery Charger Current Limiting Board (SUB945)
- ✓ AC/DC Power Supply and backup batteries.

Optional Boards:

- ✓ Expansion boards connected to the Main Control Boards.
- ✓ Display Expansion Boards connected via a Generic Driver Board to the Main Display Driver Board.

A serial adapter board is capable of linking the Main Display Driver Board to a PC during the system configuration.

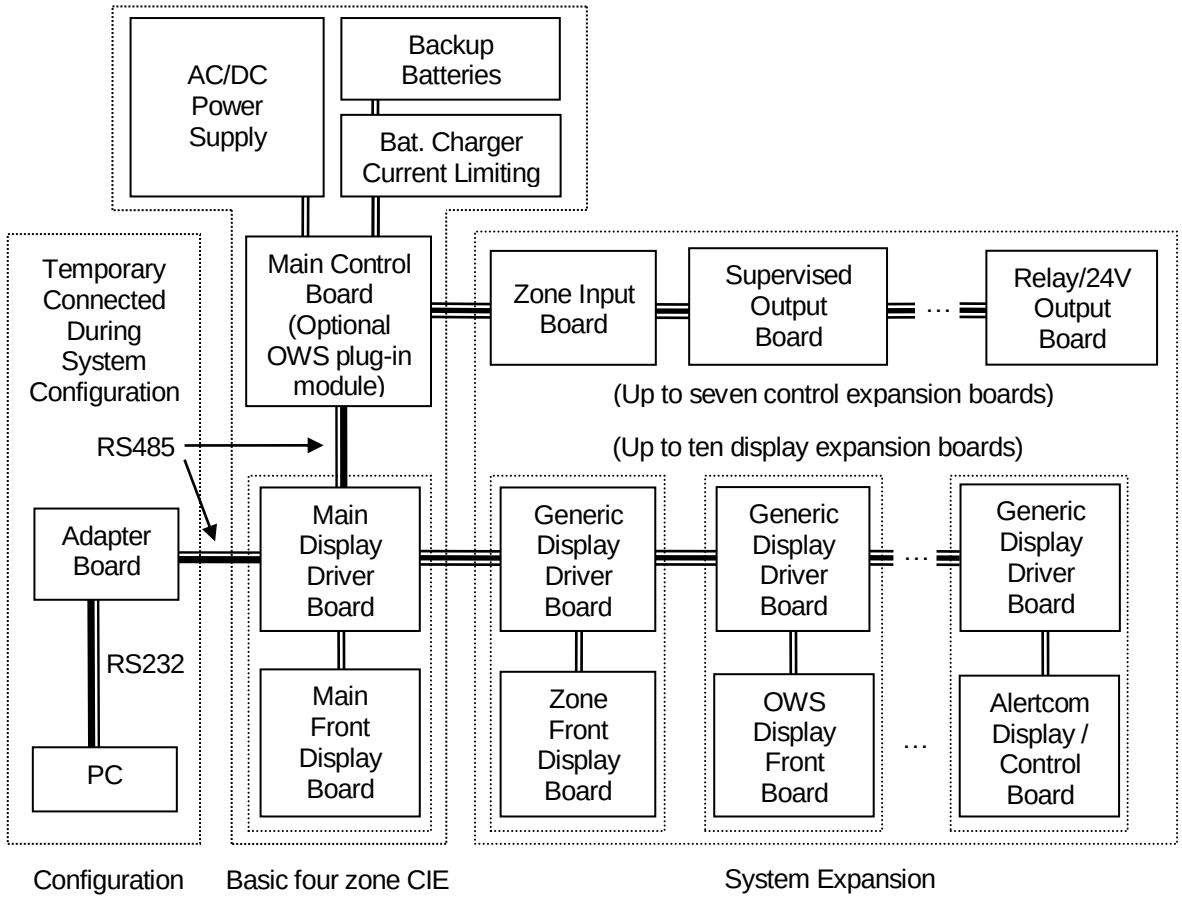


Figure 1 System Architecture

Every front display option (except AS1668 FFC) comprises a Front Display Board that contains LEDs and push-button switches and a Generic Display Driver Board (SUB891) which contains the driving

circuits. Both the front display boards and the driver boards are connected via two sets of IDC connectors.

The Main Display Board (SUB882), is connected to the Main Display Driver Board (SUB881), while each of the other display boards connect to a Generic Display Driver Board (SUB891).

Both the main control board SUB880 and the main display driver board SUB881 board are controlled by a microcontroller. During normal running conditions, both the on-chip FLASH and EEPROM memory are constantly monitored. In the event of a CPU fault, the common fault relay output and the common fault indication would be activated if a microcontroller fault was detected.

2.1.2 System Modules

All the FT420 system modules, except the AC/DC power supply and the backup batteries are listed in Table 2. Details of each module are explained in Table 3.

Table 2 System Module Summary

Part No.	Type	Description
SUB880	Basic System Boards	Main Control Board
SUB881		Main Display Driver Board
SUB882		Main Front Display board
SUB945		Current Limiting Battery Charger Board
SUB883	Expansion Board	8 Zone Expansion Board
SUB884	Expansion Display Board	4 Zone Expansion Front Display Board
SUB885	Expansion Board	8 Relay Output Expansion Board
SUB886	Expansion Board	4 Supervised Voltage Output Expansion Board
SUB887	Expansion Plug-in Module	OWS Plug-In Module, to be plugged into the Main Control Board
SUB888	Expansion Display Board	OWS Expansion Front Display Board
SUB889	Expansion Display Board	OWS Selection Front Display Board used for either the Tone Selection Display Board or the PA Zone Control Display Board. Different decal labels are required.
SUB891	Expansion Display Driver	Generic Expansion Display Driver Board
SUB952	PCB305	Termination Board
SUB953	PCB306	Display Board
FT420-PC	Optional Configuration Tool	Configuration Adapter Box used only to download the SSD file

Each system module feature and output / input limitations are listed in Table 3

All the system expansion modules can be individually installed or removed in order to meet the application requirements at minimal cost.

Table 3 Modules and Features

Type	Module	Feature	Qty	Description
Basic System	Main Control Board **SUB880**	Zone Inputs	4	Compatible with the approved actuating devices.
		Built-in MCP Input	1	Connects to the panel mounted MCP. It is capable of immediately activating the OWS evacuation, the system controls and the fire brigade calls (if Alarm Signalling equipment is installed).
		MDH Relay Output	1	N/C Dry-contact not monitored 30V @ 5A. Due to power supply/battery requirements, a separate power supply may be required.
		ACF Output	1	Supervised 24VDC output with independent disable control. 24VDC @ 500 mA. Control A/C shutdown relay or other external equipment. Separate manual control to disable the ACF output.
		External Strobe Output	1	Supervised 24V output with a manual disablement control. 24VDC @ 1 A. Control the external fire brigade strobes. Separate manual control to disable external strobe output.
		Alarm Devices Output	1	Supervised 24V output, 24VDC @ 2 A **(JP1 & JP2 fitted)** to control electronic sounders or Supervised speaker circuit, <100V RMS, < 5A **(JP1 & JP2 not fitted)** to control main OWS speaker circuit. Separate manual control to disable all alarm devices.
		Common Alarm Relay Output	1	Dry-contact, 30V @ 2A. Used normally to connect the CIE to Alarm Signalling Equipment (ASE).
		Common Fault Relay Output	1	Dry-contact, 30V @ 2A, Normally energised Used normally to connect the CIE to Alarm Signalling Equipment (ASE).
		Common Disable Relay Output	1	Dry-contact, 30V @ 2A. Used normally to connect the CIE to Alarm Signalling Equipment (ASE).
		Power Fail Relay Output	1	Dry-contact, 30V @ 2A. Activated when both the backup batteries and the mains power supply fault are detected. May be used when connecting the CIE to Alarm Signalling Equipment (ASE).
		Auxiliary 24DCV Outputs	2	Power output, 24VDC , < 4A Supply power to the expansion control boards and OWS (if fitted).

Type	Module	Feature	Qty	Description
	Main Display Driver Board **SUB881**	Buzzer	1	PCB mounted buzzer: > 60dB at 1 metre. Optional front plate mounted buzzer: >85dB at 1 metre.
		Configuration Socket	1	Connect to PC via the FT420 Configuration Serial Adapter Unit during system configuration (factory set).
		Microphone Input	1	Connect to the PCB mounted electret microphone on the OWS display board. Optional external hand-held dynamic microphone can be used.
Optional Zone & Control Expansion	Zone Input Expansion Board **SUB883**	Optional 8 Zone Inputs	1 or 2	Configurable to be 8 Alarm Zone Inputs, 8 Sprinkler Flow Switch inputs or 8 Trigger Inputs Alertcom. Compatible with the approved actuating devices. Check for space availability.
	Zone Display Board **SUB884**	Optional 4 Zone Display	1,2,3 or 4	Up to 16 Zones (4 zones per board) can be configured to indicate alarm, fault and disablement and controls for Zone Output Test, Zone Fault Test and Zone Disable.
	Dry-contact Relay Expansion Board **SUB885**	Optional 8 Dry-Contact Relay Outputs	1, 2, or 3	Provide up to 24 Dry-contact outputs, configurable N/C or N/O by jumper settings. Contact rating 30V @ 2A Each relay can be configured to be activated by an individual or all zone inputs.
	Supervised Outputs Expansion Board **SUB886**	Optional 4 Supervised Outputs	1, 2, 3, 4, 5 or 6	Up to 24 outputs can be configured as any combination of 24VDC supervised outputs or supervised speaker circuits depending on the input feed. All outputs are activated by all zone inputs. Can be used as OWS Speaker Zone Splitter 100V RMS, or generic Supervised 24VDC Alarm Outputs.
Optional OWS Expansion	OWS Plug-in Module **SUB887** & **SUB888**	OWS	1 set	Provide controls and indications for the OWS Fault, Isolate, Auto, and Manual mode controls. Provide controls and indications for manual alert and evacuation activations. Supervised 24V strobe output, bi-polarity. 24VDC @2A. Provide visual indications for evacuation and alert. Auxiliary audio input connects to a remote desk MIC or a background music input. Auxiliary supervised Enable input is capable of activating the auxiliary audio broadcasting e.g. remote desk MIC. Press-To-Talk PA with either a standard built-in electrets MIC or an optional external handheld MIC.
	OWS Tone Selection Board (Alertcom)	Optional Manual Tone Selection	1	Broadcast one of the eight tone / voice messages when one OWS Tone Selection Button is manually pressed. Requires an 8 Zone Expansion Board SUB883 for auto input triggering.
	PA zone Control Board	Optional Manual PA Zone Control	1, 2 or 3 PA zone controls	Provide manual controls to select up to 24 PA Zones. Requires Supervised Output Expansion Board SUB886

2.1.3 System Expansion Limitations

The expansion limits listed below must not be exceeded.

Only these additional boards can be added to the standard FT420 small enclosure:

- 2 x display boards
- 1 x expansion board (if necessary, another expansion board can be fitted on top of the first board).

To add additional optional modules, or a higher power rated OWS, a medium or large enclosure may be required.

Table 4 Expansion Limitation

Expansion / display board Type	Maximum Qty in CIE	Maximum individual functions
8 Zones Expansion Board	2	16 Additional zones (termination)
4 Supervised Voltage Outputs Expansion Board	6	24 Supervised output (24VDC or 100V RMS speaker circuit)
8 Clean Contact Relay Outputs Expansion Board	3	24 Relays
8 Non-Supervised Voltage Output	1	Only one board can be used
Maximum number of Control Expansion Boards	7	
4 Zones Display Board	4	16 additional zones (display)
4 Zone Display Board for	1	Only one board can be used
OWS Main Display Board	1	Only one board can be used
8 OWS Tone Selection Display Board	1	Only one board, 8 tone selections
8 PA Zone Control Display Board	3	24 PA Zone control buttons
Total number of expansion display boards on each display board expansion bus	5	
Maximum number of Expansion Display Boards	10	
Fan Control Expansion Board	Space limitation / impact only	2 Fan terminations
Fan Control Display Board	Space limitation / impact only	2 Fan status and control

2.1.4 Control Expansion Bus

As per Table 4, each FT420 system can be fitted with up to seven Control Expansion Boards that can be daisy-chain connected to the Main Control Board. Every Expansion Control Board has two bus connections; in and out and a Bus Address Selection Circuit. IDC 20-way ribbon cables are used for the bus interconnections.

The bus address selection is based on an 8-Bit DIP switch. **Only one DIP switch bank (one bit) can be turned ON at any time.** The address bit setting of all the expansion boards shall be different from each other. Refer to Table 15 on page 27.

There are two bus connectors on each expansion board. One connector connects the incoming bus and the other outgoing connects to the next expansion board. Expansion boards must be connected with the output bus of the “previous” board connected to the input bus of the “next” board.

The Main Control Board manages the bus operations. The system configuration data stored on the Main Control Board must match the type and address of each expansion board correctly.

If any configuration data error is detected, the CIE will signal a system fault and force all the expansion boards into inactive condition. This will deactivate all outputs that are non-energised and return all inputs to its deactivated state.

2.1.5 Display Driver Board Expansion Buses

There are two sets of expansion bus circuits on the Main Display Driver Board (SUB881), LEFT bus and RIGHT bus. Up to 5 Expansion Generic Display Driver boards (SUB891) can be daisy-chain connected to each bus of the Main Display Driver Board. Similarly, on each Generic Display Driver Board (SUB891), refer to Figure 9 on page 30, there are two bus connections (CON1 & CON2) and one bus address setting jumper on each Generic Display Driver Board. IDC 16-Way Ribbon Cables are used for these bus interconnections.

Each SUB891 board should be set with a unique address by a jumper link. Refer to Table 18 page 30 for jumper setting. The bus address setting is determined by the shunted status the IDC 2X5 jumper (JP1).

There are no Bus Directional Controls for the Expansion Display Driver Boards. The top bus connector will always be for incoming bus while the bottom connector is for out-going bus to the next Expansion Display Driver Board below it.

The Main Display Driver Board manages the Display Board Expansion Bus. The system configuration data stored on the Main Display Driver Board should match the type and address of each expansion display board correctly.

Should any configuration data corruption or bus error be detected, the CIE will signal a systems fault. The related controls and indications will be kept in their de-activated states.

2.1.6 Jumper Settings

There are two main types of jumper settings in the CIE, the Expansion Bus jumper settings and the Control Output jumper settings.

The Expansion Bus jumper settings shall match the allocated bus addresses and directions. The Expansion Bus jumper settings shall be recorded correctly in the related forms in Section 6.2 Appendix B Equipment Record, page 74.

Warning: The control output jumper settings should be carefully set. Incorrect jumper settings may cause short circuits of the system power outputs.

2.2 Main Control Board SUB880

The Main Control Board supports all the system controls and terminations. The field wiring for the common FT420 outputs/inputs and the first 4 zone circuits are terminated on SUB880, refer to the standard FT420 Block Wiring Diagram in Figure 39 page 76. The board layout is shown in Figure 2.

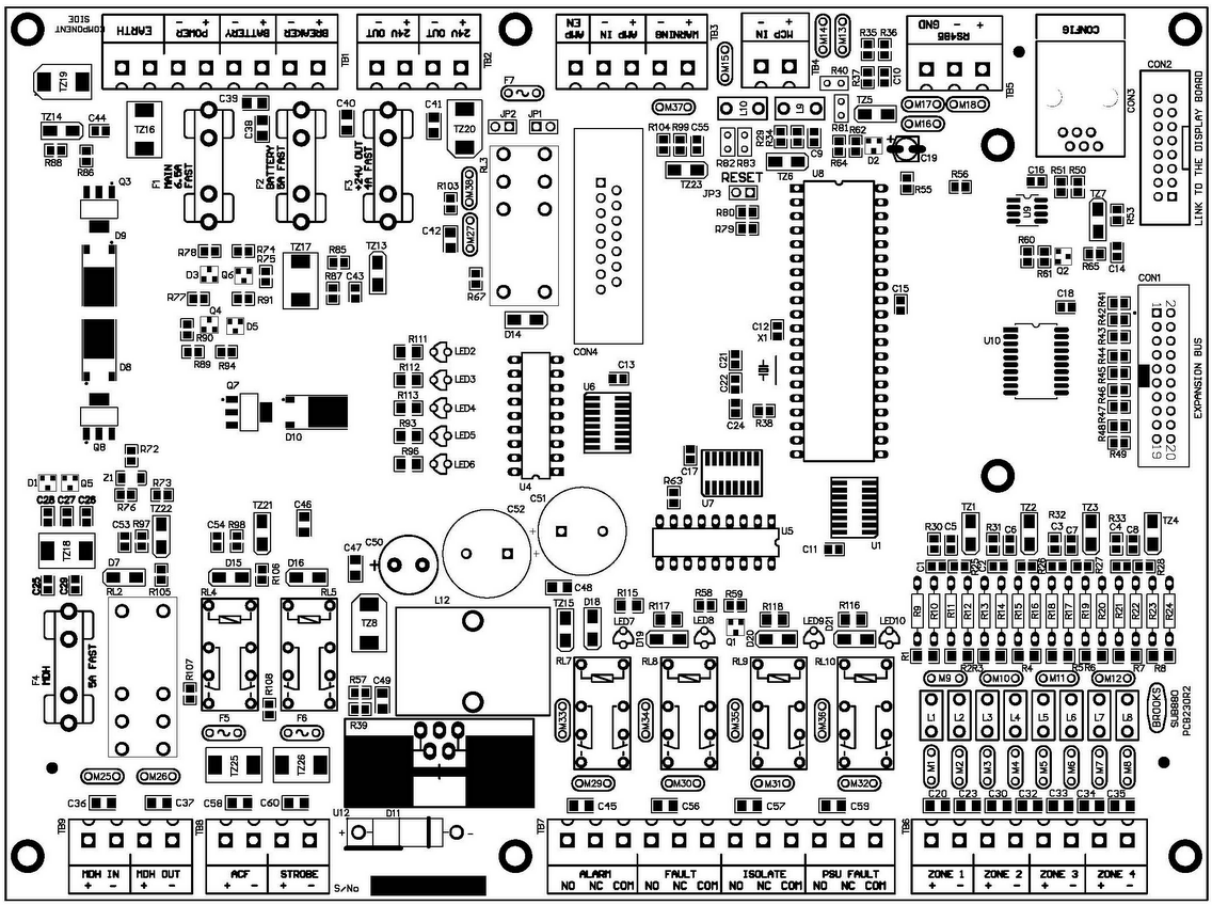


Figure 2 Main Control Board Layout (SUB880)

The board jumper settings and ancillary terminations are listed on Table 5 and Table 6 respectively.

Table 5 Main Control Board Jumper Settings

Designator	Description	Jumper Status	Function	Factory Default
JP1, JP2	Alarm device selection.	ON	24V output to control the electronic sounders	Default
		OFF	Dry-contact output to control the speaker circuits	
JP3	Microprocessor reset	ON	Set the system into reset state	
		OFF	Release reset for normal operations	Default

Table 6 Main Control Board Connections[4]

Designator	Type	Pin	Usage	Label	Description / Max rating
TB1	Removable screw terminal block	1	External Battery Circuit Breaker Connection	+	24VDC @ 6A
		2		-	
		3	Battery Connection	+	24VDC @ 5A Wired to the battery charger current limiter
		4		-	
		5	Mains Power Connection	+	28VDC +/-5% @ 5A
		6		-	
		7	Earth Connection	EARTH	Sufficient Earth connection shall be provided.
		8		EARTH	
TB2	Removable screw terminal block	1	24VDC Auxiliary Power	+	24VDC @ 4A(in total)
		2		-	
		3		+	
		4		-	
TB3	Removable screw terminal block	1	Warning output. (to control electronic sounders or speaker lines)	+	Sounder output: 24VDC @ 2 A or Speaker output: Dry-contact 100V RMS @ 5A
		2		-	
		3	Audio Line Input	+	100V RMS @ 5A. Connected to the audio amplifier output if using OWS.
		4		-	
		5	Audio Amplifier Control	N/A	Connect to Brooks audio amplifier Standby input.
TB4	Removable screw terminal block	1	Built-In MCP Input	+	The MCP is normally installed to the CIE front plate. The MCP wiring is inside the CIE cabinet.
		2		-	
TB5	Removable screw terminal block	1	RS485 Connection	+	Not used for external applications
		2		-	
		3		G	
TB6	Removable screw terminal block	1	Zone 1 input connection	+	Compatible with approved detectors and MCPs.
		2		-	
		3	Zone 2 input connection	+	
		4		-	
		5	Zone 3 input connection	+	

[4] **Abbreviation:** “Pin” = Pin No., “+” = Positive, “-” = Negative, “G” = Ground, “N/A” = Not Applicable, “N/O” = Normally Open, “N/C” = Normally Closed, “C” = Common.

Designator	Type	Pin	Usage	Label	Description / Max rating
		6		-	
		7	Zone 4 input connection	+	
		8		-	
TB7	Removable screw terminal block	1	Common Alarm Relay	N/O	Dry-contact output 30V @ 2A
		2		N/C	
		3		C	
		4	Common Fault Relay	N/O	Dry-contact output 30V @ 2A
		5		N/C	
		6		C	
		7	Common Disabled Relay	N/O	Dry-contact output 30V @ 2A
		8		N/C	
		9		C	
		10	Power Fail Relay	N/O	Dry-contact output 30V @ 2A
		11		N/C	
		12		C	
TB8	Removable screw terminal block	1	ACF Power Output	+	24VDC @ 500mA
		2		-	
		3	External Strobe Power Output	+	24VDC @ 1A
		4		-	
TB9	Removable screw terminal block	1	MDH Dry-Contact Relay Input	+	30V @ 5A. Connected to a non-battery backup AC/DC power supply. The MDH circuit is N/C.
		2		-	
		3	MDH Dry-Contact Relay Output	+	30V @ 5A. Connected to the MDH circuit. .
		4		-	
CON1	IDC20 cable connector		Expansion Board Connection	N/A	Connected to up to seven expansion boards cascaded together.
CON2	IDC16 cable connector		Main Display Board Connection	N/A	Connected to the Main Display Driver board.
CON3	RJ12 socket		Main Control Board Configuration Port	N/A	Not used

2.3 Main Display Driver Board SUB881

The FT420 Main Display comprises 2 subassemblies,

- The Main Display Driver board SUB881 and
- The Main Front Display board SUB882.

The Main Front Display board SUB882 contains the LED indicators and momentary push-button switches. The SUB881 contains all the driving circuits to drive the LEDs and implement the switch inputs. It also communicates with SUB880 via its own local microcontroller. The Main Display Driver board layout is shown in Figure 3.

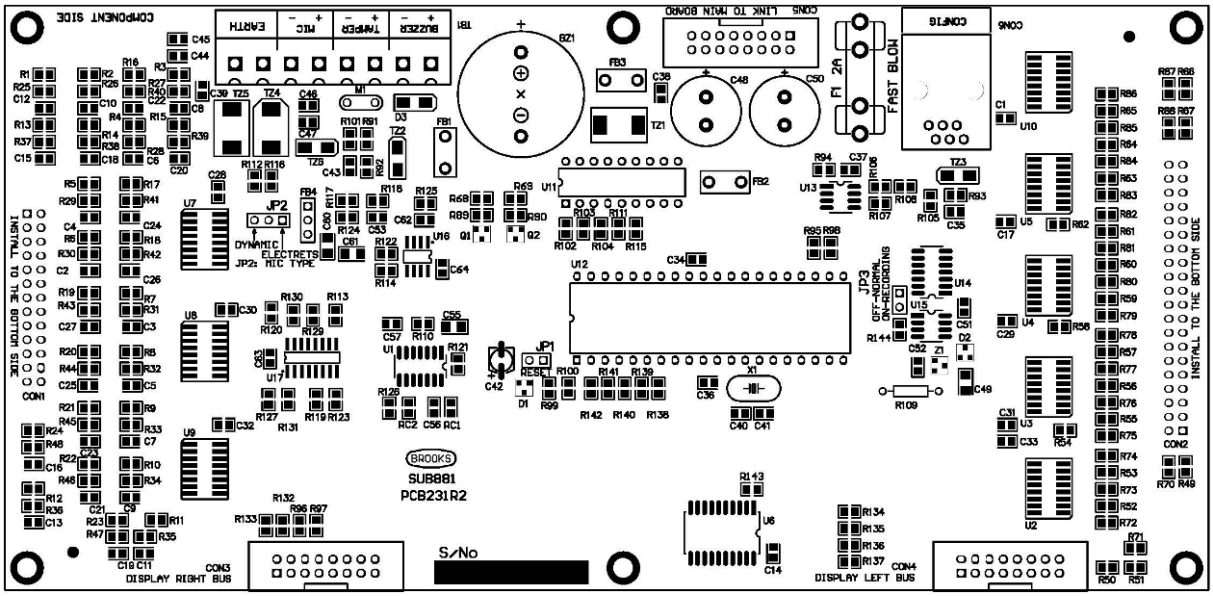


Figure 3 Main Display Diver Board Layout (SUB881)

The Main Display Driver board jumper settings and connections are shown on Table 7 and Table 8 respectively.

Table 7 Main Display Driver Board Jumper Settings

Designator	Description	Jumper Status	Function	Factory Default
JP1	Microprocessor reset	ON	Set the system into reset state	
		OFF	Release reset for normal operations	Default
JP2	Mic type selection	Dynamic	Sets optional dynamic microphone	
		Electrets	Standard system electrets microphone	Default

Table 8 Main Display Driver Board Connections

[5]Designator	Type	Pin	Usage	Label	Description
TB1	Removable screw terminal block	1	Optional External Buzzer Output	+	27.6VDC @ 200mA. (None monitored). Refer to connection diagram in Figure 22 on page 44.
		2		-	
		3	Optional CIE Door Switch Input	+	Not Used
		4		-	
		5	Microphone Input	+	Electrets or optional dynamic microphone is selectable via jumper JP2. The optional dynamic microphone cable must be shielded. The shielding connects to the EARTH terminal.
		6		-	
		7	Earth Connection	EARTH	Solid Earth connection must be provided.
		8			
CON1	IDC26 PCB header		Main Front Display Board Switch Input Connection.	N/A	Plug into the IDC socket on the main Front Display board.
CON2	IDC40 PCB header		Main Front Display Board LED Output Connection.	N/A	Plug into the IDC socket on the main Front Display board.
CON3	IDC16 cable connector		Right Display Board Expansion Bus	N/A	Support up to five expansion display boards cascaded together.
CON4	IDC16 cable connector		Left Display Board Expansion Bus	N/A	Support up to five expansion display boards cascaded together.
CON5	IDC16 cable connector		Main Control Board Connection	N/A	Connect to the main control board.
CON6	RJ12 Socket		System Configuration Port		Connect to the configuration adapter board during the system configurations.

[5] Table Abbreviation: “Pin” = Pin No., “+” = Positive, “-” = Negative, “N/A” = Not Applicable.

2.4 Battery Charger Current Limiting Board SUB945

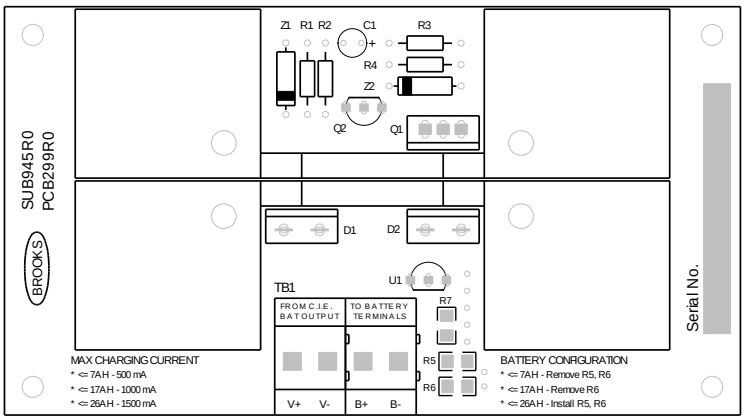


Figure 4 Battery Charger Current Limiting board layout (SUB945)

The Current Limiting Board is used only to limit the charging current to the batteries. Refer to FT420 Block Wiring Diagram Figure 39 page 76 for connection details. Termination details are shown on Table 9 below.

Table 9 Battery Charger Current Limiting Connection

Designator	Type	Pin	Usage	Lab	Description
TB1	Removable Screw Terminals	1	Connection from the Battery terminals on the main control board (TB1).	V+	Battery output on the main control board is connected to current limiting board to limit the maximum charging current.
		2		V-	
		3	Connection to Batteries	B+	
		4		B-	

The two resistors R5 and R6 control the maximum charging current versus the battery capacity depending on the resistors configuration. Table 10 below shows the configuration of R5 and R6 for the three battery sizes in the table.

Note: Default setting for R5 and R6 is to fit only R6, this covers 7-17 AH batteries. For 26 AH batteries, R5 should be fitted beside R6**.**

Table 10 Battery Capacity / Max Charging Current

Designator	PCB Configuration	Max Battery Capacity	Max Charging Current
R5 & R6	R5 & R6 Not fitted	7 AH	500 mA
	R6 Fitted	17 AH	1000 mA
	R5 & R6 fitted	26 AH	1500 mA

2.5 Optional 8 Zone Expansion Board SUB883

The first 4 Zone Input circuits are included in the Main Control Board SUB880. If more Zone circuits are required, an 8 Zone Expansion Board SUB883 is added. Each Zone Expansion Board provides 8 x Zone Input circuits.

Each Zone Input can be used either as a:

- Fire Alarm detection input,
- Flow Switch input or a
- Supervised Trigger input for the OWS Automatic Tone Alert function (Alertcom).

The Expansion Board has to be connected to the Main Control Board or another Expansion Board via ribbon cable. The board address must be selected using the DIP switch SW1 as shown in Table 11.

The board layout is shown in Figure 5.

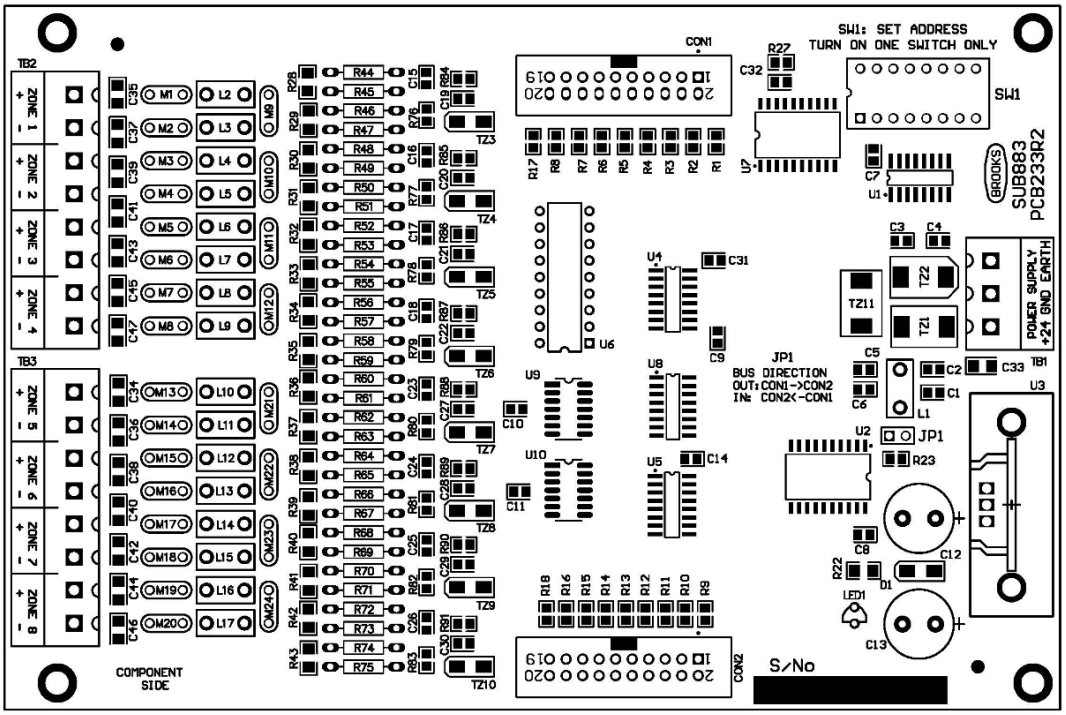


Figure 5 Zone Expansion Board Layout

The board jumper settings and connections are listed on Table 11 and Table 12 respectively.

Table 11 Zone Expansion Board Jumper Settings

Designator	Description	Jumper Status	Function	Factory Default
JP1	Not used	Out	Not used	Out
SW1	Select expansion board address. Only one bit can be turned ON.	1-7	Set one address from 1 to 7.	Based on the system configurations.
		8	Disable the expansion board.	

Table 12 Zone Expansion Board Connections[6]

Designator	Type	Pin	Usage	Label	Description
TB1	Removable Screw terminal block	1	DC power input	+24V	24VDC @ 200mA. Connected to the main control board backup power output TB2.
		2		GND	
		3	Earth connection	EARTH	Solid Earth connection shall be provided.
TB2	Removable screw terminal block	1	1st expanded Zone input connection	+	Compatible with the approved detectors and MCPs. Can also be used as the monitored inputs for flow switches, AS1668 duct detectors for fan control or the OWS automatic tone alert functions (Alertcom).
		2		-	
		3	2nd expanded Zone input connection	+	
		4		-	
		5	3rd expanded Zone input connection	+	
		6		-	
		7	4th expanded Zone input connection	+	
		8		-	
TB3	Removable screw terminal block	1	5th expanded Zone input connection	+	
		2		-	
		3	6th expanded Zone input connection	+	
		4		-	
		5	7th expanded Zone input connection	+	
		6		-	
		7	8th expanded Zone input connection	+	
		8		-	
CON1	IDC20 Cable connector		Incoming control expansion bus connector.	N/A	
CON2	IDC20 Cable connector		Outgoing control expansion bus connector	N/A	

[6] Table Abbreviation: “Pin” = Pin No., “+” = Positive, “-” = Negative, “N/A” = Not Applicable.

2.6 Optional Relay Expansion Board SUB885

The Relay Expansion board provides 8 Programmable Dry Contact Relay Outputs. Each relay output can be configured to activate from an alarm in a single zone or all zones. This configuration can be performed via the PC Configuration software. Refer to section 4.3.4 page 64 for details. The board layout is shown in Figure 6.

The Expansion Board has to be connected to the Main Control Board or another expansion board via ribbon cable. The board address must be selected using the DIP switch SW1 as per Table 13.

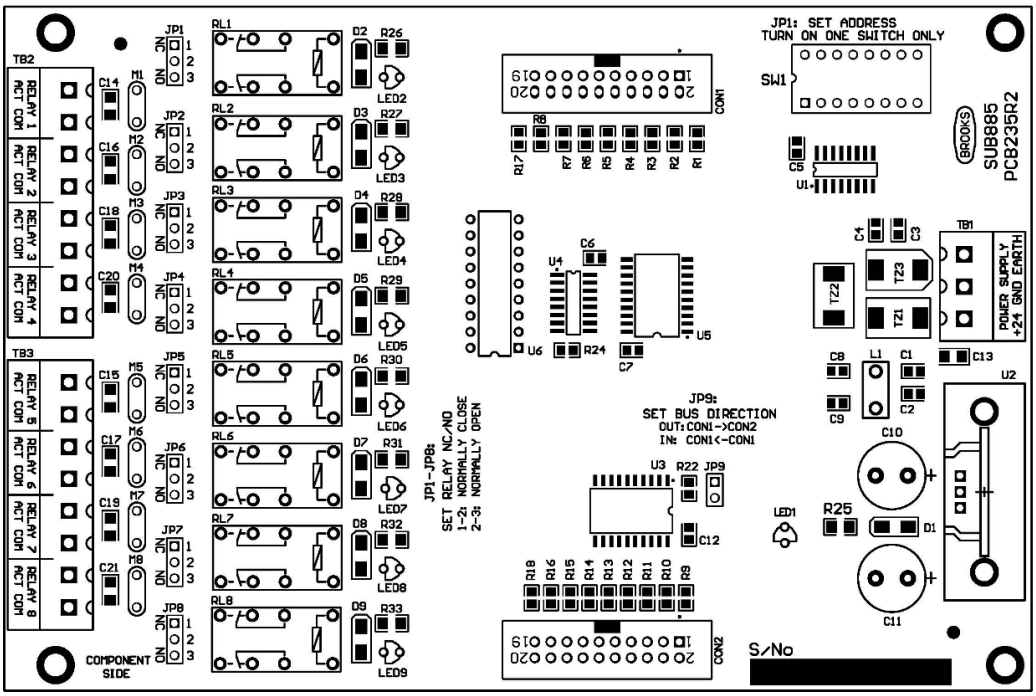


Figure 6 Relay Expansion Board Layout

The board jumper settings and connections are listed on Table 13 and Table 14

Table 13 Relay Expansion Board Jumper Settings

Designator	Description	Jumper Status	Function	Factory Default
JP9	Not used	Out	Not used	Out
JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8	Select N/O or N/C for relay output 1- 8, 3A.	1-2	Normally Closed	Set as the application specified.
		2-3	Normally Open	
SW1	Select expansion board address. Only one bit can be turned ON.	1-7	Set address from 1 to 7.	Based on the system configurations.
		8	Disable the expansion board.	

Table 14 Relay Expansion Board Connections[7]

Designator	Type	Pin	Usage	Label	Description
TB1	Removable screw terminal block	1	DC power input	+24V	24VDC @ 300mA. Connected to the main control board backup power output.
		2		GND	
		3	Earth connection	EARTH	Solid Earth connection shall be provided.
TB2	Removable screw terminal block	1	Relay 1 output connection	ACT	Dry-contact relay output. Jumper configurable N/C or N/O. "ACT" either N/C or N/O depending on jumper setting. "COM" common Maximum carry current 2A @ 30V.
		2		COM	
		3	Relay 2 output connection	ACT	
		4		COM	
		5	Relay 3 output connection	ACT	
		6		COM	
		7	Relay 4 output connection	ACT	
		8		COM	
TB3	Removable screw terminal block	1	Relay 5 output connection	ACT	
		2		COM	
		3	Relay 6 output connection	ACT	
		4		COM	
		5	Relay 7 output connection	ACT	
		6		COM	
		7	Relay 8 output connection	ACT	
		8		COM	
CON1	IDC20 Cable connector		Incoming control expansion bus connector.	N/A	
CON2	IDC20 Cable connector		Outgoing control expansion bus connector	N/A	

[7] Table Abbreviation: "Pin" = Pin No., "+" = Positive, "-" = Negative, "N/A" = Not Applicable, "N/O" = Normally Open, "N/C" = Normally Closed, "C" = Common.

2.7 Optional Supervised Output Expansion Board SUB886

The Supervised Output Expansion Board provides 4 fully Programmable Supervised Outputs. Each output can be configured to be as a 24V Supervised Output (on board power) or a Supervised Speaker Circuit for OWS. The board layout is shown in Figure 7.

The 1st Expansion Board has to be connected to the Main Control Board. If a 2nd Expansion Board is required, connect a 20-Way ribbon cable between the 1st and 2nd Expansion Boards via CON2. The board address must be selected using the DIP switch SW1 as shown in Table 15.

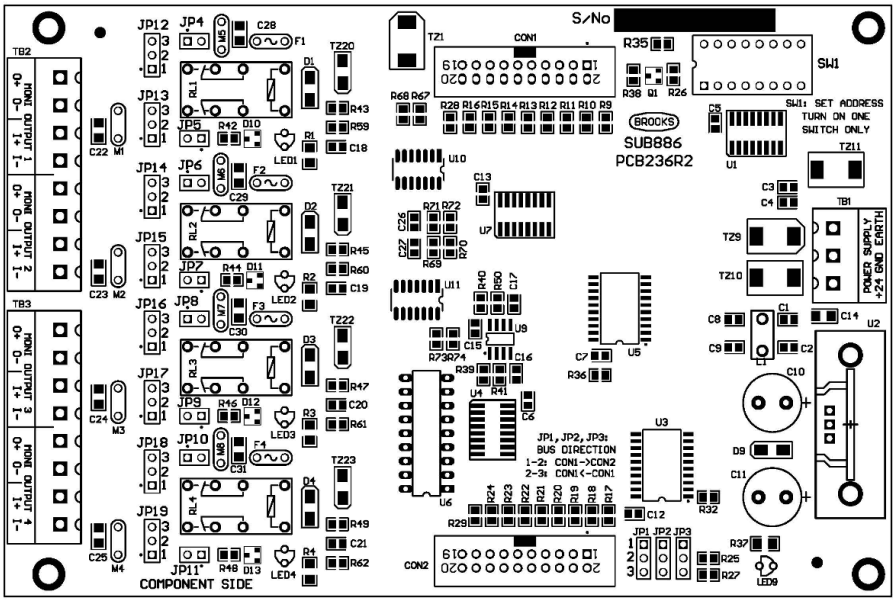


Figure 7 Supervised Output Expansion Board Layout (SUB886)

Table 15 Supervised Output Expansion Board Jumper Settings

Designator		Description	Jumper Status	Function	Factory Default
JP1, JP2, JP3		Not used	1-2	Not used	1-2
SW1		Select expansion board address. Only one bit can be turned ON.	1-7	Set address from 1 to 7.	Based on the system configurations.
			8	Disable the expansion board.	
JP4, JP5	OUTPUT 1	Select 24V alarm output or 100V speaker output.	ON	Set Output 1 to be 24VDC output	Set to suit the specified application. OWS Zone splitter uses dry contact and normal supervision. Sounders use 24V output and normal supervision.
			OFF	Set Output 1 to be 100V speaker output	
JP12, JP13		Select supervision of relay Output.	2-3	Set Relay Output 1 to be supervised	
			1-2	Not used	
JP6, JP7	OUTPUT 2	Select 24V alarm output or 100V speaker.	ON	Set Output 2 to be 24VDC output	
			OFF	Set Output 2 to be 100V speaker output	
JP14, JP15		Select supervision of relay Output.	1-2	Set Relay Output 2 to be supervised	
			1-2	Not used	
JP8, JP9	OUTPUT 3	Select 24V alarm output or 100V speaker/external source output.	ON	Set Output 3 to be 24VDC Output	
			OFF	Set Output 3 to be 100V speaker output	

Designator		Description	Jumper Status	Function	Factory Default
JP16, JP17		Select supervision of relay Output.	2-3	Set Relay Output 3 to be supervised	
			1-2	Not used	
JP10, JP11	OUTPUT 4	Select 24V alarm output or 100V speaker.	ON	Set Output 4 to be 24VDC output	
			OFF	Set Output 4 to be 100V speaker output	
JP18, JP19		Select supervision of relay Output.	2-3	Set Relay Output 4 to be supervised	
			1-2	Not used	

Table 16 Supervised Output Expansion Board Connections

Desig.	Type	Pin	Usage	Label	Description
TB1	Removable screw terminal block	1	DC power input	+24V	24VDC @ 4A. Connects to the Main Control Board backup power output.
		2		GND	
		3	Earth connection	EARTH	Solid Earth connection shall be provided.
TB2	Removable screw terminal block	1	Output 1 connection	O+	Used as 24VDC supervised output, max 2A or 100V supervised speaker. Can be utilised for splitting OWS speaker output into multiple speaker outputs or PA zoning controls.
		2		O-	
		3	Input 1 connection	I+	Input terminals can be used as an external source (24 / 12 VDC) or 100V RMS speaker input.
		4		I-	
		5	Output 2 connection	O+	Used as 24DCV supervised output, max 2A or 100V supervised speaker. Can be utilised for splitting OWS into multiple speaker outputs or PA zoning controls.
		6		O-	
		7	Input 2 connection	I+	Input terminals can be used as an external source (24 / 12 VDC) or 100V RMS speaker input.
		8		I-	
TB3	Removable screw terminal block	1	Output 3 connection	O+	Used as 24VDC supervised output, max 2A or 100V supervised speaker. Can be utilised for splitting OWS into multiple speaker outputs or PA zoning controls.
		2		O-	
		3	Input 3 connection	I+	Input terminals can be used as an external source (24 / 12 VDC) or 100V RMS speaker input.
		4		I-	
		5	Output 4 connection	O+	Used as 24V supervised output, max 2A or 100V supervised speaker. Can be utilised for splitting OWS into multiple speaker outputs or PA zoning controls.
		6		O-	
		7	Input 4 connection	I+	Input terminals can be used as an external source (24 / 12 VDC) or 100V RMS speaker input.
		8		I-	
CON1	IDC20 Cable connector		Incoming Control expansion bus connector.	N/A	Not used
CON2	IDC20 Cable connector		Outgoing Control expansion bus connector	N/A	

Notes:

1) Ensure correct jumper link settings according to Table 16 to suit applications.
2) If any of the supervised outputs generated open or short circuit fault, it will only be indicated by "System Fault" LED flashing 3 times i.e. expansion board fault.
3) If OWS is used and the supervised output board is used as speaker splitter, a fault in any circuit will not be displayed as a common fault on the OWS front display. It will be indicated as a system fault.

2.8 Optional OWS Plug-In Module SUB887

The OWS Plug-In Module is installed on the Main Control Board via the DB15 connector with designator labelled CON1 on SUB887 as shown in Figure 8. The Plug-In Board controls the different tones and messages required by the standard OWS and the Alertcom options.

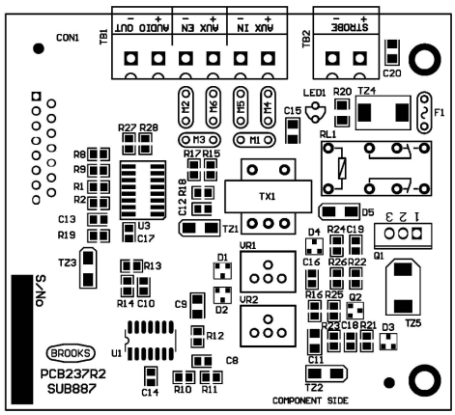


Figure 8 OWS Plug-in Module Layout.

If the OWS is left in "Isolate" or "Manual" mode in excess of 5 minutes, a fault will be generated.

In software V2.1[8] or higher, a new feature has been added to allow for 3 minutes delay between alert and evacuation tone. This time delay can be configured using the PC configuration tool software V2.1 or higher depending on the firmware in SUB880 and SUB881. There are no jumper settings for the OWS Plug-In Module. The board terminations are shown on Table 17.

Important: You must ensure J1 & J2 on the Main Control Board (SUB880) are NOT fitted.

Table 17 OWS Plug-in Module Connections

Designator	Type	Pin	Usage	Label	Description
TB1	Removable screw terminal block	1	Auxiliary Audio Input	+	0 – 1.5V RMS audio input. The audio cable shall be shielded, and the shielding shall be connected to the CIE EARTH. The remote microphone should be dynamic type with preamplifier.
		2		-	
		3	Auxiliary Switch Input	+	Clean contact input
		4		-	
		5	Audio Output	+	Audio output to the audio amplifier. 0 - 2V RMS audio output.
		6		-	

[8] The function was deleted in software V2.3.0 & V2.3.1, now it is available in V2.3.3

Designator	Type	Pin	Usage	Label	Description
TB2	Dual strobe control	1	Dual strobe as visual indications for evacuation and alert conditions	+	24VDC @ 2A, supervised, polarity reversible. EOL resistance is normally 47K Ohms, and may vary based on the type of the strobes.
		2		-	
CON1	DB15 Male		Main Control Board connection	N/A	Connects to the main control board.

Note: Trimpots VR1 and VR2 are used to adjust the auxiliary input level. VR2 is used for normal adjustment and VR1 for fine adjustment.

2.9 Optional Expansion Display boards

2.9.1 Generic display driver board SUB891

The Generic Display Driver board (SUB891) shown in Figure 9 must be used with every Optional Expansion Display board.

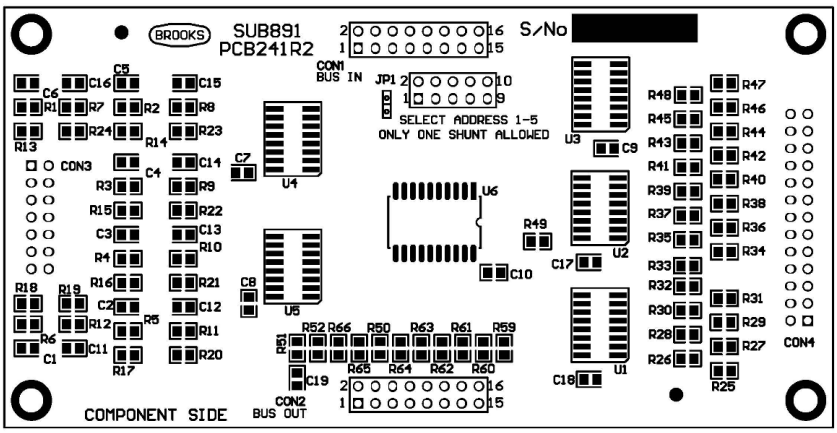


Figure 9 Generic Display Driver Board Layout (SUB891)

The board jumper settings and connections are listed on Table 18 and Table 19.

Table 18 Generic Display Driver Board Jumper Settings

Designator	Description	Jumper Shunt Status	Function	Factory Default
JP1	Select expansion display board address from 1-5	1-2	Set address 1	Based on the system configurations.
		3-4	Set address 2	
		5-6	Set address 3	
		7-8	Set address 4	
		9-10	Set address 5	

Table 19 Generic Display Driver Board Connectors

Designator	Type	Usage	Description
CON1	IDC16 Cable connector	Display Board Expansion bus input connector.	No jumper setting for the bus direction.
CON2	IDC16 Cable connector	Display Board Expansion bus output connector.	

2.9.2 OWS Display Board SUB888

The main components on the OWS Front Display board comprises LED indicators, momentary switches, an electret MIC and two IDC sockets which connects to the Generic Display Driver board. The board layout is shown in Figure 10.

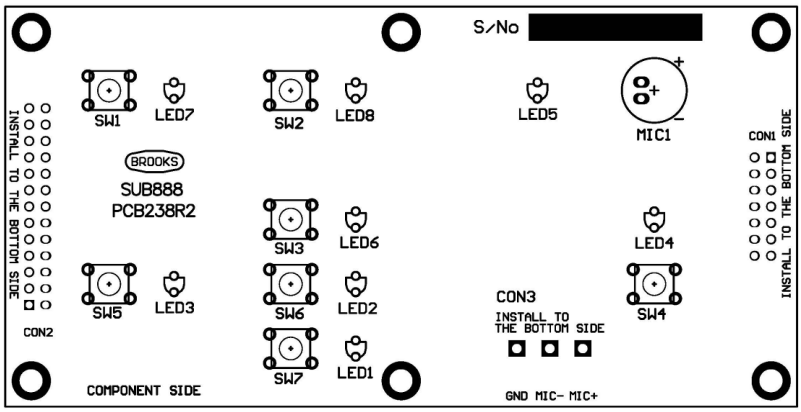


Figure 10 OWS Front Display Board Layout

There are no jumper settings required for this board. The board connections are listed on Table 20.

Table 20 OWS Front Display Board Connections[9]

Designator	Type	Pin	Usage	Label	Description
CON1	IDC14 socket		Connection to the generic display driver board.	N/A	Plug-in connections. The two boards shall be fastened with four metal spacers.
CON2	IDC26 socket			N/A	
CON3	Low profile screw terminal block on the back of the board	1	Electret microphone connection	+	Connects to the MIC input of the Main Display Driver board if built-in MIC is used.
		2		-	
		3	Microphone shielding connection	G	The MIC cable (two core audio cable) should be shielded. The shielding should be connected to this terminal. The other end of the shielding should be left unconnected.

2.9.3 Other optional Front Display boards

Similar to the OWS Front Display board, the other Front Display boards comprises main components such as LED indicators, momentary switches, 2 IDC sockets that connect to the Generic Display Driver board.

[9] Table Abbreviation: “Pin” = Pin No., “+” = Positive, “-” = Negative, “G” = Ground, “N/A” = Not Applicable.

2.10 Fuses

The system is protected with fuses detailed on Table 21. The fuse rating for MDH controls may be reduced to suit the application requirements.

Table 21 Fuse Specifications

Module	Designator	Specification	Usage
Main Control Board	F1	M205, 5A, fast blow or very fast blow	Main Power Input
	F2	M205, 5A, fast blow or very fast blow	Battery Charger Output
	F3	M205, 3A, fast blow or very fast blow	Backup +24V Power Output
	F4	M205, 5A, fast blow or very fast blow	MDH Control
	F5	Poly resettable, 500mA	ACF 24V Power Output
	F6	Poly resettable, 1A	External Strobe 24V output
	F7	Poly resettable, 2A	Warning / Speaker 24V output
	BREAKER +/-	7A, External Miniature Circuit Breaker	Batteries Over-Current Protection
Main Display Board	F1	M205, 2A, fast blow	5V Power Input.
Four Monitored Relay Board	F1	Poly resettable, 2A	24V Power Output
	F2	Poly resettable, 2A	24V Power Output
	F3	Poly resettable, 2A	24V Power Output
	F4	Poly resettable, 2A	24V Power Output
OWS Plug-in Module	F1	Poly resettable, 2A	24V Power Output

3 FUNCTIONS AND CONNECTION DIAGRAMS

3.1 CIE Front Control Display Panel

An 8-Zone FT420 CIE with OWS is shown in Figure 12 and Figure 13. The details of the front display labels are shown in Figure 11.

When a FT420 with only 4 Zones and OWS is required, the OWS display must be moved to the left hand side instead of the location shown in Figure 11.

If there are more than 8 zones in addition to the OWS, a larger enclosure may be used where additional ancillary plates can be mounted in order for additional display modules to be fitted. Each additional ancillary plate provides space for two front boards. The maximum number of zones for FT420 CIE is 20.

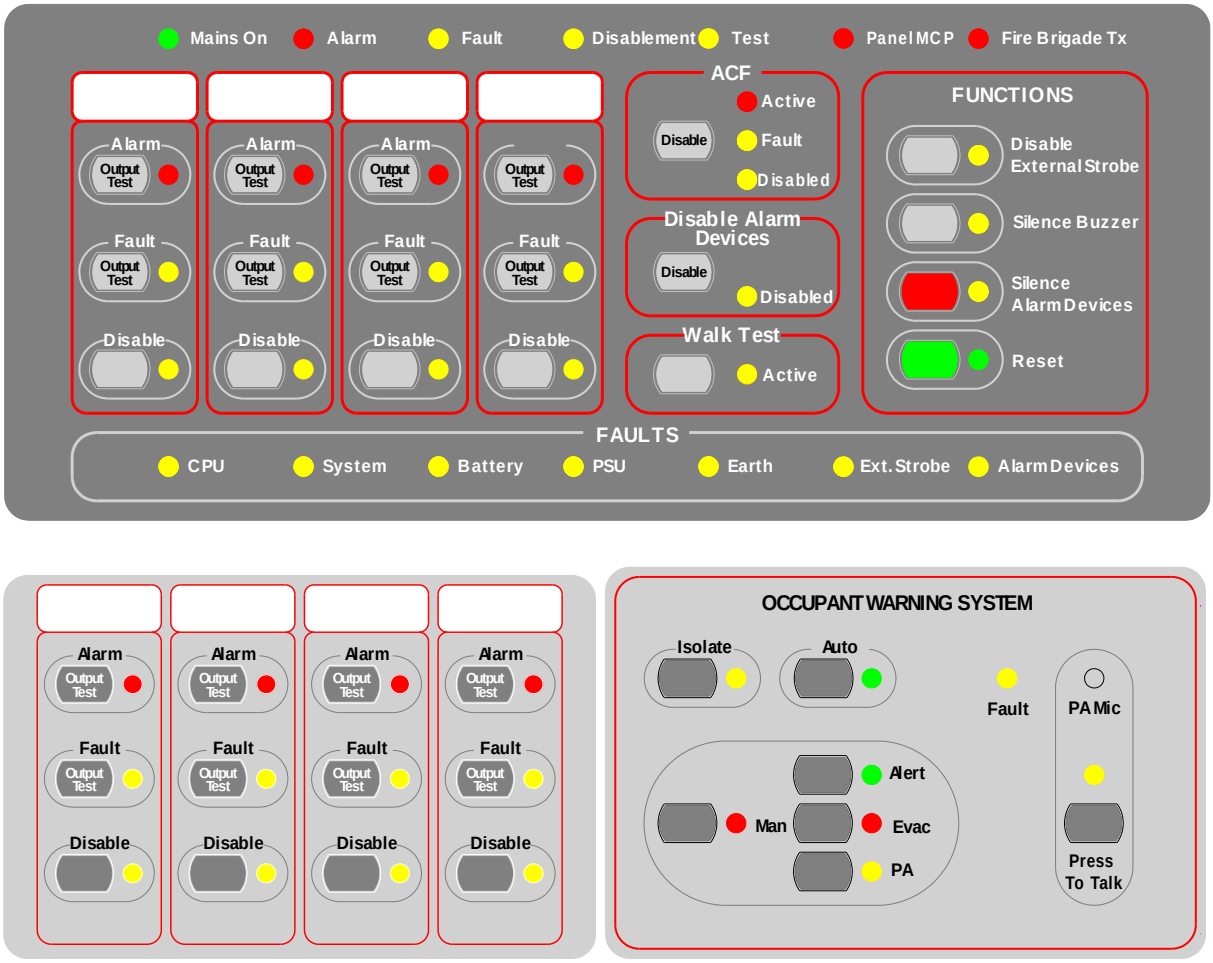


Figure 11 Typical CIE Front Display boards Layout

3.2 Typical FT420 CIE

The Firetracker FT420 CIE provides system status via individual LED indicators and controls. Each control button is a momentary push-button switch. The LED indicators and momentary switches are grouped based on their functionality as shown in Figure 11. The Main Front Display Board which includes the first four zones, is located on the top section as shown in Figure 12. All other display boards are optional.

Figure 12 Typical 8-Zone FT420 with OWS in a small enclosure

Figure 13 Typical 8 Zone FT420 CIE with OWS in a small enclosure (door opened)

3.3 CIE Indications

If not defined below, the default state of the LED indicators are **OFF** with the exception of the "**Mains On**" LED with the buzzer **SILENT**.

3.3.1 LED Indicating Patterns

The FT420 CIE LED indicators use the following signal patterns to alert different system condition i.e. some LEDs may indicate different status depending on the flash rate.

Table 22 LED Indicating Patterns

Name	Period	Flash times	On Time per flash	Off Time per flash	Idle State
Emergency	0.512s	1	0.256s	0.256s	OFF
Flash 1	2.56s	1	0.256s	0.256s	
Flash 2	2.56s	2	0.256s	0.256s	
Flash 3	2.56s	3	0.256s	0.256s	
Flash 4	2.56s	4	0.256s	0.256s	
Steady ON	Always ON				

3.3.2 Fault LED indications

Some of the fault LED indicators have multiple indicating patterns to provide more information on the type of faults. The fault LED indicating patterns are listed on Table 23.

Table 23 Fault LED Indications

Location	LED Indicator	LED Pattern[10]	Description
Main Display Board and Zone Expansion Display board	Zone Fault	Flash 1	Zone open circuit fault.
		Flash 2	Zone short circuit fault.
Main Display Board	Common Fault	Steady ON	Common fault condition detected.
	ACF Fault	Flash 1	An open circuit fault is detected in the ACF connection.
		Flash 2	A short circuit fault is detected in the ACF connection.
	CPU Fault	Steady ON	CPU or communication fault condition detected.
	System Fault	Steady ON	Multiple system faults detected.
		Flash 1	MCP circuit fault.
		Flash 2	Main display board has a display board expansion fault.
		Flash 3	Main control board has a control expansion fault. This will also indicate supervised output fault if supervised output board is used.
	Power Supply Fault	Steady ON	Battery Low Fault detected.
		Flash 2	Mains Low Fault when the Mains ON LED is OFF.
		Flash 1	Mains High Fault (or Charger High Fault) when the Mains ON LED is ON.
		Flash 2	Charger Low Fault.
		Flash 3	Both mains and charger have faults.
	Battery	Flash 1	Battery low fault detected

[10] Refer to Table 22 LED Indicating Patterns.

Location	LED Indicator	LED Pattern[10]	Description
	Earth Fault	Flash 1	A leakage between the 0V and the earth is detected.
		Flash 2	A leakage between the +24VDC and the earth is detected.
	External Strobe Fault	Flash 1	An open circuit fault is detected in the external strobe wiring.
		Flash 2	A short circuit fault is detected in the external strobe wiring.
OWS Fault on the OWS Display board Warning System Fault on the Main Display board	OWS Fault Warning System Fault	Steady ON	Multiple OWS faults detected.
		Flash 1	OWS Speaker or 24VDC output fault.
		Flash 2	OWS bi-colour strobe output fault.
		Flash 3	OWS auxiliary switch input fault.

3.3.3 Buzzer Indicating Patterns

The CIE buzzer uses the following patterns to alert different system conditions.

Table 24 Buzzer Indicating Patterns

Name	Period	On Time	Off Time
Alarm	3s	2s	1s
Key Pressed	40ms	40ms	Not ON
Steady ON	Always ON		

3.4 CIE Signalling Patterns

3.4.1 Optional OWS messages

The standard format of the OWS provides the T3 evacuation tone and message in alarm conditions. The alert tone / message can be activated manually from the OWS Front Display. Alternatively, it can in auto mode be configured to activate for 3 minutes followed by the T3 evacuation tone / message until the alarm resets[11]. This function has to be configured via the PC configuration tool V3.2 or higher.

Table 25 OWS Tone and Voice Messages

Audio Indication	Type	Active conditions	Description
Evacuation T3	T3 Tone and voice message	Alarm condition or manual activation via the front display	Repeat the tone below for 4 times. Sweeping from 500-1200Hz with the ON/OFF time of 0.5s, repeated for 3 times, and then followed by an additional 1 second silence. Then the following evacuation voice message: “Attention, attention, fire alarm evacuate now” When the voice message is completed, the tone repeats again.
Alert	Alert tone and voice message	Alarm condition when the 3 minutes delay option is selected followed by T3 evacuation or manual activation via the front display	Repeat the tone below for twelve times. Continuous tone at 420Hz with the ON/OFF time of 0.6s, repeated for three times. The alert voice message follows. “Attention, attention, a fire alarm has been detected within the building. Standby for further instructions”. When the voice message is completed, the tone repeats again. If 3 minutes delay is selected, the alert tone will automatically change to the evacuation tone.

[11] Refer to the OWS option “Alert to evac after 3 minutes“ in the configuration software Chapter “Configuration Setup” page 62

Audio Indication	Type	Active conditions	Description
Alarm Test Or Walk Test	Voice Message	Alarm input detected during walk test	Repeat in zone alarm test. Only once in walk test mode.

3.4.2 Signalling patterns

Table 26 below lists the FT420 signalling patterns under different operational conditions. All the common indications are shown in Figure 11, page 33. When a zone or supervised output is disabled, new alarms or faults within this zone will not activate any common alarm / fault conditions or outputs. However, only the respective zone alarm or fault conditions will remain in its state. In alarm condition, the “Fire Brigade Tx” LED illuminates, even if no physical connections are provided to transmit this signal to the Fire Brigade.

Table 26 CIE Signalling Patterns

Type	CIE Conditions	LED Name	LED Colour	LED Pattern	Buzzer Pattern	Audio Broadcasting
Alarm	DBA alarm	Common Alarm	Red	Emergency	Alarm	Evacuation message to all speakers, refer to Table 25
		Fire Brigade Tx				
		Zone Alarm				
	Non-DBA alarm	Common Alarm		Emergency	Alarm	Alert message to all PA zones with auto timer to evac
		Zone Alarm				
Alarm Test	Zone alarm test	Zone Alarm Test	Red	Steady ON	N/A	Alarm test message “Testing”
	No zone alarm has been detected during the zone walk test conditions			Steady ON	N/A	N/A
	Zone alarm has been detected during the zone walk test			Flash 2	N/A	Alarm test message “Testing”
Other Related Tests	LED test	LED Test	Yellow	Steady ON	Steady ON	N/A
	Zone fault test	Zone Fault Test		Steady ON	Steady ON	N/A
	Walk Test in progress	Walk Test		Steady ON	N/A	N/A
	Walk Test mode activated			Alert	N/A	N/A
Disable	Disabled	Common disablement	Yellow	Steady ON	N/A	N/A
		Zone / output disabled				
Fault	Fault	Common Fault	Yellow	Based on fault types	Steady ON	N/A
		Any other fault				
Mains	Mains power supply is available	Mains ON	Green	Steady ON	N/A	N/A
	System is performing automatic battery test			Alert	N/A	N/A
	Mains voltage is too low			Steady OFF	Steady ON	N/A
ACF Output	ACF control activated	ACF Active	Red	Steady ON	N/A	N/A
Silence	Buzzer is silenced by the	Silence Buzzer	Yellow	Steady ON	OFF	N/A

Type	CIE Conditions	LED Name	LED Colour	LED Pattern	Buzzer Pattern	Audio Broadcasting
Control	manual control					
	OWS or Sounders are silenced by the manual control	Silence Alarm Devices	Yellow	Steady ON	N/A	OFF
LED Test	CIE is in quiescent conditions press and hold External Strobe Disable button	All the LEDs except the Common Fault and the CPU Fault LED	Red Yellow Green	Steady ON	Steady ON	OFF
Reset	System reset is in progress	Reset	Green	Steady ON	N/A	N/A
OWS	OWS is active	Auto	Green	Alert	N/A	Audio to all speakers
	OWS is active	Man	Red			
	OWS is broadcasting Evacuation tone / message	Evac	Red	Emergency	N/A	Evacuation tone / message to all speakers
	OWS is broadcasting Alert tone / message (manual)	Alert	Green	Emergency	N/A	Alert tone / message to all speakers
	OWS PA mode is activated	PA	Yellow	Steady ON	N/A	N/A
	Auxiliary audio input activated in CIE quiescent conditions	Auto	Green	Alert	N/A	Auxiliary audio to all speakers

3.5 Line Monitoring

The FT420 CIE continuously monitors each of the zone inputs, supervised outputs and panel mounted MCP input. Should an open or short-circuit (if zone short circuit alarm is not enabled) be detected in any of the field wiring, the CIE fault condition will be activated.

3.5.1 Fault Delay

Each supervised output has a time delay to latch the circuit fault in order to provide sufficient stabilisation time to overcome the accumulated cable capacitance and delay of the relay action.

Please note that the speaker lines normally have large DC isolation capacitors installed. If the fault delay period is insufficient, use more OWS zoning controls and connect fewer speakers to each PA zone relay.

3.5.2 EOL (End-Of-Line) Resistors

To perform line supervision, the CIE requires one EOL resistor to be installed to the end of each supervised input or output. If a supervised input or output is not used, the EOL resistor needs to be installed to the related terminals in the CIE. The EOL resistor values required for each module input / output are listed on Table 27.

Table 27 End of Line Resistor Specifications

Module	Supervision	Qty	EOL Resistor
Main Control Board	Zone Inputs	4	3.9K, 1W, metal film
	CIE MCP	1	3.9K, 1W, metal film
	ACF Output	1	47K, 1W, metal film
	External Strobe Output	1	47K, 1W, metal film
	Warning Output	1	47K, 1W, metal film
Optional Eight Zone Expansion Board	Zone Inputs	8	3.9K, 1W, metal film
Optional Supervised Outputs Expansion Board	Supervised output	4	47K, 1W, metal film
Optional OWS Plug-in Module	Remote auxiliary Input	1	47K, 1W, metal film
	Dual Strobe Output	1	47K, 1W, metal film. May vary based on the device.

3.6 Zone Inputs

3.6.1 Zone Input Specifications

Table 28 Zone Input Circuit Specifications

Item	Description
Number of zones per CIE	4 - 20 zones
Maximum number of detectors per zone	0 – 40, including MCPs
Maximum number of detectors per CIE	0 – 800, including MCPs
Maximum number of detectors in alarm per zone	Up to 2, including MCPs, heat or smoke detectors.
Maximum alarm current per zone	51mA
Typical Zone quiescent current	5mA
Typical zone input resistance in alarm condition per zone	560 Ohm

3.6.2 Compatible actuating devices

The compatible devices are listed on Table 29.

Table 29 Compatible Actuating Devices

Part No.	Manufacturer	Description
2324	Panasonic	Conventional detector base
4350	Panasonic	Conventional multi detector[12]
4352	Panasonic	Conventional photoelectric smoke detector[12]
4452	Panasonic	Conventional photoelectric smoke detector (new)
4375	Panasonic	Heat detector fixed temperature 60^0
4376	Panasonic	Heat detector fixed temperature 80^0
6295	Panasonic	Conventional enclosed heat detector 60 degrees
6296	Panasonic	Conventional enclosed heat detector 80 degrees
6297	Panasonic	Conventional enclosed heat detector 100 degrees
6298	Panasonic	Conventional enclosed heat detector 120 degrees
4318	Panasonic	Conventional combination heat detector Type A/B
MRCSRR	Cooper	MCP

The alarm resistance of the Panasonic conventional detector is determined by the detector base (560Ω)

3.6.3 Zone Input Connection

The typical wiring of zone input circuit is shown Figure 14.

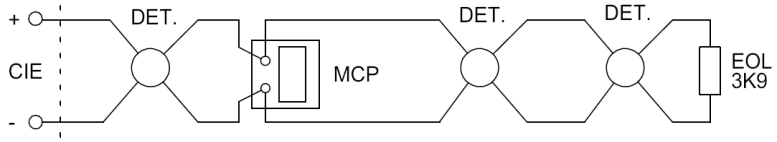


Figure 14 Typical Zone Input Circuit

[12] 4350 and 4352 are obsoleted, 4352 is replaced by 4452.

3.7 Control Outputs

3.7.1 Control Output Specifications

The CIE control outputs are listed in Table 30**.**

Table 30 Control Output Specifications

Module	Item	Qty	Type	Voltage	Current Rating	Fuse
Main Control Board SUB880	MDH Output	1	Dry-contact, N/C	30V	5A	M205, 5A, fast blow
	ACF Output	1	24V output	24V	500mA	Poly resettable, 500mA
	External Strobe Output	1	24V output	24V	1A	Poly resettable, 1A
	Alarm Devices Output	1	Dry-contact	110V RMS	5A	No
			24V output	24V	2A	Poly resettable, 2A
	Backup Power Output	2	24V output	24V	4A	M205, 3A, fast blow in total.
	Common Alarm Relay Output	1	Dry-contact	30V	2A	No
	Common Fault Relay Output	1	Dry-contact	30V	2A	No
	Common Disablement Relay Output	1	Dry-contact	30V	2A	No
	Power Fail Relay Output	1	Dry-contact	30V	2A	No
4 Supervised Output Expansion Board SUB886	Optional Supervised Outputs	4	Dry-contact	30V	2A	No
			24V output	24V	2A	Poly resettable, 2A
Eight Relay Expansion Board SUB885	Optional Dry Contact Relay Output	8	Dry-contact	30V	2A	No
OWS Plug-in Module SUB888	Optional Dual Strobe Output	1	Power output, polarity reversible	24V	2A	Poly resettable, 2A

3.7.2 Dry Contacts Relay and Voltage Outputs

The non-monitored outputs include the following:

- MDH output,
- Common alarm relay output,
- Common fault relay output,
- Common disablement relay output,
- Power Fail relay output.
- Optional 8 relay outputs expansion board SUB885,

If any output listed above was monitored by external equipment, the installation circuit should meet the requirements of the external equipment.

3.7.3 Alarm Devices – Supervised Output

The Alarm Devices Output can be used in different applications depending on how it is configured. It can be configured as:

- A supervised speaker line output if OWS zoning is required or
- Internal 24V supervised alarm output, suitable where electronic sounders are used.

Warning: Ensure that the jumpers are correctly set as described in Table 5 Main Control Board Jumper Settings page 17. Incorrect jumper settings may short circuit the system power outputs and damage the boards.

The typical connection diagrams shown in Figure 15 and Figure 16 are used when supervised speaker circuit (S) is required and Figure 17 when 24V supervised output is required.

3.7.3.1 Supervised Speaker Output

If the alarm devices output is used as a speaker output circuit, the speakers should then be connected to the warning output on the SUB880 as shown in the connection diagram in Figure 15.

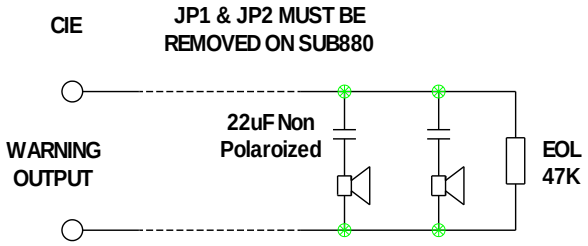


Figure 15 Typical Speaker Output Circuit

If the optional 4 Supervised Output Expansion Board SUB886 is used as a Speaker Zone Splitter, the speakers must be connected to SUB886 outputs while the input is connected to the warning output on the SUB880.

A typical connection where the four outputs of SUB886 are used to split a single speaker output into 4 supervised speaker circuits is shown in Figure 16.

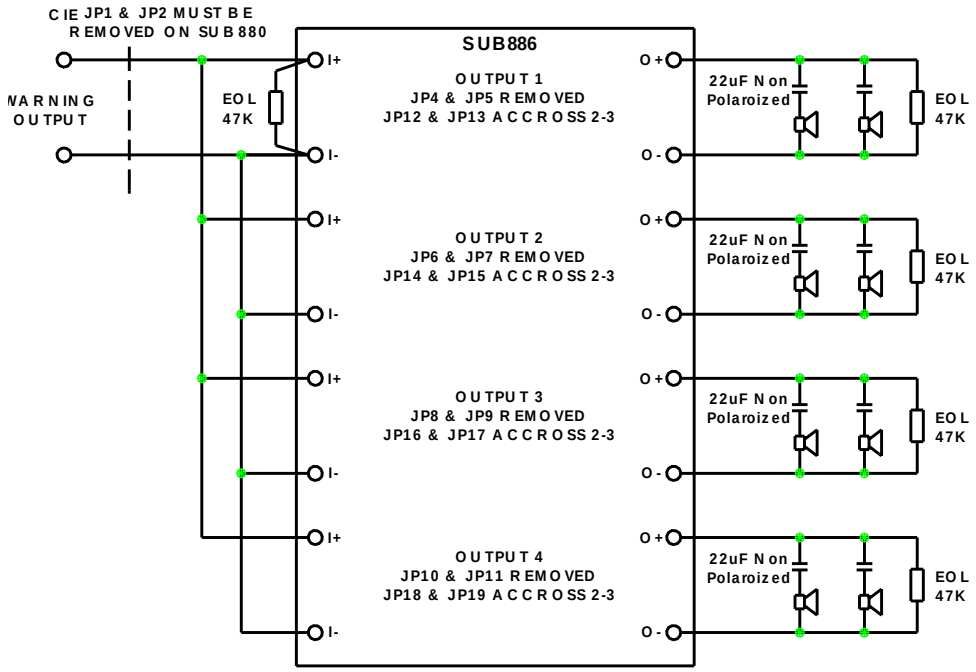


Figure 16 Speaker Zone Splitter Connection Diagram using SUB886

3.7.3.2 Supervised 24VDC Outputs[13]

If the optional OWS is not used, the warning output may be utilised as a supervised 24VDC outputs to drive sounders, external relays, or to drive strobes as shown in the connection diagram in Figure 17. Check the jumper link settings respectively.

- External Strobe Output
- Optional Supervised Control Relays

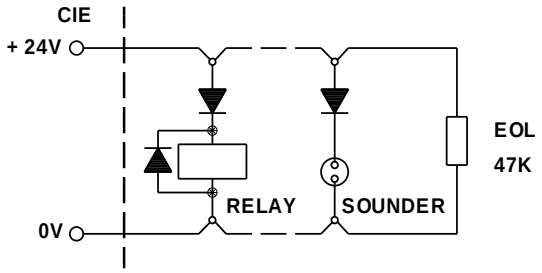


Figure 17 Typical Sounder or Relay Control Connection Diagram

3.7.4 Supervised Ancillary Control Output ACF

The ACF output is a fully supervised 24V output used to control air conditioning relays with separate indicators and control. A typical connection diagram is shown in Figure 18.

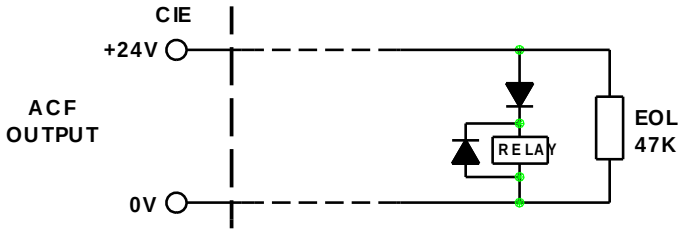


Figure 18 Typical ACF Connection Diagram

3.7.5 Supervised External Strobe

The external 24V strobe output is a fully supervised output used to drive a red strobe outside the building to assist the fire brigade personnel in locating the fire panel.

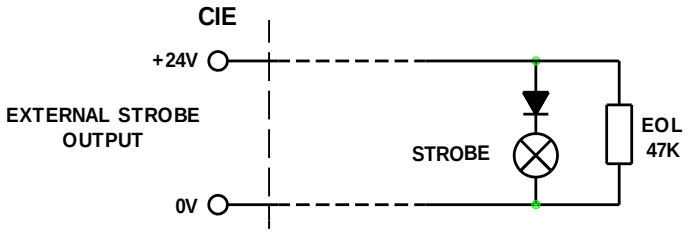


Figure 19 Typical External Strobe Connection Diagram

Note: The External Strobe output cannot be used for dual red / amber strobe, it provides output for only one colour strobe. Typical connection diagram is shown in Figure 19.

[13] SUB886 can also be used to provide 4 x 24VDC supervised outputs driven from common alarm or independent zone alarm, refer to FT420 configuration software. Figure 16 can be used for voltage input / output instead of audio signal and wired as shown in Figure 17. Jumper setting must be set accordingly.

3.7.6 MDH outputs

The connection for an MDH output is shown in Figure 20.

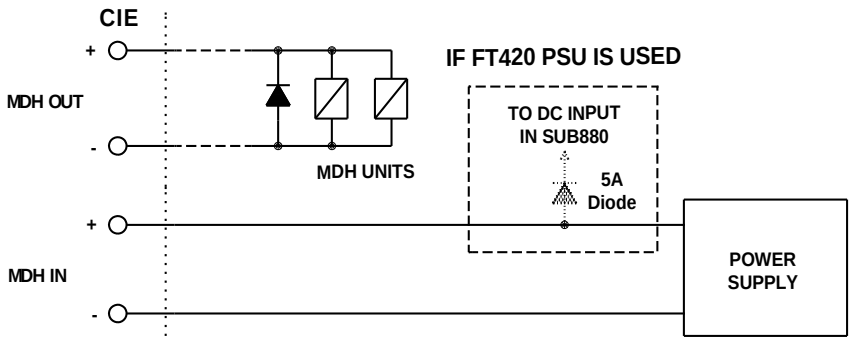


Figure 20 Typical MDH Output Circuit

Separate power supply is recommended to provide 24V supply to the magnetic door holders. If the power supply requirement is calculated correctly, FT420 power supply can be used to provide power to the door holders and must be connected as shown in Figure 20. A 5 Amp diode must be added as shown in the drawing to isolate the batteries from back feeding power to the door holders.

3.8 Internal Connections

3.8.1 Panel Mounted MCP

Every FT420 CIE is supplied with a panel mounted manual call point (MCP). The MCP is connected to the main control board via dedicated MCP terminals. This MCP input is fully supervised and requires 3.9KΩ EOL resistor as shown in Figure 21.

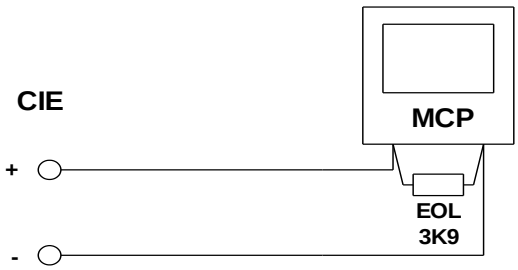


Figure 21 MCP Circuit

3.8.2 Optional External Buzzer

FT420 has a PCB-mounted buzzer on the Main Display Driver board that meets the buzzer sound level requirement of 65dB at 1 metre. If the sound level of 85dB at 1 metre is required, an external buzzer can be installed to the CIE front plate and wired as shown Figure 22, in this case, the PCB-mounted buzzer must be removed.

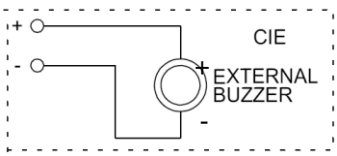


Figure 22 External Buzzer Circuit

3.9 Optional FT420 OWS

Brooks Occupant Warning System option is a single zone intelligent add-on system designed to warn the occupant to evacuate the building in the event of fire or emergency. It can be integrated in FT420 with some other options depending on the space availability in the standard cabinet. Depending on the size of the power amplifier required, larger enclosures are available to allow for more options.

The OWS comprises a Tone Generator Plug-In Board (SUB888), Amplifier, Control / Indication Front Display and Speakers / Strobes distributed within the building to provide audible and visual warning to the occupants as well as Public Address (PA) notification. In addition to the T3 and AS2220 tones, the OWS provides in its standard configuration both alert and evacuation messages as well as an electret microphone for PA purposes.

Brooks OWS can be integrated in FT420 system within the same cabinet and powered from the system power supply for up to 60 Watt. A separate power supply must be added for larger amplifiers. Brooks OWS provides high quality audio output utilising high efficiency Class D amplifier. Available sizes are 60W, 120W and 250W.

The OWS can automatically initiate the T3 evacuation tone / message in alarm conditions or be manually operated for general alerting purposes in non-emergency conditions. The OWS can also be used in non-alarm conditions for general PA, background music or Brooks Alercom.

OWS Features:

- High power efficient Class D audio amplifiers with standby input to maximize power conservation.
- Optional 3 minutes time delay between alert tone / message and evacuation tone / message.
- Configurable audio warnings with pre-recorded digital voice messages.
    - ☞ Meets the requirements of the ISO7731, ISO8201 standards, clause 3.22 of AS1670.1-2004 and relevant clauses of AS1670.4-2004.
    - ☞ For non-regulatory applications, the tones and voice message can be customized e.g. Brooks Alertcom.
- Auxiliary input to connect to Brooks single or multiple zone remote microphones.
- Supervised speaker circuit and strobe output.
- Speaker output can be split to multiple speaker circuits using SUB886. Each circuit is individually supervised for short and open-circuit faults.

Alertcom:

The FT420 CIE can be used to provide multiple tones activated via multiple inputs similar to Brooks Alertcom system. The features of the FT420 as an Alertcom system are:

- A total of ten digital tones and voice messages, one tone/message activated by a dedicated supervised input and alert/evac tone/message on alarm condition.
- Dual strobe visual indications for the evacuation and alert conditions
- Automatic tone / message alert function with manual tone selections
- PA zone controls
- PA with built-in electret microphone or an optional external dynamic microphone
- Auxiliary audio and supervised enable input for remote desktop microphone and/or background music.

3.9.1 Audio Amplifiers

Three different Audio Amplifiers are available to fit within the FT420 system:

1. SUB865 60 Watt audio amplifier
2. SUB866 120 Watt audio amplifier
3. SUB867 250 Watt audio amplifier

Large amplifiers e.g. 120W or 250W require separate power supply and larger cabinets.

3.9.2 60/120 Watt Amplifier Module

Features:

- High energy efficiency class D amplifier design.
- Available in 60W and 120W configuration.
- Standby function to reduce power consumption.

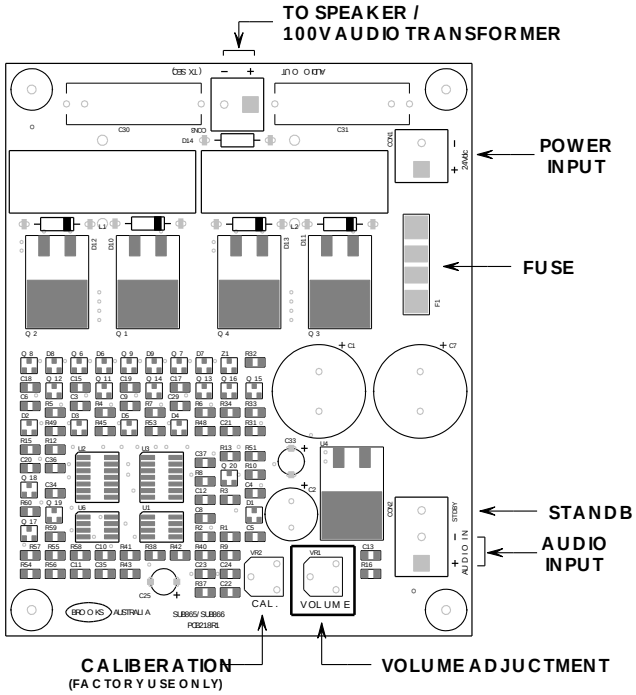
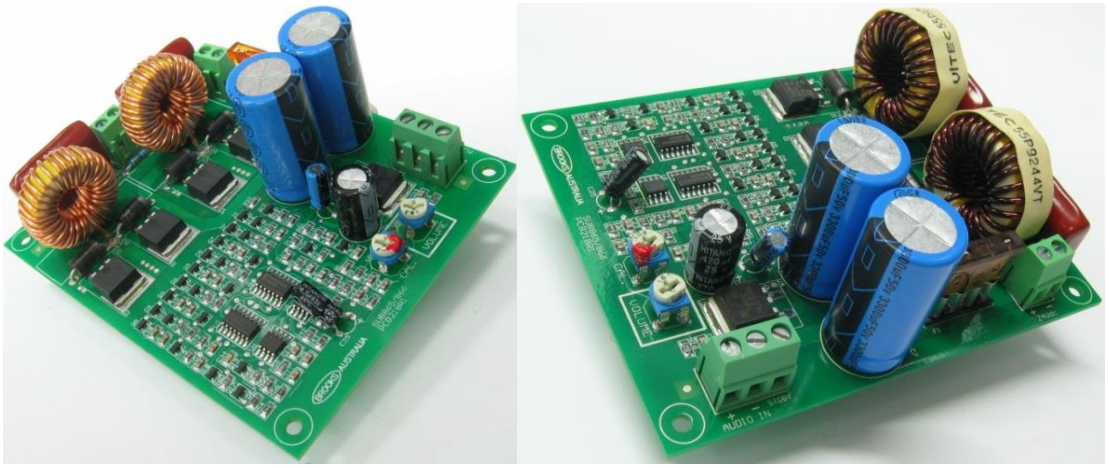


Figure 23 Class-D 60W / 120W Audio Amplifier Board Layout



60 Watt 120 Watt

Figure 24 60W / 120W Audio Amplifier photos

Specifications

Function	60W version	120W version
Voltage input range	20 to 32Vdc	
Fuse	5A (blade fuse)	7.5A(blade fuse)
Low voltage shutdown	15V (approx)	
Audio input impedance	10kΩ	
Output load	4Ω	2Ω
Current draw – quiescent (standby on)	40mA	
Current draw – quiescent (standby off)	95mA	140mA
Current draw – full load[14]	2.8A	5.3A

Note: The amplifier standby input is used by Brooks OWS controller to keep quiescent current to a minimum. If the Brooks OWS standby feature is not used, then the higher current must be used in quiescent power calculations.

3.9.3 250 Watt Amplifier Module

- High energy efficiency class D amplifier design.
- Low voltage protection.
- Over current protection
- Standby function to reduce power consumption.

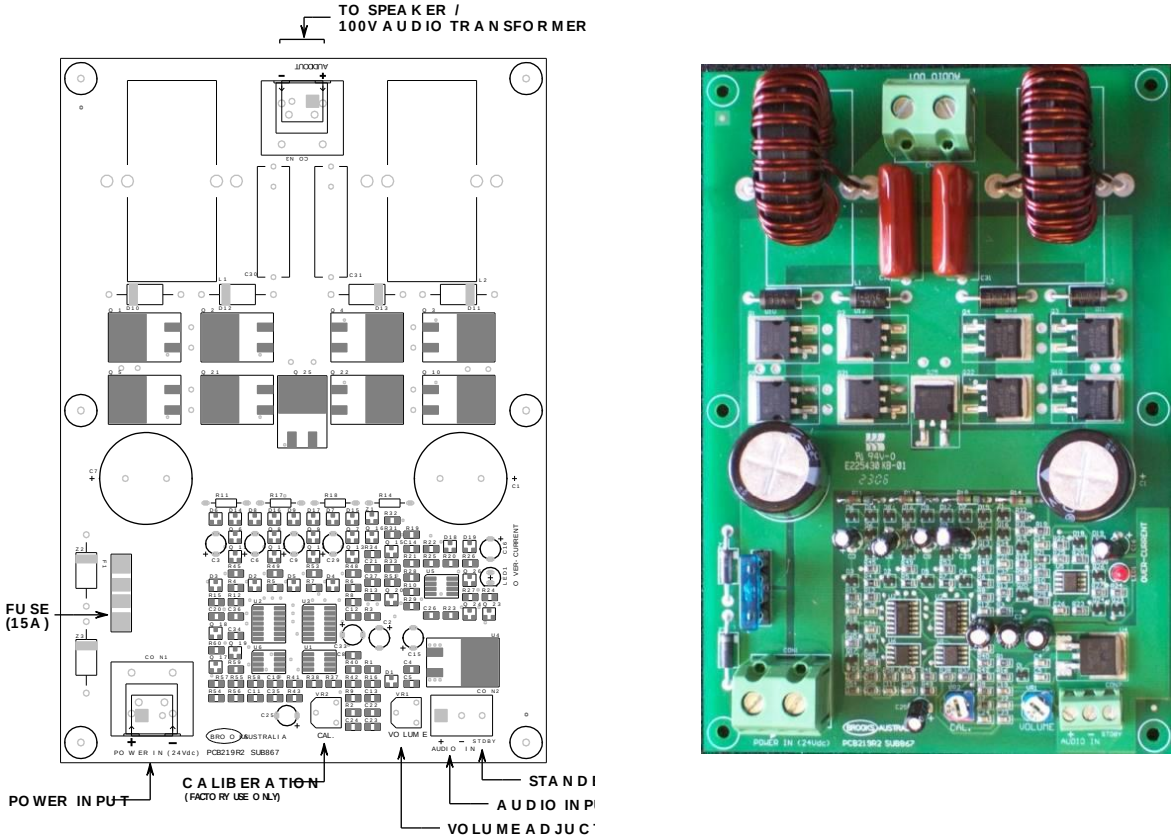


Figure 25 Class-D 250W Audio Amplifier Board Layout

[14] Current measured at 27V supply

Specifications

Function	Rating
Voltage input range	20 – 32Vdc
Fuse	15A (automotive blade fuse)
Low voltage shutdown	19V (approx.)
Audio input impedance	10kΩ
Output load	1Ω
Current draw – quiescent (standby on)	40mA
Current draw – quiescent (standby off)	140mA
Current draw – full load	10A

Table 31 Connection of the Audio Amplifier 60W, 120W and 250W

Designator	Type	No.	Label	Pin	Description
CON1	Screw terminal	1	24Vdc	+	Power input. 19V - 32V, 3.1A (60W), 5.5A (120W), 11A (250W)
		2		-	
CON2	Screw terminal	1	AUDIO IN	+	Audio input from the main control board. <=1V_{RMS}. Input impedance: 10K.
		2		-	
		3		STDBY	Audio amplifier enable/disable input, logic 5V, <= 5mA. It is to minimize the unit power consumption. The amplifier output will be disabled when the input is high.
CON3	Screw terminal	1	AUDIO OUTPUT	+	Audio output to the transformer secondary side on the Main Control Board. 16V_{RMS} to the associated different transformer.
		2		-	

Note: If Brooks OWS standby feature is not used then the higher current must be used in quiescent power calculations.

3.9.4 OWS volume adjustment

All volume adjustments are made on the Audio Amplifier Module via the trimpot VR1 only. This volume adjustment is given a reference designator, VR1 and named “VOLUME” on all amplifier boards. This trimpot, VR1, is located in both Figure 23 and Figure 25 do not use VR2 for adjusting the volume at any time. VR2 is only used for factory calibration purposes.

The following procedures describe how to adjust the volume.

a) Manually turn on the evacuation tone.

b) Adjust the trimpot clockwise a little at a time to increase the volume on the audio amplifier.

c) Then test or measure if the required audio level is met.

d) Repeat b) to c) as necessary.

Table 32 OWS Audio Volume Adjustment

Designator	Description	Function	Factory Default
VR1	Audio volume control	Adjust the Audio input stage, fine tune.	Adjusted to the middle point.
VR2	Factory Calibrated	Reference voltage tuning for comparator.	(Do not adjust)

3.9.5 Auxiliary Audio Inputs

The CIE OWS provides an Auxiliary Audio Input and a Supervised Auxiliary Enable Input. The Auxiliary Audio input can be connected to the background music or a remote desktop microphone. When the CIE is in quiescent conditions and the auxiliary enable input is activated, the auxiliary audio is activated and remote PA announcement or background music will be broadcasted across the speakers.

Shielded cables should be used for Audio signals and its shielding should be connected to the CIE EARTH terminal.

The auxiliary input requires a 47KΩ End of Line resistor connected across the auxiliary switch input and a second 47KΩ resistor in series with the enable switch as shown in Figure 26.

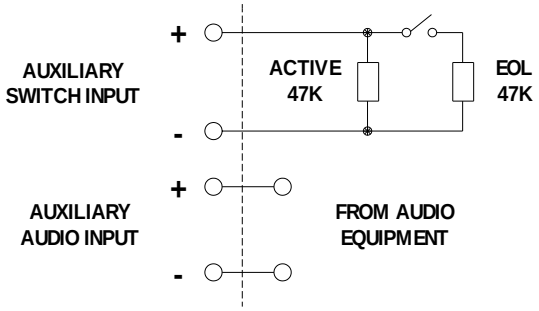


Figure 26 OWS Auxiliary Input Circuit

3.9.6 OWS Dual Strobe Output

The OWS Dual Strobe output circuit is shown in Figure 27. A small current flows through one of the two strobes constantly, which is normally too small to activate the strobes in normal conditions. The EOL resistor of the output is normally 47KΩ. However, the EOL resistance may vary based on the strobe model connected. Strobe models may be limited.

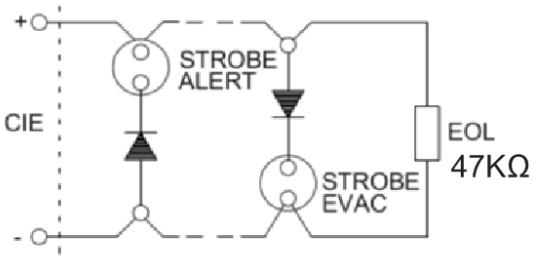


Figure 27 Typical OWS Dual Strobe Control Circuit

3.10 Gaseous Extinguishing Control Module

3.10.1 Overview

The Gaseous Extinguishing System Control Module is provided for use as an option in FT420[15]. The gas module is comprised of the following:

- Control Board SUB928, software is configured to interface with CIE
- Display Board SUB929
- CIE interface board SUB943
- Front panel decal with interconnection cable

In addition to the control module, system ancillaries may include:

- A combination of Brooks Warning Signs
- Brooks Local Control Station (LCS)
- Voice / Tone Electronic sounder
- Dual Strobe Module

The Gas Control Module combined with other Brooks system components have been designed to provide monitoring and control functions of a complete gaseous extinguishing system that meets the requirements of clause 7.1 to 7.16 of the Australian Standard AS4214-2002 (including amendment 1). For more details, refer to FT2GAS Operation / Technical Manual MA400.

The Gas Control Module have the following inputs / outputs:

- Three fully supervised external input circuits, Gas Lock-Off Valve input, Manual Release input and Gas Discharged Sensor input.
- Fully Supervised System Inoperative Warning Sign 24VDC output rated @ 0.5A maximum.
- Fully supervised 2 wire system, 24VDC output for level 1 and level 2 alarm to Brooks Warning Signs (alarm 1 [+/-] & alarm 2 [-/+]) rated @ 3A maximum.
- Fully Supervised 24VDC Gas Release output rated @ 5A maximum.
- Gas Release Clean-Contact Relay output rated @ 2A maximum.
- Gas Fault Clean-Contact Relay output rated @ 2A maximum.
- Gas Isolate Clean-Contact Relay output rated @ 2A maximum.
- One four-wire Local Control Station (LCS) interface. Both the local gas isolate control and the Local Gas Release Control are fully supervised for open and short circuit faults.
- Adjustable gas release timer via a built-in DIP switch.

Note: The current rating above is the maximum current capacity of the outputs, a power supply calculation must be performed to ensure that the power supply capacity is sufficient to run the system in full alarm condition without exceeding the maximum current rating of the power supply.

[15] In FT420 software V2.3 and higher, zone 1 and zone 2 in FT420 are allocated for the 1st and 2nd alarm in the gaseous extinguishing system.

3.10.2 DISPLAY Board & Decal

The gaseous extinguishing front display is shown in Figure 28.

All LED indicators on the front display are covered by a polycarbonate decal clearly labelled with their functions.

In normal condition, all LED indicators will be extinguished.

The gaseous extinguishing system status indicating LEDs and flash patterns are described in Table 33 page 51. The default state of the LED indicators is OFF, if it is not defined below.

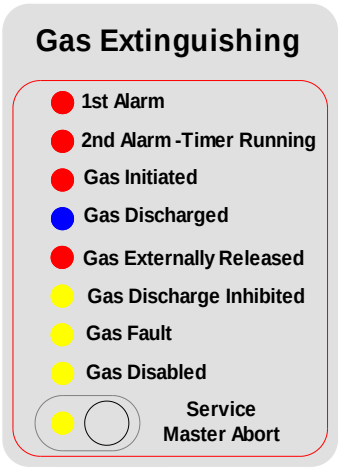


Figure 28 Gas Extinguishing Display Layout

Table 33 Gas Front Status LED Indication and flash Pattern

Type	LED Name	Module Conditions	LED Pattern
Alarm	1st Alarm	One zone in alarm	Fast Flash
	2nd Alarm – Timer Running	Both zones in alarm	
	Gas Initiated	Gas release output activated	
	Gas Externally Released	External Gas Release control activated	
	Gas Discharged	Gas discharged sensor input activated	
Fault	Gas Fault	Fault in any of the supervised inputs or outputs	Steady ON
Disable	Gas Discharge Inhibited	Gas discharge inhibited via LCS isolate switch	Steady ON
	Gas Discharge Disabled	Gas discharge disabled by the service Master Abort Switch or the gas lock-off valve controls	
	Service Switch Active	Illuminates when the master abort switch is activated	
	Service, Master Abort	Gas service Master Abort Switch	

3.10.3 Control Board (SUB928)

The Gaseous Extinguishing Control Board (SUB928KT) is mounted on top of the CIE interface board (SUB943) as shown in Figure 29 page 52

The Gas Control Board SUB928 provides all the gaseous extinguishing control functions. It provides the termination and supervision of all the field equipment.

3.10.4 CIE Interface Board SUB943

The CIE interface board provides the interface between FT420 and the gas control board. The interface board (with gas control board on top) is mounted at a suitable location inside FT420 cabinet. It provides terminations for internal connection between the Gas Extinguishing Control System and FT420. This includes zone alarm, fault, isolate and gas release conditions.

Note: Normally, zone fault or isolate activates the system inoperative sign. Switch 6 in the DIP switch provides the option to disable or enable the gas release if the system inoperative sign is active. Ensure you configure the system to suit the application.

Figure 29 Assembled Control & Interface Boards

3.10.5 Inputs from FT420 to CIE Interface Board SUB943

The following inputs are provided in the gas interface board:

- **24VDC Supply** (22-30V), 200mA to 3A.
- **Zone 1 & Zone 2 alarm**, open alarm contact for each zone.
- **Fault input**, zone 1or zone 2 may activate the system inoperative sign. Fault input should be normally closed clean contact.
- **Zone Isolate input**, if any of the two zone inputs used to release the gas is isolated (open), the system inoperative sign will activate.

3.10.6 Outputs from CIE Interface Board (SUB943) to FT420

The following outputs from SUB943 are provided to indicate the Gaseous Extinguishing System status in FT420:

- Gas isolate relay output.
- Gas fault relay output.
- Gas release relay output.

3.11 AS1668 Fan Control Module

The Brooks AS1668 Fan Control Module is totally independent design and hardwired to the CIE, it has been designed to meet the requirements of AS1668:1998. The module is a dual fan controller for controlling fire fans and can be incorporated in any conventional CIE.

The fire fan display and control boards provide an easy and simple to use manual override control via a 3 position switch, 3 fan status indicators for Air Handling Units (AHU) and fire trip reset switch as shown in Figure 30.

The AS1668 Fan Control module is used to display the fan status and control the fan operation in fire mode conditions as well as manually override the fan operation. A number of jumper links are available to configure and select the type of fan, normal or fail safe operation, options to select the method of controlling the start or stop relays, fan fault indication, etc.

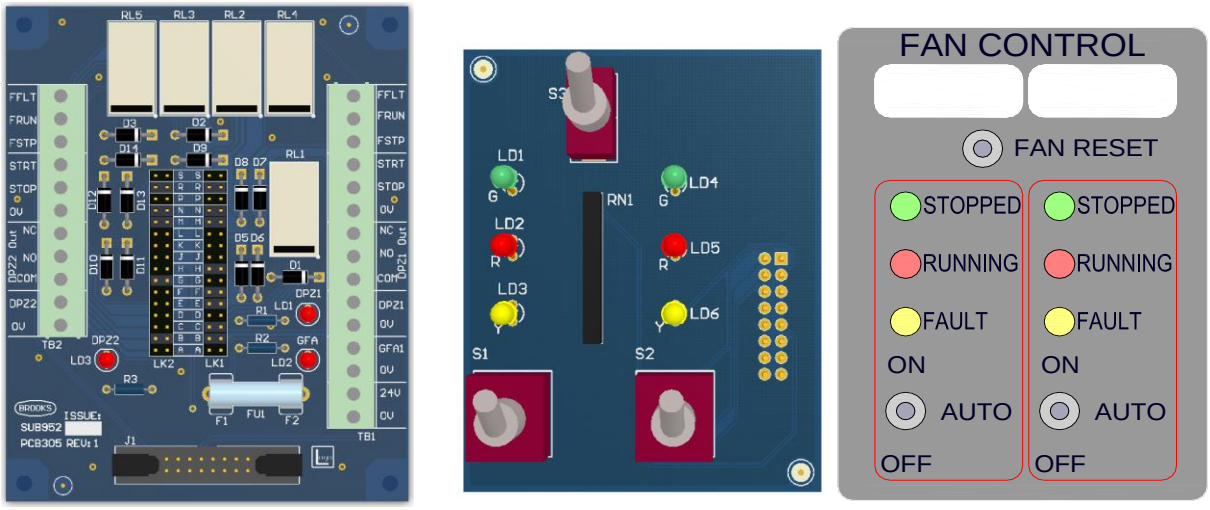
The AS1668 Fan Control module consists of two boards, display and termination board. The display board (SUB953) is mounted on the front face plate behind a decal label that includes the fan status indicators Stopped, Running and Fault in addition to 3 position switch On / Auto / OFF for fan operation manual override. A Fire trip reset switch is also included to reset the smoke control system independently of the fire mode condition.

The second board is the termination and control board (SUB952) and is mounted on the rear equipment plate inside the CIE. The termination board is used to interface the general fire alarm relay (GFA) or Duct Probe Alarm (DPA) to the MSSB equipment.

The Fan Control module supplies 24V DC to the external fan Start and/or Stop relays in the field either in normal or fail safe mode depending on the jumper settings.

AS1668 Fan Control Kit

Part No.	Description
SUB952A	S1668 Fan Control Termination Board (2 x Fans)
SUB953A	S1668 Fan Control Display Board (2 x Fans)
LA978	668 Decal Label (2 x Fans)
CA109M	6 Way Ribbon Cable Assembly 650mm. Longer cable can be used if required



SUB925A SUB953A Fan Label

Figure 30 AS1668 module

Note: For more details, jumper settings and drawings, refer to Brooks technical bulletin TB008.

3.12 Power Supply Management

3.12.1 Maximum Current Capacity

The CIE maximum current capacity is 5A. This includes the total current supplied to the main control board, battery charger, main display board, expansion control boards and the expansion display boards.

WARNING: The maximum CIE current capacity shall not be exceeded in any applications. Otherwise the fuses on the control board may blow and damage the CIE hardware.

3.12.2 Mains power supply

The CIE mains power supply requirements are shown in Table 34. The maximum supply current excludes the current drawn by the MDH and the audio amplifier if used.

Table 34 Mains Power Supply Requirement

Characteristics	Typical	Tolerance
Input Voltage Range	240VAC	+/- 1%
Input Voltage Frequency	50Hz	47- 63 Hz
Output Voltage	28VDC	+/- 1%
AC Input Current	<= 1A	Varies based on the applications
DC Output Current	<= 5A	Varies based on the applications

The output voltage of the AC/DC power supply needs to be checked and calibrated. An on-site calibration may be necessary to compensate the load variations. The calibration procedure is as follows.

- Use a calibrated and certified multimeter to measure the voltage of the battery terminals.
- At the same time, adjust the AC/DC power supply potentiometer until the multimeter reading stabilises between 27.3 – 27.5VDC on the battery terminals (without connecting the batteries).

WARNING: Care must be taken when adjusting the AC/DC power supply. Do not to touch the covered 240VAC wirings and terminals. Do not remove the plastic protection cover unless necessary.

3.12.3 Power supply monitoring

The CIE constantly monitors the mains power supply and the battery charger voltage. The CIE power supply monitoring characteristics are listed below.

Table 35 Power Supply Monitoring Characteristics

Characteristics	Threshold
Battery Low Fault	24VDC, Measured on the battery terminals
Battery Automatic Cut Off	20.7VDC, Measured on the battery terminals, when the mains is not available
Charger High Fault	30.5VDC, Measured on the main terminals
Main Low Fault	22.1VDC, Measured on the main terminals
Charger Low Fault	24.3VDC, Measured on the battery terminals
Automatic Battery Test	Periodically run the system on battery only for one hour every 70 hours. Terminate automatically when any power supply fault or an alarm condition being detected.

The CIE carries out an automatic battery load test every 72 hours for 60 minutes. During the automatic battery test, the AC/DC power supply is disconnected and the CIE runs on batteries only.

Should any power supply related faults or an alarm conditions be detected, the automatic battery test will terminate immediately and the CIE power supply fault indications would be signalled.

3.12.4 Power Supply Calculations

The following calculations should be carried according to the application requirements of the related current standards, such as AS7240.2, AS1670.1, and AS1670.4.

1. Battery capacity calculation
2. AC/DC power supply current capacity calculation

WARNING: The current consumption data used in this Chapter does not include any current supplied to the external devices. The actual current consumption shall be re-calculated based on actual system configurations. The following current consumption must be included in the power supply calculations where appropriate.

- ACF output
- External Strobe output,
- OWS Audio Amplifier if used,
- Warning output to electronic sounders if OWS is not used,
- OWS Dual Strobe output,
- MDH power if supplied from CIE,
- Backup power outputs,
- Routing equipment current requirements (ASE),
- Any other backup power supply outputs.

3.12.5 System Current Consumption

The current in alarm state is measured when two zones are in alarm condition, all the outputs are activated and the Fire brigade TX indicator is activated. The quiescent state current is measured when all the common condition relays except the common fault relay are de energised. No power output current was included.

Typical current consumption for each module is listed on Table 36 and Table 37 with their respective combination.

Table 36 Current Consumption of Function Modules

Type	Part No.	Quiescent Current, I_Q	Alarm Current, I_{act}
Basic System	SUB880, SUB881, SUB882	90 mA	231 mA
8 Zone Expansion Board	SUB883	72 mA	73 mA
8 Relay Expansion Board	SUB885	14 mA	138 mA
4 Supervised Output Expansion Board	SUB886	14 mA	54 mA
Zone Display Board	SUB884, SUB891	1 mA	2.1 mA
Basic OWS	SUB887, SUB888, SUB891	1 mA	18 mA
OWS Tone Selection Display Board	SUB889, SUB891	1 mA	17 mA
OWS PA Zone Control Display Board	SUB889, SUB891	1 mA	34 mA

Table 37 Current Consumption of Typical CIE Configurations[16]

CIE	Expansion Board Quantity			Expansion Display Qty		I_Q (mA)	I_{act} (mA)	Required Back up (AH)	Recom. Battery Capacity (AH)
	Zone	Superv. Output	Dry Contact Relay	Zone	OWS				
Basic 4 Zone	0	0	0	0	0	90	231	2.85	7
Basic 12 Zone	1	0	0	2	0	164	307.2	5.11	7
Basic 20 Zone	2	0	0	4	0	238	383.4	7.38	12
4 Zone + 60W OWS	0	0	0	0	1	209	3249	8.30	12
8 Zone + 60W OWS	1	0	0	1	1	282	3324	10.54	12
8 Zone + 120W OWS	1	0	0	1	1	283	5524	11.94	12
12 Zone + 60W OWS	1	0	0	2	1	283	3326	10.57	12
12 Zone + 120W OWS	1	0	0	2	1	284	5526	11.98	12
20 Zone + 60W OWS	2	0	0	4	1	357	3403	12.84	17
20 Zone + 120W OWS	2	0	0	4	1	358	5603	14.24	17

To calculate the total system current, alarm current I_{act} and quiescent current I_Q shown in Table 36 and Table 37 were used. The battery capacity of a basic 4 zone FT420 CIE complete with 60W OWS is shown in Table 37 as an example.

Table 38 is a screenshot of the FT420 Current Calculation Spread Sheet.

Table 38 Battery calculation example

FT420 CIE Battery Calculations					**Rev**	**2.4**	**Date**	***26-Oct-18***
Project:								
System Components	**Stock Number**	**No. of Units**	**Quiescent Current**		**Alarm Current**			**Comments**
			mA	Total mA	mA	Total mA		
FT420 Basic 4 Zone CIE	FT420-4	1	90.0	90.0	231.0	231.0		No. of units must = 1 (4 Zones)
8 Zone Expansion Board	SUB883	0	72.0	0.0	73.0	0.0		Max. No. of Units 2 (16 Zone)
4 Zone Display Board	SUB884+SUB891	0	1.0	0.0	2.1	0.0		Add 1 for every 4 zones, max. 4
8 Relay Expansion Board	SUB885	0	14.0	0.0	138.0	0.0		Max. No. of Units 3
4 Supervised Output expansion Board	SUB886	0	14.0	0.0	54.0	0.0		Max. No. of Units 6
Basic OWS	SUB887+SUB888+SUB891	1	18.0	18.0	18.0	18.0		Max. No. of Units 1
Add 60 W Amplifier Module	SUB865	1	40.0	40.0	2750.0	2750.0		Max. 1 unit, current @27.5
Is BGM enabled? (1=Yes/0=No)		0	65.0	0.0	0.0	0.0		
Add 8 Tone Selection Control/Display Board	SUB889+SUB891	0	1.0	0.0	17.0	0.0		Maximum No. of Units 1
Number of expansion boards		0						
Number of display boards		1						
Warning System Output				0.0		0.0		
ACF Output				0.0		0.0		
External Strobe Output				0.0		0.0		
24 V for Routing Equipment				0.0		0.0		
C.I.E. current consumption. (mA)				148.0		2999.0		
Standby Time (hours)		24						
Alarm Time (minutes)		30						
Battery Requirement (in AH)		**8.1888**						
Nearest Standard Battery Size (Ah)		**12**						

[16] Other combinations can be calculated using the spread sheet or the equations shown in this Chapter.

As per AS1670.1 Section 3.16.4, the battery capacity requirement shall be determined as follows:

$$C20 = 1.25\,[(IQ \times TQ) + FC\,(IA \times TA)]$$

Where *C*20 = Battery Capacity in AH at 20h discharge rate at 15°C - 30°C

1.25 = Compensation factor for expected battery deterioration

*I*Q = Total system quiescent current in Ampere

*T*Q = Quiescent standby power source time, normally 24 hours for externally monitored systems and 72 hours for unmonitored systems

*F*C = Capacity de-rating factor, typically 2

*I*A = Total system alarm current in Ampere

*T*A = Alarm load standby power source time, normally 0.5 hour

C_{20}, Required Battery Capacity = 1.25[(0.162x24)+2(3.137x0.5)]
= 8.78 Ah

Battery Charger Calculations

Battery charger Ah required for 96 hours= (5xIQ) + Fc(0.5xIA)
= (5x0.162) + 2(0.5x3.137)
= 3.95 Ah

Battery charging current required = $\frac{\text{Battery Charger Ah Required}}{T_Q \times \eta}$ where η is efficiency of battery manufacturer typically 75%-85% (BB Battery)

= 3.95/(24x0.75)
= 2.19 Amp

Note: The battery capacity calculation shown above is calculated for monitored system i.e. 24 hours in quiescent and 30 minutes in alarm. AS1670.1:2015 requires the battery capacity for non-monitored systems to be calculated for 72 hours in quiescent and 30 minutes in alarm.

3.13 Cable Types and Calculations

3.13.1 General Requirements

The CIE cable type and cable installations shall follow the application related current standards and regulations stipulated in AS/NZ 3000, AS/ACIF S-009 and AS1670.

3.13.2 Real Cable Resistance

The CIE cable length is mainly determined by the cable cumulated resistance. The cumulative cable resistance is the total resistance of all installed copper wire used in the related circuit loop, including both the supplying path and the returning path.

The cable resistance character is generally specified in ohms per meter by the cable manufacturer. However, in the cable calculations, the real cable resistance shall be used, which includes the following modifications of the manufacturer specified value.

1. The manufacturer specified value shall be doubled for twisted-pair cables.
2. The total cable length shall include both the supply path and the return path. The manufacturer specified value shall be doubled for multiple core cable so that both the supply and the return paths are considered.

For example, if the manufacturer specified cable resistance of a twisted pair cable is 0.05 Ohms per meter, the real cable resistance per meter will be 0.05 X 2 X 2 = 0.2 Ohms per meter. If the cable length is 100 meters, the cable cumulated resistance is 0.2 X 100 = 20 Ohms.

Some common used cable parameters are listed in the following table.

Table 39 Cable Resistance of the Reference Cables

Cable Type	Copper Area	Insulation	Manufacturer specified cable resistance	Real cable resistance
Electra Cables, FC7402LD	1mm^2	250 / 250 V	0.02 Ohms / m	0.04 Ohms / m
Electra Cables, FC7502LD	1.5mm^2	250 / 250 V	0.0128 Ohms / m	0.0256 Ohms / m
Electra Cables, FC7502HD	1.5mm^2	0.6 / 1 KV	0.0128 Ohms / m	0.0256 Ohms / m

3.13.3 Zone, Audio Input and Monitored Switch Input

The zone, microphone audio input and monitored enable input cables are required to have less than 50Ω of the total cumulated cable resistance.

The maximum cable length is calculated using the following equation.

$$L_{MAX} = 50 / R_{RPM} \qquad \textbf{(Equation 1)}$$

While L_{MAX} - the maximum cable length,

R_{RPM} - the real resistance per metre.

For example, if the manufacturer specified cable resistance of a 2-core cable is 0.02Ω per metre, the real resistance will be 0.04Ω per metre and the max. zone cable length will be 50/0.04 = 1250 metres.

3.13.4 Output Devices

For each speaker circuit cable length, please refer to the audio amplifier documentation.

For each dry-contact output, the cable length is determined by the connected equipment or devices.

For power output devices such as a MDH and or electronic sounders, the maximum cable length is calculated using the following equation.

$$L_{MAX} = (V_{LOWEST} - V_{WORKING}) / (R_{RPM} \times I_{MAX}) \qquad \textbf{(Equation 2)}$$

While L_{MAX} - the maximum cable length,

V_{LOWEST} - the lowest power supply voltage.

$V_{WORKING}$ - the minimum working voltage of the output device,

I_{MAX} - the maximum current,

R_{RPM} - the real resistance per metre.

For power outputs, the lowest voltage of the CIE power supply is fixed at 22V. For the MDH output, the lowest power supply voltage is determined by the MDH specifications.

For example,

Assume that the lowest power supply voltage is 22V. The minimum working voltage of a device is 18V with a maximum current at 0.5A and a real cable resistance of 0.04 Ω/m. The calculated maximum cable length will be (22 - 18) / (0.04 x 0.5) = 200 metres.

3.13.5 Requirements and Reference cable types

The requirements and the referenced cable specifications in Table 40 are used to achieve the specified maximum cable lengths corresponding to each connection type, equivalent or better type of the cables shall be used.

Table 40 Cable Types for Different Connections

Connection	Requirement	Reference Cable Specifications	Maximum Cable Length
Zone Circuits	Use Equation 1	Two core, Red, 1mm^2 conductive area, Specified cable resistance 0.02 Ohms / m Real cable Resistance 0.04 Ohms / m	1250 meters
Power Outputs	Use Equation 2	Two core, Red, 1.5mm^2 conductive area Specified cable resistance 0.0128 Ohms/ m. Real cable Resistance 0.0256 Ohms / m	781 meters with the maximum current of 0.5A and the lowest voltage of 12V.
Supervised Control Outputs	Use Equation 2	Two core, Red, 1.5mm^2 conductive area Specified cable resistance 0.0128 Ohms/ m. Real cable Resistance 0.0256 Ohms / m	156 meters with up to 1A current and the lowest voltage of 18V
MDH Control Output	Use Equation 2	Two core, Red, 1.5mm^2 conductive area Specified cable resistance 0.0128 Ohms/ m. Real cable Resistance 0.0256 Ohms / m	78 meters with up to 2A current, the minimum working voltage of 18V, and the lowest power supply of 22V
Audio MIC Input		Shielded twisted pair audio cable	100 meters

4 CONFIGURATION

4.1 Introduction

The FT420 Configuration Tool is a Windows based Application software for configuring Site Specific operation of the FT420 range of Control and Indicating Equipment (CIE).

The FT420 CIE system configuration can only be carried out when the CIE is connected to a PC via a configuration adaptor box FT420-PC as shown in Figure 31.

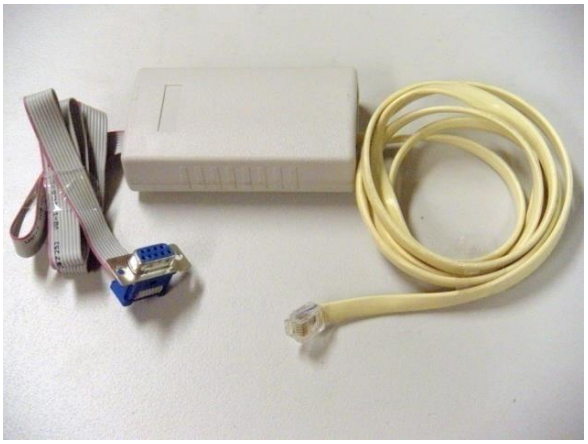


Figure 31 FT420-PC Communications Adaptor Box with Cables

The configuration data can be edited and saved on a PC and then downloaded to the CIE. The current PC configuration software V2.3.2 has additional features that are not available in the previous revisions.

The firmware on the microprocessor for subassemblies, SUB880 V2.3.3 and SUB881 V2.3.3, has been modified to include the new features in FT420 configuration software V2.3.2.

Note: The PC configuration software V2.3.2 must be used with firmware V2.3.2 or V2.3.3 in SUB880 and SUB881 i.e. the firmware revision number must be identical in SUB880 and SUB881.

To upgrade an existing FT420 CIE to V2.3.2 PC configuration software, please request the latest microprocessor chips from Brooks manufacturing with the same version number V2.3.3.

WARNING: The system configurations are crucial for the normal CIE operation. Great care should be taken to ensure that the CIE is being configured correctly. Incorrectly configured CIE may operate in an unpredictable manner.

4.2 Configuration Tool Installation

4.2.1 List of Equipment Required

1. PC, notebook or desktop
2. Serial to USB adapter if required
3. FT420-PC downloading adapter box complete with cables
4. PC Configuration software V2.3.2 on disc or memory stick

4.2.2 Installing Configuration Tool

A) Updating Existing config. software to V2.3.2

When upgrading your PC with config. software version V2.3.2, all previous PC software versions must be uninstalled. Follow these steps to uninstall previous revisions:

1. Start -> Control Panel -> Programs and Features
2. Select FT420 Configuration Tool V2.x from the list
3. Select Uninstall/Change
4. Press OK on the opened dialog box

After uninstalling the old version, install V2.3.2 either with a CD or memory stick:

5. Look for the file named “FT420 Config V2.3.2.zip” on the CD or memory stick and
6. Unzip the file to a folder named “FT420_Config V2.3.2” on the PC.
7. Then run the Setup.exe file from the FT420_Config folder.
8. This will automatically install the software on the PC.
9. To launch the software, go to

START>Brooks FT420> FT420 Configuration Tool -- V2.3.2

B) New Installation of config. software V2.3.2

To install V2.3.2 from either a CD or memory stick:

1. Look for the file named “FT420 Config.zip” on the CD or memory stick and
2. unzip it to a folder named “FT420_Config” on the PC.
3. then run the Setup.exe file from the FT420_Config folder. This will automatically install the software on the PC.
4. To launch the software, go to:

START>Brooks FT420> FT420 Configuration Tool -- V2.3.2

Note: Ensure that the correct COM port matches the PC. To do this, launch the FT420 Configuration Tool software. Click on the pull down menu named “Port” to select the appropriate COM port. See Figure 32.

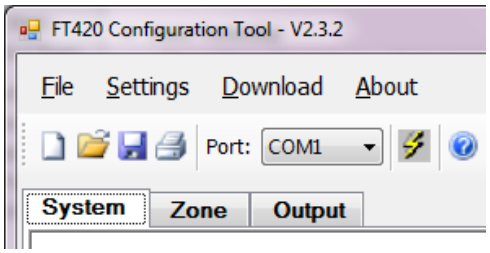


Figure 32 COM Port Selection

4.2.3 Saving, Recalling and Downloading SSD files

To save an SSD setup file for future use:

1. Click on “File->Save” then
2. Select a location in the PC to save the SSD file.

To load an SSD setup file: Select “File-> Open”.

To start a new SSD setup: Click on “File->New”.

Downloading an SSD file to FT420

Once selected options and setup have been made to the SSD file, download the new configuration settings to the FT420 CIE as described in section 4.2.4.

NOTE: For the new SSD settings to take effect on the FT420, reboot the FT420 by disconnecting the battery and switching off the mains power. Wait for about 10 secs before powering up again.

4.2.4 Configuration Setup

1. To avoid any unexpected system behaviour during the configuration setup, **power down** the system.
2. Use the RJ12 connector from the FT420-PC adapter box and connect to the configuration socket labelled CON6 on the Main Display Driver board SUB881 (fitted on the rear of the FT420 door).
3. Connect the DB9 connector on the FT420-PC adapter box to the PC serial port. If a serial port is not available on your computer, use a serial to USB adapter.
4. Power up the system.
5. Silence the buzzer and ignore any fault during the configuration process.
6. On the FT420 configuration software application, click on "Download" menu button or the Lightning Bolt icon  .
7. The Configuration Tool will prompt to confirm FT420 update, answer "Yes" to start download.
8. The Configuration Tool will commence updating the FT420 SSD with the new settings. A green progress bar will be displayed at the bottom of the dialogue box.
9. When downloading is completed successfully, power down the system.
10. Disconnect the configuration cable from the CIE.
11. Power up the system. Wait until the system Common Fault LED turns ON and buzzer starts to beep.
12. Press the CIE system reset and ensure no faults exist.

4.2.5 Logic number

Logic numbers are used in system configurations. The logic number of the zone inputs and the control outputs are used to specify the configuration data. They are shown in Table 41 below.

Table 41 CIE I/O Logic Numbers

Logic Number	Board	Board Sequence Number
Zone 0	Main control board.	The built-in MCP
Zone 1- Zone 4	Main control board.	Zone inputs 1 - 4
Zone 5 – Zone 12	The first zone expansion board based on its bus address	Zone inputs 1- 8
Zone 13 – Zone 20	The second zone expansion board based on its bus address	Zone inputs 1- 8
Supervised 1 – 4	The first monitored relay expansion board based on its bus address	Supervised outputs 1- 4
Supervised 5 – 8	The 2nd monitored relay expansion board based on its bus address	Supervised outputs 1- 4
Supervised 9 – 12	The third monitored relay expansion board based on its bus address	Supervised outputs 1- 4
Supervised 13 – 16	The forth monitored relay expansion board based on its bus address	Supervised outputs 1- 4
Supervised 17 – 20	The fifth monitored relay expansion board based on its bus address	Supervised outputs 1- 4
Supervised 21 - 2 4	The sixth monitored relay expansion board based on its bus address	Supervised outputs 1- 4
Relay 1 - 8	The first dry-contact relay expansion board based on its bus address	Relay outputs 1- 8
Relay 9 - 16	The second dry-contact relay expansion board based on its bus address	Relay outputs 1- 8
Relay 17 - 24	The third dry-contact relay expansion board based on its bus address	Relay outputs 1- 8

4.3 FT420 System Options

System options window describes 7 system configuration tabs to cover any possible application for FT420 as shown in Figure 33. Refer to section 2.1.3 page 15 for expansion board limitations and implementations. The expansion boards available for FT420 system are explained in the following sections.

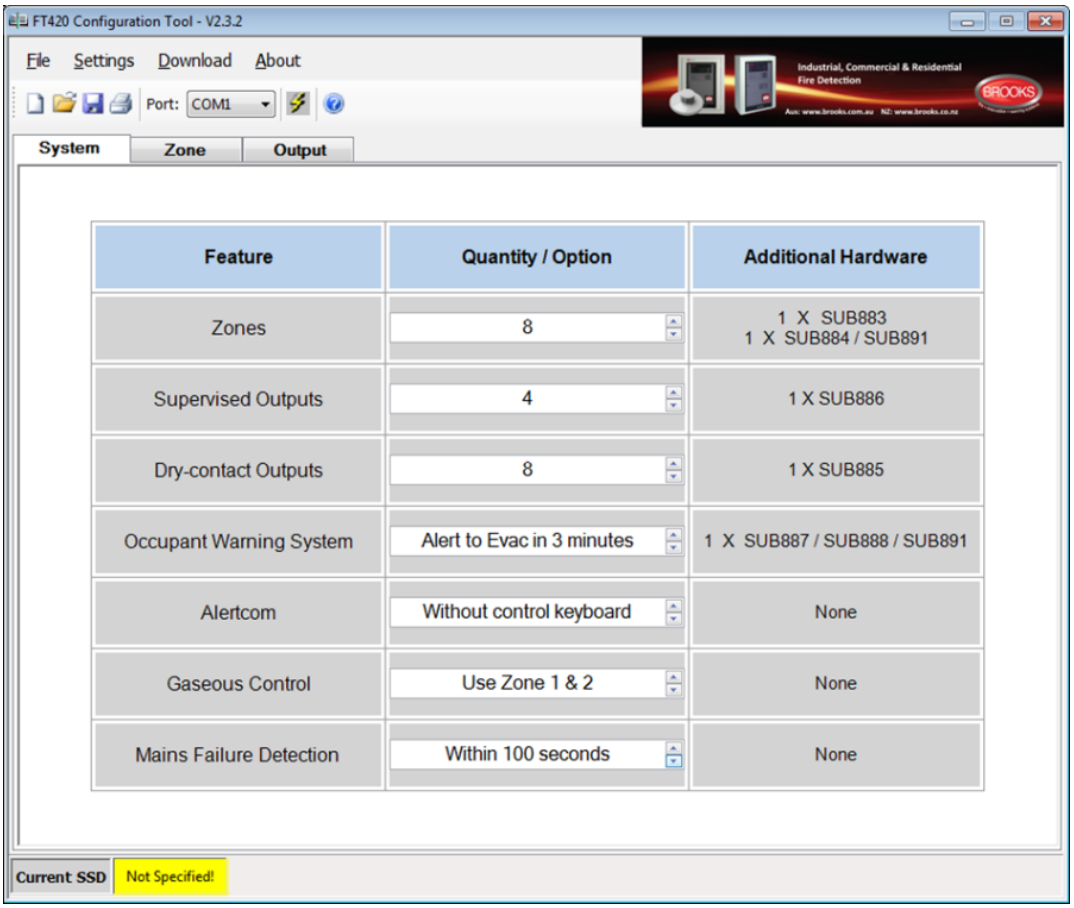


Figure 33 FT420 System Configuration Options

4.3.1 Zone Expansion

The Zone Expansion option requires a combination of two separate expansion boards, an 8-Zone expansion termination board SUB883 controlled by the addition of a 4-Zone Display Board SUB884. Up to 20 zones can be configured by this software in groups of eight expansion termination (2 x SUB883) and four of expansion display (4 x SUB884) in addition to the first 4 standard zones.

4.3.2 OWS Expansion

If an OWS is fitted in FT420, two options in the automatic mode are available:

Evac Only: Any zone alarm activates the evacuation tone T3 and evacuation message

Auto Alert to Evac (3min): Any zone alarm activates the alert tone and message for 3 minutes then change to the evacuation tone T3 and message.

The OWS option provides standard voice messages and tones. Other tones and messages are available if Alertcom option is selected.

When the OWS option is selected in the configuration software, all the standard hardware required will be selected. Amplifiers are added based on the audio power requirements (not shown in main window).

4.3.3 Supervised Outputs Expansion

Supervised outputs expansion option is achieved by the addition of one or more of the 4 supervised output Expansion boards SUB886, refer to section 2.7, page 27 for more details.

Selecting this option provides the ability to configure the supervised outputs to activate on alarm condition.

- If the OWS is fitted, the supervised output board can be used as speaker splitter circuits, in this case ALL outputs will be activated of any zone alarm.
- If the OWS is not fitted, the supervised output board will be used to provide multiple 24V supervised outputs which can be activated from a specified zone or all zones.

Up to 24 supervised outputs can be added in a group of four outputs depending on the number of other expansion boards fitted and space availability inside FT420 cabinet.

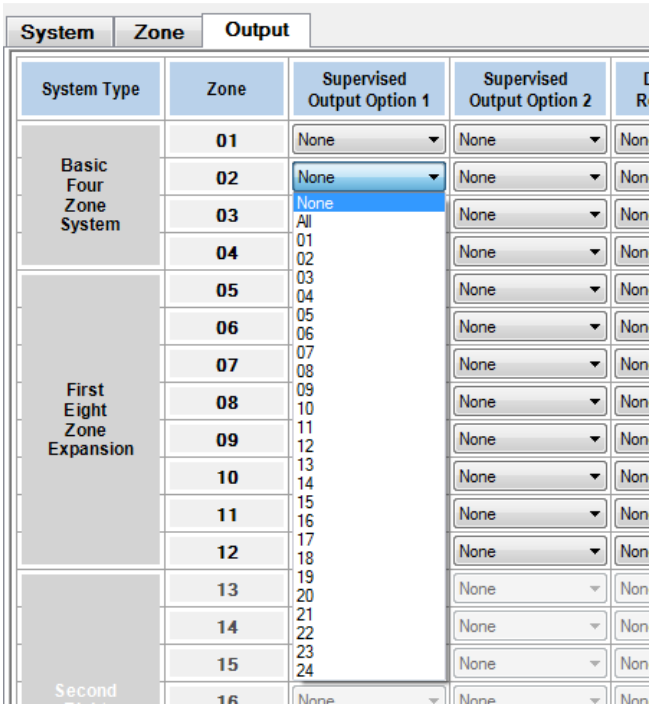


Figure 34 Supervised Relay Outputs

4.3.4 Dry-Contact Relay Expansion

Dry-Contact relay output expansion is achieved by adding one or more of the Dry Contact Relay Expansion boards (SUB885), refer to Section 2.6, page 25 for more details.

Click on the pull-down menu under the “Dry-Contact Relay” options, the specific outputs can be selected against each zone as shown in Figure 35. Selecting this option gives the ability to configure dry contact relay outputs to activate on alarm condition from the specified zones or all zones. Up to 24 outputs can be added in groups of eight, depending on the number of other expansion boards fitted and space availability inside FT420 cabinet.

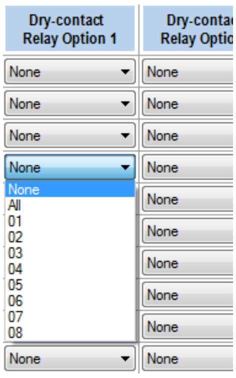


Figure 35 Dry contact relay outputs

4.3.5 Alertcom

The Alertcom is an Occupant Management System enabling the tailoring of unique tones / messages for occupants. Each tone / message was designed to elicit a specific response. The Alertcom utilises FT420 OWS in conjunction with Brooks range of audio amplifiers. These tones can be applied to a wide variety of situations, from emergency warning and evacuation to simple meal break indications.

The FT420 Alertcom system consists of the following:

- Standard FT420 system complete with OWS and suitable amplifiers.
- 8 Zone Expansion Board (SUB883) for supervised clean contact input for automatic triggering[17].
- 8 Manual Select Display Board (SUB889) if manual control is required

The Alertcom enables Emergency Control Organisation flexibility when implementing procedures for buildings or work places by providing a range of tones / messages for different responses required by the emergency plan.

The Alertcom system provides up to 8 separate tones initiated either automatically or via manual control in addition to the standard alert and evacuation tones.

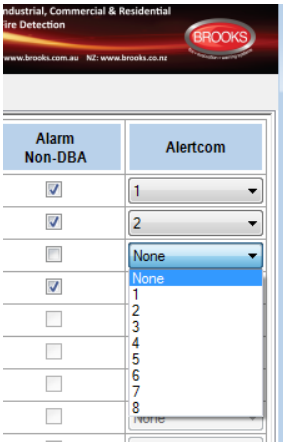


Figure 36 Alertcom Tone Configurable Outputs

Similarly, click on the pull down menu under the column “Alertcom” against the corresponding zones. This would allow for up to 8 selectable different tones to be configured, each zone input selects different tone. The first 4 tones are pre-set as listed on Table 42. Tones 4 to 8 can be customised.

[17] If only 4 tones / messages are required, the expansion board SUB883 is not required.

Table 42 Configurable Alertcom Tones

Tone No.	Tone Type	Tone Frequency
1	Sweeping Tone	500Hz to 1200Hz for 3.75S, 250mS off. (Evacuation Signal)
2	Intermittent Tone	420Hz 625mS on, 625mS off.(Alert Signal)
3	Alternating Tone	420Hz 500mS and 870Hz 500mS
4	Continuous Tone	420Hz
5	User defined	
6	User defined	
7	User defined	
8	User defined	

4.3.6 Gaseous Control

This option enables FT420 to provide two smoke detection zones for hazardous areas, as well as the associated supervised and dry-contact outputs required for a complete Gaseous Extinguishing System. When this option is selected, both Zone 1 and Zone 2 will be dedicated for the smoke detection in the risk area.

The two zones and their allocated outputs will be separated from the rest of system operations i.e. the alarm conditions of the two zones will not activate system alarm conditions. Meanwhile the outputs selected by both Zone 1 and Zone 2 will not be activated by any other zone inputs.

4.3.7 Mains Failure Detection

A new option is added to V2.3.2 to delay mains fail fault for approximately one hour. AS7240 requires any fault to be detected within 100 seconds, this is the default setting. When the FT420 is installed in a remote location or in an installation where blackout occurs for longer period of time, the 60 minutes delayed mains fail detection can be selected.

4.4 Zone Configuration

Zone Controls and Indicators on the Main Display board are always mapped to the 4-Zone inputs on the Main Control Board. The Expansion Zone Controls and Indicators can be allocated to different Expansion Zone input circuits.

Some Expansion Zones may not have a related zone indication e.g. when they used as a trigger input in Alertcom applications.

Each zone is capable of activating any of the following control outputs in its alarm conditions.

- Common conditions.
- Common conditional relays.
- ACF, external strobe, MDH and warning outputs.
- Expansion Supervised Outputs.
- Expansion Dry-Contact Relay outputs.

The CIE supports a number of features for each zone input circuit and is described in the following sections.

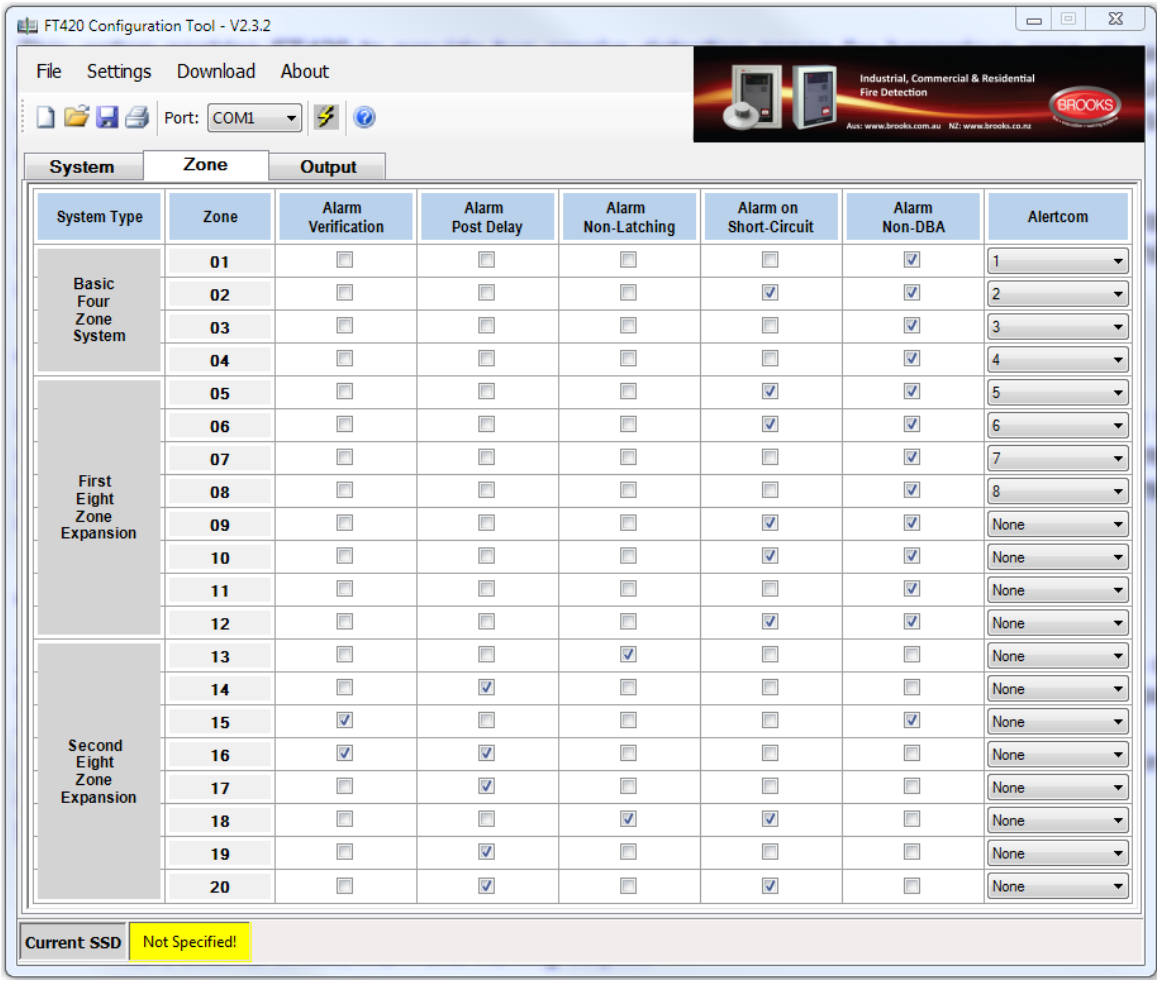


Figure 37 Zone Configuration Options

4.4.1 Alarm Verification Facility (AVF)

- **AVF Enabled**
  An alarm condition will not immediately signal an alarm state on the initial detector activation. The zone with AVF enabled will reset the detector in that zone for the first 16-20 seconds (reset cycle). The smoke detector will latch on if there is further detection on that detector within the next verification cycle. This causes the zone alarm condition to remain on. If no further alarm input was detected during the reset cycle, no alarm conditions will be generated.
- AVF disabled
  If the AVF is disabled, an alarm condition will be generated as soon as an alarm input is detected.

To select AVF:

Check the “Alarm Verification” check boxes for each zone required for the alarm to be verified.

To select “All” Zones:

- Right click on the “Alarm Verification” heading and
- Choose “Set the Feature To all”.
- Select “Reset the Feature to All” to uncheck all boxes.

4.4.2 Alarm Post Delay Facility Option

The feature is normally used in the Fire Fan Control applications where a duct detector is fitted in the supply air duct. If the Alarm Post Delay feature was enabled for a zone (i.e. check box under that column has a tick), and if a smoke detector in that zone was in alarm, the zone will latch the alarm condition. When the smoke clears up in the smoke detector, the zone will remain in alarm for another 30 - 60 seconds before the zone alarm condition resets (post timing).

To enable this feature, check the “Alarm Post Delay” check boxes for the desired zones.

4.4.3 Alarm Non-latching (Auto-Reset) Option

When the “Alarm Not-Latching” option is selected for a zone, this zone will automatically reset once the smoke in a smoke detector within this zone clears up i.e. auto-reset. Similarly when a heat detector in a zone goes into alarm, this zone latches in alarm condition until the temperate decreases below the alarm threshold. Then the detector resets as well as the zone in alarm.

To select non latching mode, check the “Alarm Non-Latching” check box for each zone required to be non-latched.

To check all boxes for “Alarm Non-Latching” against all zones, choose “Set the Feature To all”, select “Reset the Feature to All” to uncheck all boxes.

A non-latching zone is normally used as a tone alert trigger input in Alertcom or a fan control duct probe input.

The Alarm Non-Latching feature has precedence over the Alarm Post Delay and the two are interlocked. Therefore, if any check box under the Alarm Non-Latching has a tick, the corresponding Alarm Post Delay check box for that zone will automatically be disabled (i.e. check box un-ticked) and vice a versa. Both these columns cannot be enabled simultaneously.

4.4.4 Alarm on Short Circuit Option

When this option is selected, a short circuit in the zone input will generate an alarm instead of fault.

To select this feature, check the boxes against the desired zones under the column heading “Alarm on Short Circuit’.

To check all boxes for “Alarm on Short Circuit” against all zones, choose “Set the Feature To all”, select “Reset the Feature to All” to uncheck all boxes.

4.4.5 Alarm Non-DBA

If the Non DBA option is selected for a zone, an alarm in this zone will be treated as a Non-Brigade Alarm. The common alarm relay will not activate and the Brigade Tx LED will not flash, any other general alarm function will operate as a normal DBA zone.

If the OWS is fitted, the non-DBA zone will trigger the alert tone / message for approximately 3 minutes then activate the T3 evacuation tone / message.

To check all boxes for “Alarm Non-DBA” against all zones, choose “Set the Feature To all”, select “Reset the Feature to All” to uncheck all boxes.

5 INSTALLATION AND COMMISSIONING

The installation and commissioning of Brooks FT420 CIE shall be carried out by qualified and trained installers following the requirements of all the related current standards and regulations, such as AS1670, AS/NZ 3000 and AS/ACIF S-009. Additional procedures detailed in this Chapter must also be followed.

If any measurements are required during the installation and commissioning, only calibrated and certified multimeters should be used. The CIE test results and maintenance history shall be recorded in the forms provided in the APPENDICES from page 71 onwards. Duplicate the forms as necessary and attach all results to this manual.

5.1 Installation

The Brooks FT420 system is factory pre-wired and fully tested before delivery to the site of installation. After delivery to site, the system should be carefully checked for any possible mechanical damage before commencing installation.

The FT420 cabinet can be mounted directly on a flat wall surface or into a wall recess using suitable hardware.

5.1.1 AC Mains Supply and Battery Check

The FT420 system is connected permanently to the line side of the mains fuses at the main distribution board.

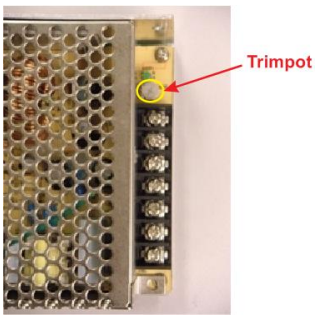
The mains cable should be separated from other cables entering the cabinet. It should be wired straight into the termination box situated in the top left hand corner of the cabinet. The mains earth wire must be terminated at the main earth stud near the mains termination block.

Ensure the mains isolate switch in FT420 cabinet is OFF, do not connect the batteries.

Before applying power to the CIE, the voltage of each battery shall be measured using a multimeter. If a 12V battery voltage is less than 10.7V, the battery shall be replaced since it might have been deeply discharged or depleted.

Apply the mains power then measure and calibrate (if required)[18] the battery charging voltage as follow:

1. Measure the voltage between the Battery terminals. The voltage should be between 27.3V – 27.5V.
2. If the voltage is out of the range, adjust the trimpot on the AC/DC power supply, refer to (Figure 38 below) until the voltage falls within 27.3 -27.5V (Turning anticlockwise to increase voltage).
3. Connect the batteries
4. Record the final battery charger output voltage on the related spread sheet in Appendix A.



[18] The power supply voltage is pre-adjusted in the factory, the procedures are required only if the voltage measurement differs from the recommended values.

Figure 38 Power Supply Trimpot Location

5.1.2 Visual Inspection and Field Wiring Termination

Note: Prior to any field wiring connection, check the panel operation and ensure the correct operation before terminating any field wiring. Only the “Mains On” green LED should be ON.

All cable terminations should be visually inspected and incorrect wiring should be rectified before commencing testing. Check that all quick connect plugs are properly inserted.

- If initial check is satisfactory, disconnect the batteries and switch the mains power off.
- Check all field cables and detector connections for correct polarity. The detectors and voltage outputs are polarity conscious. Therefore, care must be taken to ensure correct termination of all wires.
- Check that End of Line resistors are fitted to the last detector base in the zone circuit and the last device of each supervised input / output circuit. If the OWS is fitted, install the EOL resistor in the last speaker in the speaker circuit.
- Carryout the relevant resistance check as per Table 43 page 71.
- Check that all jumpers and DIP switches are set correctly. Refer to Table 15 on page 27.

5.1.3 Connection of Field Wiring

Field wiring should be connected one portion at a time. This assists to identify any cabling / termination problem which would lead to a fault on the system.

After terminating all the field wiring, commence testing the system as configured.

6 APPENDICES

6.1 Appendix A Pre-Commissioning Record

Table 43 Pre-commissioning Resistance Measurement Record

Module	Feature	Multimeter Probe +	Multimeter Probe -	Expected Resistance Range (Ohm)	Result
Main Control Board	Main Power input	TB1 – 5, POWER+	TB1 – 6, POWER-	10K - 54K	
	Earth	TB1 – 7, EARTH	TB1 – 5, POWER+	30K – 100K	
		TB1 – 7, EARTH	TB1 – 6, POWER-	30K – 100K	
	Charger	TB1 – 3, BATTERY+	TB1 – 4, BATTERY-	30K – 100K	
	Backup power outputs	TB2 – 1, 24V OUT+	TB2 – 2, 24V OUT-	1K – 54K	
	Zone input 1	TB6 – 1, ZONE1 +	TB6 – 2, ZONE1 -	2.5K – 5K	
	Zone input 2	TB6 – 3, ZONE2 +	TB6 – 4, ZONE2 -	2.5K – 5K	
	Zone input 3	TB6 – 5, ZONE3 +	TB6 – 6, ZONE3 -	> 10K	
	Zone input 4	TB6 – 7, ZONE4 +	TB6 – 8, ZONE4 -	10K - 54K	
	MCP Input	TB4 – 1, MCP +	TB4 – 2, MCP -	30K – 100K	
	MDH relay output	TB9 – 3, MDH OUT+	TB9 – 4, MDH OUT -	30K – 100K	
	ACF output	TB8 – 4, ACF -	TB8 – 3, ACF +	10K – 54K	
		TB8 – 3, ACF +	TB8 – 4, ACF -	> 28K	
	External strobe output	TB8 – 2, STROBE -	TB8 – 1, STROBE +	10K – 54K	
		TB8 – 2, STROBE +	TB8 – 1, STROBE -	> 28K	
	Speaker / Warning output	TB3 – 2, WARNING -	TB3 – 1, WARNING+	Speaker Line: 40K – 54K	
				24V output:: 40K – 54K	
		TB3 – 1, WARNING+	TB3 -2, WARNING -	Speaker Line: 40K – 54K	
				24V output: > 14	
	Common alarm relay	TB7 – 1, ALARM +	TB7 – 3, ALARM -	Follow the requirements of the equipment connected. Visual inspection of the connections	
	Common fault relay	TB7 – 4, FAULT +	TB7 – 6, FAULT -		
	Common disable relay	TB7 – 7, ISOLATE +	TB7 – 9, ISOLATE -		
	Power Fail relay	TB7 – 10, POWER FAIL +	TB7 – 11, POWER FAIL -		
Optional OWS Plug-in Module	OWS bi-colour strobe	TB2 – 1, STROBE +	TB2 – 2, STROBE -	10K – 54K	
	OWS auxiliary input	TB2 – 3, AUX EN+	TB2 – 4, AUX EN -	10K – 54K	
Optional Zone Input Expansion Board 1	Optional Zone Input 1	TB2 – 1, ZONE1 +	TB2 – 2, ZONE1 -	2.5K – 5K	
	Optional Zone Input 2	TB2 – 3, ZONE2 +	TB2 – 4, ZONE2 -	2.5K – 5K	
	Optional Zone Input 3	TB2 – 5, ZONE3 +	TB2 – 6, ZONE3 -	2.5K – 5K	

Module	Feature	Multimeter Probe +	Multimeter Probe -	Expected Resistance Range (Ohm)	Result
	Optional Zone Input 4	TB2 – 7, ZONE4 +	TB2 – 8, ZONE4 -	2.5K – 5K	
	Optional Zone Input 5	TB3 – 1, ZONE5 +	TB3 – 2, ZONE5 -	2.5K – 5K	
	Optional Zone Input 6	TB3 – 3, ZONE6 +	TB3 – 4, ZONE6 -	2.5K – 5K	
	Optional Zone Input 7	TB3 – 5, ZONE7 +	TB3 – 6, ZONE7 -	2.5K – 5K	
	Optional Zone Input 8	TB3 – 7, ZONE8 +	TB3 – 8, ZONE8 -	2.5K – 5K	
Optional Zone Input Expansion Board 1	Optional Zone Input 1	TB2 – 1, ZONE1 +	TB2 – 2, ZONE1 -	2.5K – 5K	
	Optional Zone Input 2	TB2 – 3, ZONE2 +	TB2 – 4, ZONE2 -	2.5K – 5K	
	Optional Zone Input 3	TB2 – 5, ZONE3 +	TB2 – 6, ZONE3 -	2.5K – 5K	
	Optional Zone Input 4	TB2 – 7, ZONE4 +	TB2 – 8, ZONE4 -	2.5K – 5K	
	Optional Zone Input 5	TB3 – 1, ZONE5 +	TB3 – 2, ZONE5 -	2.5K – 5K	
	Optional Zone Input 6	TB3 – 3, ZONE6 +	TB3 – 4, ZONE6 -	2.5K – 5K	
	Optional Zone Input 7	TB3 – 5, ZONE7 +	TB3 – 6, ZONE7 -	2.5K – 5K	
	Optional Zone Input 8	TB3 – 7, ZONE8 +	TB3 – 8, ZONE8 -	2.5K – 5K	
Optional Supervised output Expansion Board 1	Optional Supervised output 1	TB2 – 1, O+	TB2 – 2, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 2, O-	TB2 – 1, O+	24V output: 40K – 54K	
	Optional Supervised output 2	TB2 – 3, O+	TB2 – 4, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 4, O-	TB2 – 3, O+	24V output: 40K – 54K	
	Optional Supervised output 3	TB2 – 5, O+	TB2 – 6, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 6, O-	TB2 – 5, O+	24V output: 40K – 54K	
	Optional Supervised output 4	TB2 – 7, O+	TB2 – 8, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 8, O-	TB2 – 7, O+	24V output: 40K – 54K	
Optional Supervised output Expansion Board 2	Optional Supervised output 1	TB2 – 1, O+	TB2 – 2, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 2, O-	TB2 – 1, O+	24V output: 40K – 54K	
	Optional Supervised output 2	TB2 – 3, O+	TB2 – 4, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 4, O-	TB2 – 3, O+	24V output: 40K – 54K	
	Optional Supervised output 3	TB2 – 5, O+	TB2 – 6, O+	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 6, O+	TB2 – 5, O-	24V output: 40K – 54K	
	Optional Supervised output 4	TB2 – 7, O+	TB2 – 8, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 8, O-	TB2 – 7, O+	24V output: 40K – 54K	
Optional Supervised output Expansion Board 3	Optional Supervised output 1	TB2 – 1, O+	TB2 – 2, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 2, O-	TB2 – 1, O+	24V output: 40K – 54K	

Module	Feature	Multimeter Probe +	Multimeter Probe -	Expected Resistance Range (Ohm)	Result
	Optional Supervised output 2	TB2 – 3, O+	TB2 – 4, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 4, O-	TB2 – 3, O+	24V output: 40K – 54K	
	Optional Supervised output 3	TB2 – 5, O+	TB2 – 6, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 6, O-	TB2 – 5, O+	24V output: 40K – 54K	
	Optional Supervised output 4	TB2 – 7, O+	TB2 – 8, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 8, O+	TB2 – 7, O+	24V output: 40K – 54K	
Optional Supervised output Expansion Board 4	Optional Supervised output 1	TB2 – 1, O+	TB2 – 2, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 2, O-	TB2 – 1, O+	24V output: 40K – 54K	
	Optional Supervised output 2	TB2 – 3, O+	TB2 – 4, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 4, O-	TB2 – 3, O+	24V output: 40K – 54K	
	Optional Supervised output 3	TB2 – 5, O+	TB2 – 6, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 6, O-	TB2 – 5, O+	24V output: 40K – 54K	
	Optional Supervised output 4	TB2 – 7, O+	TB2 – 8, O-	Speaker: 40K – 54K	
				24V output: > 14	
		TB2 – 8, O-	TB2 – 7, O+	24V output: 40K – 54K	

Table 44 Pre-Commissioning Battery Voltage Measurement Record

Battery	Multimeter Probe +	Multimeter Probe -	Expected Voltage	Multimeter Readings (V)
Battery 1	Battery +	Battery -	> 10.5V	
Battery 2	Battery +	Battery -	> 10.5V	
Battery 3 (If any)	Battery +	Battery -	> 10.5V	
Battery 4 (If any)	Battery +	Battery -	> 10.5V	

Table 45 Power ON AC/DC Power Supply Calibration Record

Multimeter Probe +	Multimeter Probe -	Expected Voltage	Measured Voltage (V)	Calibrated Voltage (V)
TB1 – 3 of the battery charger current limiting board (Battery +)	TB1 – 4 of the battery charger current limiting board (Battery -)	27.0V – 27.6V		

6.2 Appendix B Equipment Record

Table 46 CIE General Record

Description		Record
CIE Model No.		
CIE Serial No.		
CIE Date Of Manufacturing		
Main Control Board SUB880	Serial No.	
	Firmware version	
Main Display Driver Board SUB881	Serial No.	
	Firmware version	

Table 47 CIE Expansion Board Record

Type	Module	No.	Bus Address	Bus Direction	Serial Number
Expansion Control Board	8 Zone Expansion Board SUB883	1			
		2			
	4 Supervised Output Expansion board SUB886	1			
		2			
		3			
		4			
		5			
		6			
	8 Dry-Contact Relay Expansion board SUB885	1			
		2			
		3			
Expansion Display Board	Zone Display Board SUB884	1		N/A	
		2		N/A	
		3		N/A	
		4		N/A	
	OWS Main Display Board SUB887	1		N/A	
	OWS Tone Selection Display Board SUB889	1		N/A	

Table 48 CIE Maintenance Record

No.	Description	Technician Name	Signature & Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

6.3 FT420 Block Wiring Diagram

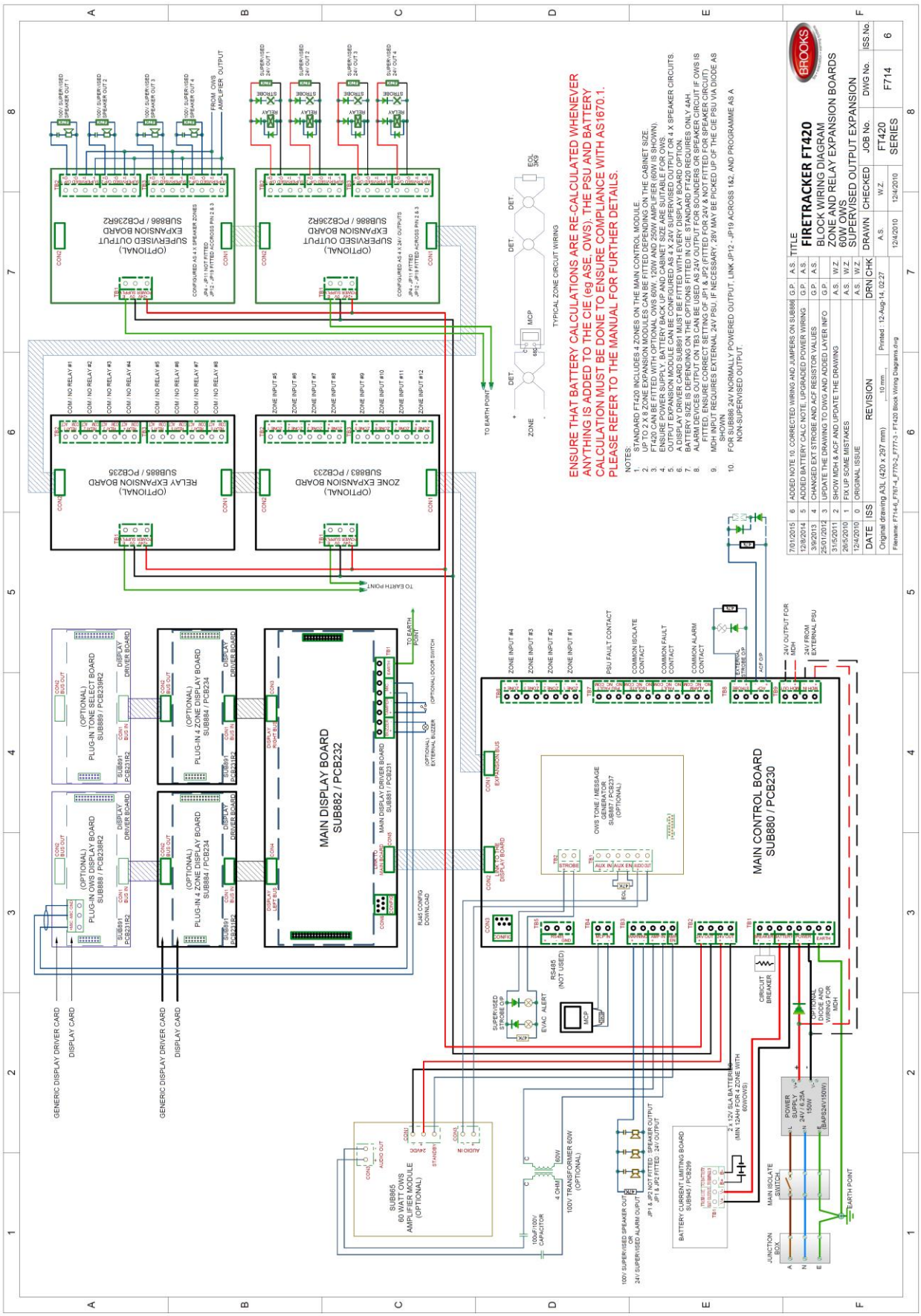


Figure 39 FT420 with All Options

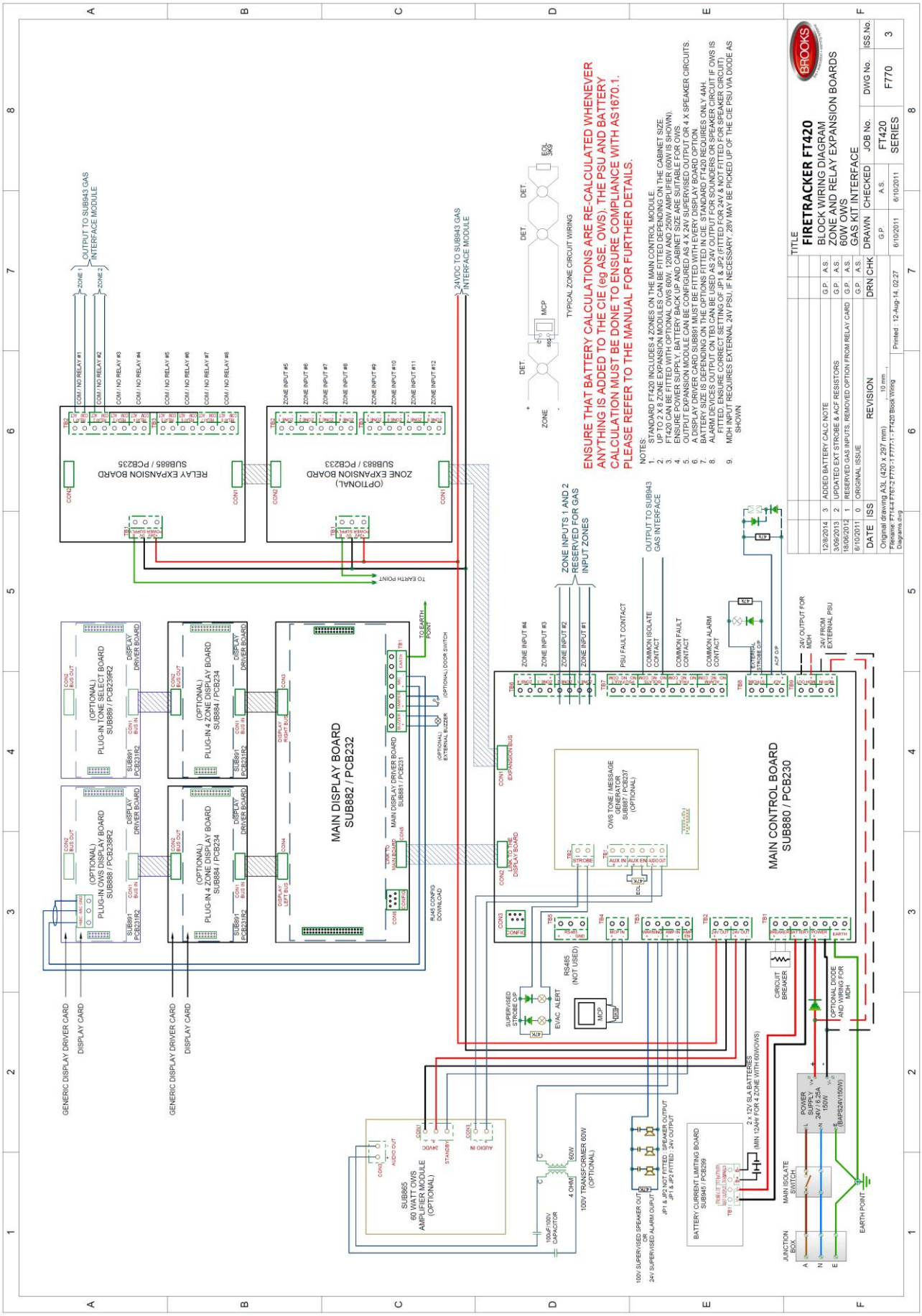


Figure 40 FT420 with Gas Kit Interface

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