



Fire Products & Solutions

Operation / Technical Manual

FT2GAS

Rev 1.3



Gaseous Extinguishing System

FT2GAS



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READ AND OBSERVE THE FOLLOWING WARNINGS PRIOR TO OPERATING THE CIE

WARNING!

- Improperly operating the CIE may cause serious consequences including fatal injury, personal harm, damage or loss of property and equipment and interruption to the site normal functions.
- Contact the Fire Brigade immediately in the case of a fire alarm regardless of whether the CIE supports fire alarm routing equipment or automatic fire protection equipment.
- Always perform installation, maintenance and service by a qualified and trained personnel in accordance with all the relevant standards and regulations.
- Always install and operate in accordance with Brooks equipment instructions.
- Any controls provided by the CIE are for fire protection purposes only. Do not rely on the CIE to operate external equipment for any other purposes.
- Activate the Service Master Abort switch (CIE) and the gas lock-off valve (gas system pipe-work) to safely disable the system before and during any system maintenance which requires the disablement of the gas release.
- The Brooks CIE monitors the wiring conditions by using the end of line devices. However, it is 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.

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DOCUMENT HISTORY

Issue	Date	Description	S/W Version	Written By	Checked By
Draft	10/12/07	Original Document.	Draft	W. Zhong	A. Shenouda
1.0	20/3/09	Updated after reviewing	V1.0	W. Zhong	A. Shenouda
1.1	23/11/11	Add sounders datasheet & update table 9. Review & correct, all label to all figures, correct calculation example in Appendix D.	V1.0	W. Zhong	E. Thein
1.2	15/7/13	Modify the table for Gas Control Board (SUB928) DIP Switch (8 ways) SW1 Configuration. Bit 5 is reused to select whether the gas discharged sensor input activates the alarm conditions	V1.2	W. Zhong	A. Shenouda
1.3	3/12/19	Update document, drawings, logo and add warning signs with voice & speaker	V1.2	A.S.	A.S.

Documentation Feedback

If you have any comments or suggestions regarding this manual, please contact Brooks Technical Services.

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Please include the following information:

- Product name and version number (if applicable)
- Manual part number and revision (found on the front cover)
- Page number
- Brief description of the content which you think should be improved or corrected
- Suggestions for improvement

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1. ABOUT THIS MANUAL

1.1 Purpose

This manual is designed to be the reference point for the Brooks Dual Zone Gaseous Control System and provides the technical and operational instructions to the installer / user. The document is intended to be used by the end user, service and commissioning personnel. It provides detailed information required for installation, commissioning and operation.

The manual provides the following details for the Brooks Gaseous Extinguishing System:

- Technical instructions
- Operating instructions
- Indicators and controls
- Input and output cabling and connectivity.
- Power supply calculation documents
- Datasheets
- Block wiring diagrams

1.2 Referenced Documents

AS7240.2	Fire detection and alarm systems Part 2: Control and indicating equipment (ISO7240-2:2003, MOD)
AS7240.4	Fire detection and alarm systems Part 4: Power supply equipment (ISO7240-4:2003, MOD)
NZS4512-2003	New Zealand Standard Fire Detection and Alarm Systems in Buildings
AS4214-2002	Australian Standard Gaseous fire extinguishing systems
AS1670.1-2015	Fire detection, warning, control and intercom systems-System Design and commissioning – Part 1: Fire
AS/NZS 3000-2007	Australian / New Zealand Standard Electrical Installations (Known as Australian/New Zealand Wiring Rules)

2. FT2GAS TECHNICAL DESCRIPTIONS

2.1 System Overview

A typical Brooks FT2GAS system is comprised of the following:

- Brooks FT2 Dual Zone control board (SUB922) and Zone Display Board (SUB923)
- Brooks Gas Extinguishing Control board (SUB928) and Gas Display board (SUB929).
- Switch Mode AC/DC Power Supply and backup batteries
- A combination of Brooks System Warning Signs
- Brooks Local Control Stations
- Brooks Dual Strobe Modules
- Brooks voice / tone warning speakers
- Optional Panasonic web server for remote monitoring of the system.

Figure 1 below illustrates some of the various components of the system.

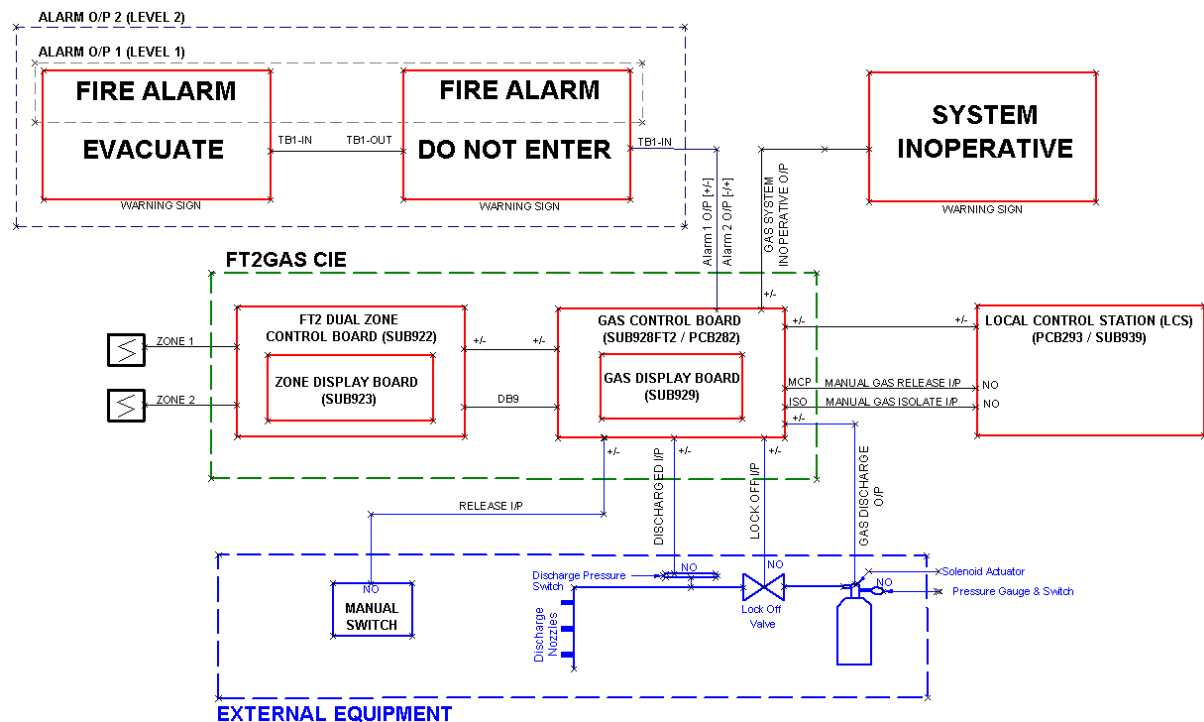


Figure 1 Gaseous Extinguishing System Overview

The FT2 Dual Zone control board (SUB922) and the Zone Display Board (SUB923) shown in Figure 1 forms the two-zone fire panel functions that meets the requirements of the Australian Standards AS7240.2 & AS7240.4. In addition, the board provides RS232 output to connect to an optional web server for remote monitoring over Ethernet.

The plug-in Gas Control Board (SUB928) and the Gas Display Board (SUB929) in Figure 1 are designed to provide the control and monitoring of a complete gaseous extinguishing system that meets the requirements of the relevant clauses of the Australian extinguishing standard AS4214.

The standard FT2GAS system is fitted with a 150 Watt switch mode power supply (5A @ 28V) and can house up to 2x12Ah sealed lead acid (SLA) batteries. A battery and power supply calculation should be

performed to verify the suitability of this standard product for use in the intended application, refer to Appendix D on page 39.

2.2 Features

The Brooks dual zone gaseous extinguishing control system has the following features:

- An intelligent dual microprocessor system which combines both the two zone CIE functions and the dual zone gas controller functions.
- Fully supervised power supply to meet the requirements of the Australian standard AS7240.4.
- Intuitive indication and controls via the well-grouped LED indicators and momentary switches.
- Fully supervised input circuits, including two fire detection zone inputs, one gas lock-off valve input, one manual release input and one gas discharged sensor input.
- Fully supervised system inoperative warning sign 24V output rated @ 0.5A maximum.
- Fully supervised 2 wire system outputs for level 1 and level 2 alarms to Brooks warning signs (Level 1: alarm 1 [+/-] & Level 2: alarm 2 [-/+]) rated @ 3A maximum. Note: [+/-] & [-/+] means polarity changes accordingly to level 1 or 2.
- Fully supervised gas release output rated @ 5A maximum.
- Fully supervised 24V output for warning devices or sounders (Ancillary Control Facility, ACF) rated @1A maximum. The output, once activated, can be disabled separately via the silence (alarm device) switch.
- Common Alarm dry-contact relay output rated @ 2A maximum.
- Common Fault (Defect) dry-contact relay output rated @ 2A maximum.
- Common Isolate dry-contact relay output rated @ 2A maximum.
- Two alarm dry-contact relay output for alarm 1 and alarm 2 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-circuit and short-circuit faults.
- Adjustable gas release timer settings via a built-in DIP switch.
- Provision for connection of an optional Panasonic web server to provide Ethernet connectivity with web pages and email alerts.
- Transient suppression protection comprises metal oxide varistors (MOV) and transorbs to all inputs and outputs.

Note: the current rating mentioned 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.

2.3 Specifications

Table 1 General Specifications

Feature		Specification
Mains Power Supply		230V AC, +/- 20%. Wattage 150W (maximum 5 A @28V)
Standby Battery		2 x 12V sealed lead acid batteries up to 12 AH, refer to power supply calculations, APPENDIX D on page 39
System Access Security		<p>Access Level 1: All the LED indicators are viewable through the locked transparent window on the front door.</p> <p>Access Level 2: All the controls are accessible via the front door using a 003 key.</p> <p>Access Level 3: The system configuration DIP switch is behind both the front door and the front plate. To change the system configurations, the technician needs to open the front door, unscrew the front plate and change the DIP switch settings or replace fuses.</p> <p>Access Level 4: The control and indicating circuits are behind the front plate. To upgrade its firmware or, the technician needs to open the front door, unscrew the front plate and replace the microcontroller.</p>
Access Security for the Local Control Station		<p>The gas isolate switch is a push button (with LED) accessible by lifting a plastic flap cover.</p> <p>The gas release switch is a yellow manual call point (with built-in LED and without glass) accessible by lifting a plastic flap cover.</p>
Operating Temperature		0°C to +40°C.
Operating Humidity		5-95%, non-condensing.
Enclosure	IP Rating	IP31
	Material	1.5mm zinc anneal steel powder coated oyster.
	Dimension	400mm H x 320mm W x 165mm D (with door closed)
	Weight	12Kg. (without backup battery and web server)
Design Standards		Gaseous Extinguishing Systems – AS4214-2002 amdt 1 CIE – AS7240.2-2004, AS7240.4-2004
Applications		Not suitable for use within any hazardous locations unless applying proper safety techniques according to the related hazard regulations. Installed in an indoor environment only.

2.4 Operation

2.4.1 Display Layout

The FT2GAS gaseous extinguishing control system display is shown in Figure 2

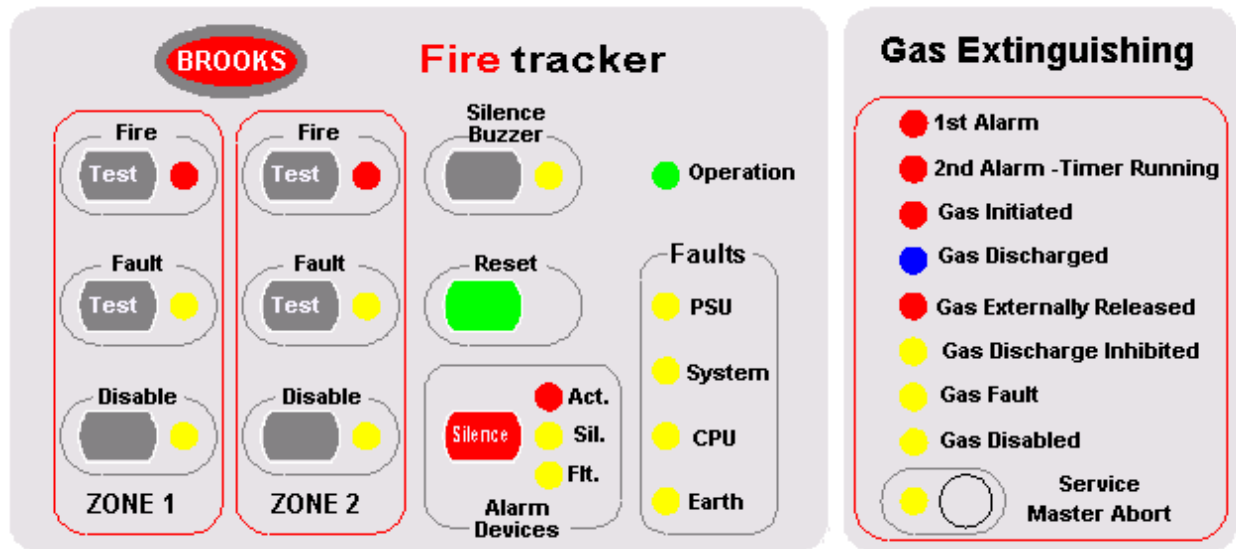


Figure 2 Dual Gaseous Extinguishing System Display Layouts

All the control buttons and LEDs on the front display of the control panel, with the exception of the Service Master Abort switch, are a pushbutton covered with a polycarbonate overlay decal and clearly labeled with their function.

When the system is in the normal condition, only the “Operation” (green) LED will be illuminated.

All other LED indications will be off.

2.4.2 System Controls

The system controls can be carried out by operating the momentary push-button switches on the front display whilst the remote control is carried out by switches on the Local Control Station and / or the gas valves of the gas protection equipment. The system controls are detailed in Table 2 below.

Table 2 System Controls

Location	Control	Condition	Description
FT2 section of Front Display	Zone 1 or 2 Alarm Test	Zone 1 or 2 is not in alarm or fault condition.	Perform Zone 1 or 2 Alarm Test (internal to the CIE only). The alarm test state will be cancelled automatically when the internal test is completed.
	Zone 1 or 2 Fault Test	Zone 1 or 2 is not in alarm or fault condition.	Perform Zone 1 or 2 Fault Test (internal to the CIE only). The fault test state will be cancelled automatically when the internal test is completed.
	Zone 1 or 2 Disable	Zone 1 or 2 is in any condition.	Disable or re-enable Zone 1 or Zone 2.
	Silence Alarm Devices	Output for alarm devices (ACF) is in the active state.	Disable or re-enable alarm devices.
	System Reset	CIE is in Fault or Alarm conditions.	Reset alarm condition, alarm devices must be silenced first. Reset fault conditions. Any condition were not rectified will be re-activated.
	LED Test	Press and hold both Silence Buzzer and Reset buttons. Correct operation of this function can only be expected when the system is in "normal" status.	When the control is activated: <ul style="list-style-type: none"> All LEDs, except CPU Fault and Service Master Abort LEDs illuminate. The buzzer turns ON. NOTE: When the system is reset from alarm or fault conditions, this function on FT2 and gas front displays will be disabled for approximately 10 seconds in order to ensure that no further fault or alarm is to be re-established.
Gas Extinguishing Section of Front Display	Service Master Abort Button	CIE is in any condition	Pressing the switch will cause the following: <ul style="list-style-type: none"> Gas discharge output is electrically isolated. Service Master Abort LED Illuminates. Gas Disabled LED illuminates.
Local Control Station (section 4.9.4)	Gas Release	CIE is in any condition	Illuminates both Gas Externally Released and 2 nd Alarm – Timer Running LEDs and starts the CIE gas release timer. Overrides the LCS Gas Isolate switch.
	Gas Isolate	The LCS gas release control has not been activated.	Inhibits the LCS gas discharge output preventing an automatic gas discharge from occurring due to the alarm activation of both alarm zones.
External Equipment (Gas)	Gas Discharge	CIE is in any condition	To monitor the system gas pressure/flow sensor and confirm gas flow through the system pipe-work. When the switch operated, the Gas Discharged LED is activated.
	Gas Release	CIE is in any condition	Monitors for activation of the gas release via a mechanical release action (external equipment). Both the alarm signs and the gas discharge output activate. Overrides the LCS Isolate switch/control.
	Gas Lock-off	CIE is in any condition	To monitor the system gas pipe-work lock-off valve position. With the valve closed the GAS FAULT LED is activated and system inoperative sign illuminates.

2.4.3 Buzzer & LED Indicating Patterns

The CIE buzzer uses the following patterns to indicate the system conditions.

Table 3 Buzzer Indicating Patterns

Name	Period	On Time	Off Time
Pulsing	3s	2s	1s
Key Pressed	40ms	40ms	Always OFF, only one beep when pressed
Continuous	Buzzer sounds continuously		

The CIE LED indicators use the following flash patterns to signal the system conditions.

Table 4 LED Flash Patterns

Name	Flash times
Flash fast	One flash every 0.5sec
Flash 1	One flash every 2.5sec
Flash 2	Two flashes every 2.5sec
Flash 3	Three flashes every 2.5sec
Steady ON	Steady illumination

2.4.4 System Indications

The dual zone gaseous extinguishing control system condition indicating LEDs and flash patterns are described in Table 5. The default state of the LED indicators and the buzzer are OFF, if it is not defined Table 5 below.

Table 5 System Indicating LEDs and flash Pattern

Type	CIE Conditions	LED Name	LED Color	LED Pattern	Buzzer Pattern
Fire	One zone alarm	1st Alarm	Red	Fast Flash	Pulsing
	Both Zone 1 and Zone 2 alarm	2nd Alarm – Timer Running			
	Gas release output activated	Gas Initiated			
	External gas release control activated	Gas Externally Released			
	Gas discharged sensor input activated	Gas Discharged	Blue		
Fault	Fault	All Fault indicators	Yellow	Based on fault types (section 2.4.5)	Continuous
Test	Zone Alarm Test	Zone Alarm Test	Red	Steady ON	Off
	Zone Fault Test	Zone Fault Test	Yellow	Steady ON	Off
Disablement	Zone 1 Disabled	Zone 1 Disable	Yellow	Steady ON	Off
	Zone 2 Disabled	Zone 2 Disable			
	Gas Discharge Inhibited via LCS isolate switch	Gas Discharge Inhibited			

Type	CIE Conditions	LED Name	LED Color	LED Pattern	Buzzer Pattern
	Gas Discharge Disabled by the Service Master Abort switch or the gas lock-off valve controls	Gas Discharge Inhibited	Yellow	Steady ON	Off
	Gas Service Master Abort switch activated	Service Master Abort			
Operation	Mains power available	Operation	Green	Steady ON	Off
Silence Alarm Devices	Alarm Devices output activated	Alarm Devices – Silence - "Act."	Red	Steady ON	Off
	Alarm Devices output (ACF) de-activated	Alarm Devices – Silence - "Sil."	Yellow	Steady ON	
Silence Buzzer	Buzzer is silenced manually	Silence Buzzer	Yellow	Steady ON	OFF
LED Test	The system is in the LED test conditions	All the LEDs except the Gas Fault and the CPU Fault LEDs	N/A	Steady ON	Continuous

The local gas control station (LCS) has an integrated buzzer and LED indicator. Both the audible and visible indicators will remain ON as long as the LCS gas isolate control switch is activated.

2.4.5 Fault Indications

Many fault LED indicators have multiple indicating patterns to provide more information on the causes of the faults. The fault LED indicating patterns are detailed Table 6 below.

Table 6 Display Fault LED Indications

LED Indicator	LED Pattern	Description
Zone Fault	Steady ON	Multiple faults detected.
	Flash 1	Zone open circuit fault.
	Flash 2	Zone short circuit fault.
	Flash 3	Zone test fault. A fault is detected during the zone alarm/fault test.
Alarm Devices Fault (Flt.)	Steady ON	Multiple faults detected.
	Flash 1	Alarm devices open circuit fault.
	Flash 2	Alarm devices short circuit fault.
CPU Fault	Steady ON	CPU fault condition detected.
System Fault	Steady ON	Multiple faults detected
	Flash 1	FT2 communication fault (only if the Panasonic web server is installed)
	Flash 2	FT2 display board fault
	Flash 3	Monitored power supply output failed (Gas module power supply failed).
PSU Fault	Steady ON	Multiple power supply faults detected.
	Flash 1	Main high fault.
	Flash 2	Mains low or charger low fault.
	Flash 3	Battery low fault
Earth Fault	Steady ON	Multiple faults detected.
	Flash 1	A leakage between the GND (-Ve) and the earth is detected.
	Flash 2	A leakage between the +24V and the earth is detected.
Gas Fault	Steady ON	Gas system fault. This indicator is on the dual zone section of the keyboard.

In addition to the LED indicators on the system front display, there are four yellow fault LED indicators located on the gas control board (SUB928) inside the cabinet. The internal LED indicating patterns are described in Table 7 below.

Table 7 Gas Control board Fault LED Indications

LED Indicator	LED Pattern	Description
Gas	Steady ON	Multiple faults detected.
	Flash 1	Gas module power supply fault
	Flash 2	Gas release output fault
	Flash 3	Gas module flash memory fault.
Signs	Steady ON	Multiple faults detected.
	Flash 1	System inoperative warning sign output fault
	Flash 2	Alarm warning sign output fault
Inputs	Steady ON	Multiple faults detected.
	Flash 1	Gas lock-off valve input fault.
	Flash 2	Manual gas release input fault.
	Flash 3	Gas discharged sensor input fault.
Local	Steady ON	Multiple faults detected
	Flash 1	LCS manual gas release input fault.
	Flash 2	LCS isolate input fault.
	Flash 3	Gas master isolate input fault or display connection fault.

2.5 CIE Inputs and Outputs

2.5.1 Fire Detection Zone Inputs

The zone specifications and the compatible devices are listed Table 8 below.

2.5.1.1 ZONE INPUT CIRCUIT SPECIFICATIONS

Table 8 Zone Input

Item	Description
Number of zones in one CIE	2 zones
Number of detectors per zone	0 – 40, including Manual Call Points (MCPs) if any
Maximum number of detectors in alarm per zone	Up to 2 detectors per zone, including MCPs, heat and/or smoke detectors.
Zone current per zone	0 – 51mA
Typical Zone quiescent current per zone	5mA
Typical zone input resistance in alarm conditions per zone	560 Ohm

The typical zone input circuit is shown in Figure 3 below

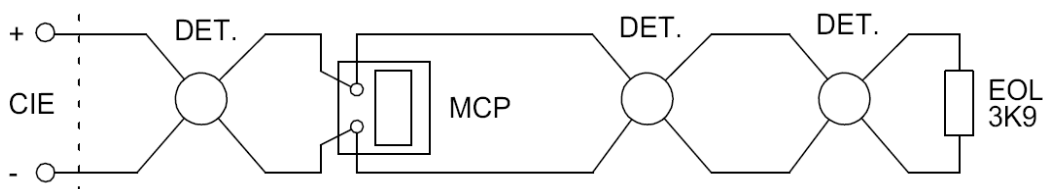


Figure 3 Zone Input Circuit

Each zone input circuit is fully supervised for open circuit and short circuit faults. The EOL resistor type is 3K9, 1W, 1%, metal film.

2.5.1.2 ZONE INPUTS COMPATIBLE ACTUATING DEVICES

Table 9 Compatible devices

Part No.	Description
4452	Conventional multi detector (recommended)

Note:

Only smoke detectors can be used in gaseous extinguishing systems.

2.5.2 Control Input and Output

2.5.2.1 Non Supervised Outputs

The standard FT2 module provides the following five non-supervised outputs:

- Alarm relay output, changeover voltage free contacts
- Fault relay output, changeover voltage free contacts
- Isolate relay output, changeover voltage free contacts
- Zone alarm level 1 relay output, changeover voltage free contacts
- Zone alarm level 2 relay output, changeover voltage free contacts

The current carry capacity of each relay contacts is 2A.

The zone alarm level 1 relay and the zone alarm level 2 relay are only activated by the zones. The LCS gas release input on the gas manual release input do not change the states of the two zone relay outputs.

2.5.2.2 Alarm Devices Output

FT2 control board provides 22-30V DC supervised output which can be used to activate warning devices such as sounders, strobes, etc. The front display of FT2 has a segregated section for warning system output which includes a disable facility with LED to confirm switch operation, fault and fire indications.

The warning system output can also be used to control external relays to control ancillary equipment. Figure 4 below shows the connection diagram and end of line resistor. Series diode must be fitted if the ancillary devices have no polarity.

NOTE: The voltage polarity is shown with the output in the active state.

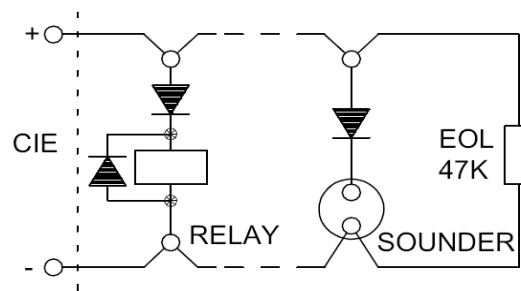


Figure 4 Typical Relay or Sounder Control Circuit

The alarm devices (shown as ACF on the (PCB) output is 22-30V DC, maximum current is 1A. The output is fully supervised for open and short circuit faults. The EOL resistor type is 47K, 1/2W or 1W, 1%, metal film.

2.5.2.3 Extinguishing System Inoperative Sign Output

The gas control board provides a supervised output to activate the Extinguishing System Inoperative warning sign. The output is 22-30V DC @ 0.5A and fully supervised for open and short circuit faults. The EOL resistor type is 20K, 1/2W or 1W, 1%, metal film.

For more details, refer to the data sheet of the system inoperative sign in Brooks product datasheets in Appendix I 4.9.2 Warning Signs

Standard Warning Signs on page 48.

2.5.2.4 Fire Alarm / Do Not Enter and Evacuate Signs Output

The gas control board provides a fully supervised bi-directional 22-30V DC / 3A max (current capacity) to activate a number of gas warning signs (depends on the power supply and battery capacity), refer to power supply calculation sheet in appendix D on page 39.

The voltage output from the gas module SUB928 has 3 states:

1. Normal, monitoring +24V limited to <1.5mA
2. Level 1 Alarm, active condition is -24V
3. Level 2 Alarm, active condition is +24V

The nominal voltage output of level one alarm is +24V DC when measured across L1-/L2+ and L1+/L2- of the connector TB3. The level two voltage output is -24V DC when measured across same terminals.

The output is fully supervised for open and short circuit faults. The EOL resistor type is 20K, 1/2W or 1W, 1%, metal film.

The two-wire system of the alarm warning signs output is compatible with Brooks warning signs and tone / voice sounders.

For more details, refer to the data sheet of the Brooks warning signs in Brooks product datasheets in appendix I on page 48.

2.5.2.5 Gas Discharge Output

The system gas discharge output is 22-30V DC with up to 5A current capacity. The output is fully supervised for open and short circuit faults. The EOL resistor type is 20K, 1/2W or 1W, 1%, metal film.

Note: CIE Voltage polarity shown in Figure 5 below is for the output in the active state

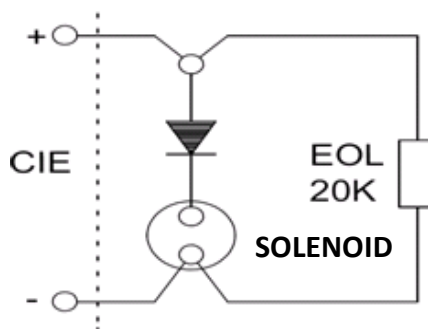


Figure 5 Typical Gas Discharge Output Control Circuit

Notes:

1. The series diode is rated @ 3A (1N5404), Brooks part number DI600. If the discharge output is required to be rated @ 5A continuous, a higher rated diode should be used.
2. The FT2GAS must have suitable power supply to support additional current required by Gas discharge output if a 5A continuous current is needed.

2.5.2.6 External Supervised Inputs

The system has the following external supervised inputs.

- **Gas release input** monitors the gas manual release mechanism, normally located at the head of the extinguishing agent contactor. When this input is activated, the “Gas Externally Released” LED illuminates, the level 2 alarm signs will be activated immediately. This input will not initiate the automatic sequence of gas releasing.
- **Gas lock-off valve input**, this input monitors the lock-off valve position. If the valve is closed, the input will be active which causes the “Gas Fault” LED to flash once every 2.5 seconds and the Extinguishing System Inoperative sign to illuminate.
- **Gas discharged sensor input**, the gas pressure switch or flow sensor is supervised via this input and confirms that the gas has been released. A pressure switch will normally operate when the extinguishing agent bottle has low pressure indicating the bottle has emptied or is low. A flow sensor will operate when the extinguishing agent is discharged through the system pipe-work past the sensor.

The external inputs are fully supervised for open and short circuit faults.

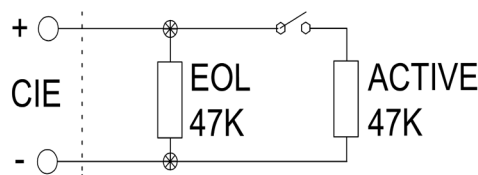


Figure 6 Supervised Input Circuit

Both the EOL resistor and the active resistor are 47K, 1/2W or 1W, 1%, metal film.

2.5.2.7 Local Control Station (LCS)

The FT2GAS system provides an interface to multiple remote gas control stations. Only the Brooks LCS can be connected to this interface. It includes the following four signals,

- LCS +24V,
- LCS Ground,
- LCS Gas Release input,
- LCS Gas Isolate input.

Both LCS gas release input and gas isolate input are fully supervised for open and short circuit faults.

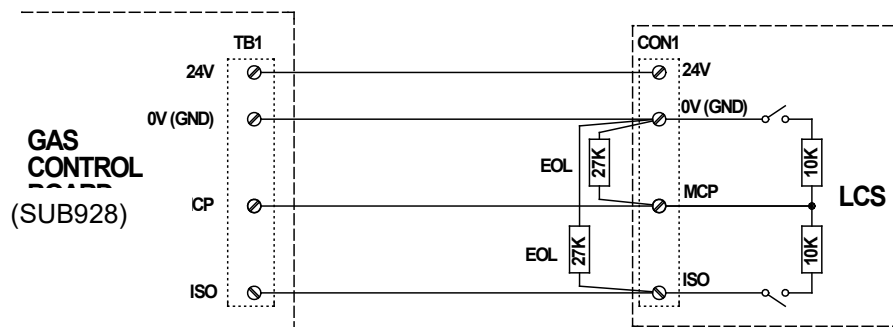


Figure 7 Remote Station Input Circuit

The EOL resistor is 27K, 1/2W or 1W, 1%, metal film. The active resistor is 10K, 1/2W or 1W, 1%, metal film. The schematics for the LCS can be found in Figure 13 page 35.

2.5.2.8 External Buzzer

The FT2 control board has an internal PCB mounted buzzer which meets the buzzer sound level requirement of 65dB at 1 metre distance with the door closed. If the internal buzzer sound level is insufficient, an external buzzer can be installed to the CIE front plate. To disable the PCB mounted buzzer, the resistor R8 located just next to the PCB buzzer on the FT2 control board needs to be removed. Refer to the board layout under section 4.1.1 page 29.

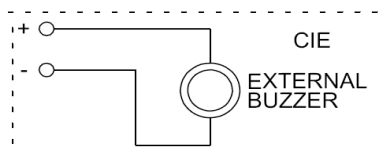


Figure 8 External Buzzer Circuit

2.5.2.9 DIP Switch Configurations

Two DIP switches are provided in FTGAS for system configuration. One 4-way DIP switch, SW1 on the FT2 control board (SUB922), Refer to section 4.1.1 page 29.

Another 8 way DIP switch, SW1 on the dual zone gas control board (SUB928), refer to section 4.1.2 on page 31. The gas control board is mounted above the FT2 main control board and connected together via a 9-pin D-range connector. To access DIP switch, SW1 on the FT2 main control board, disconnect the power first then carefully remove the plug-in dual zone gas control board.

Table 10 FT2 Control Board (SUB922) DIP (4 way) Switch SW1 Configuration

Purpose	Switch Bank Number	Status On= 1 OFF= 0	Description
Zone latch	1	1	Zone alarm is non-latching
		0	Zone alarm is latching (default setting)
Zone alarm verification	2	1	Enable alarm verification (not used with FT2GAS).
		0	Disable alarm verification. (default setting)
Zone relay controls	3 & 4	must set to 11	Zone Relay 1 activates only when one zone or both zones is/are in alarm conditions, Zone Relay 2 activates only when both zones are in alarm conditions. Note: The other settings of the two switches are not used in FT2GAS but are used in FT2 system.

Table 11 Gas Control Board (SUB928) DIP Switch (8 way) SW1 Configuration

Purpose	Switch Bank Number	Status On = 1 Off = 0				Description
		4	3	2	1	
<p>Gas release timer selection.</p> <p>In normal conditions, the timer is started by the dual alarm conditions or the remote release controls.</p> <p>The gas will be initiated at the end of the specified period.</p>	1-4	← Switch number				
		0	0	0	0	200 milliseconds
		0	0	0	1	5 seconds
		0	0	1	0	10 seconds
		0	0	1	1	15 seconds
		0	1	0	0	20 seconds
		0	1	0	1	25 seconds
		0	1	1	0	30 seconds
		0	1	1	1	35 seconds
		1	0	0	0	40 seconds
		1	0	0	1	45 seconds
		1	0	1	0	50 seconds
		1	0	1	1	55 seconds
		1	1	0	0	60 seconds (default setting)
		1	1	0	1	70 seconds
		1	1	1	0	80 seconds
		1	1	1	1	90 seconds
Whether the gas discharged sensor input activates the alarm conditions.	5	1				The gas discharged sensor input activates the level 2 alarm conditions.
		0				The gas discharged sensor input does not activate any alarm conditions.
Whether the gas release is stopped if the system is inoperative.	6	1				The gas release is not disabled by the system inoperative.
		0				The gas release is disabled if the system is inoperative (default).
Whether the gas discharge control is activated by one zone alarm input or two zone alarm inputs.	7	1				The gas discharge control is activated by any one of the two zone alarm inputs.
		0				The gas discharge control is activated by two zone alarm inputs (default).
Whether the remote gas release activates the gas timer or gas release directly.	8	1				The LCS gas release activates the gas timer
		0				The LCS gas release activates the gas release immediately.

2.6 Power Supply Unit (PSU)

2.6.1 PSU Specifications

The main power source of the standard FT2GAS system is a 150W switch mode power supply, the maximum current capacity is up to 5A @ 28V DC. The PSU supports the following:

- Total current required for the internal circuits
- Battery charging current
- Maximum current required to drive external loads
- Current required for optional web server and any additional loads.

WARNING: The maximum CIE current capacity shall not be exceeded in any applications. Otherwise the fuses on the control board may blow and the CIE hardware may be damaged. Check system design against the power supply and battery calculation spreadsheet in Appendix D page 39.

Table 12 Basic mains power supply requirement

Characteristics	Typical	Range
Input Voltage Range	230V AC	170-264VAC
Input Voltage Frequency	50Hz	47- 63 Hz
Output Voltage	28V	+/- 1%
AC Input Current	< 2A	Varies based on the applications
DC Output Current	5A @ 28V	Varies based on the applications

Larger power supplies can be used depending on the applications. However, larger enclosures would be required.

The output voltage of the power supply is factory set, it may need to be checked and calibrated on-site. The calibration procedure is as follows.

- Use a calibrated and certified multi-meter to measure the DC voltage of the battery connection (between TB1 POWER IN + and POWER IN -) on the FT2 control board or the battery terminals.
- Adjust the AC/DC power supply potentiometer until the multimeter reading is stabilized between 27.3V – 27.5V DC.

WARNING: 240V AC. Care must be taken when adjusting the AC/DC power supply. If you need to remove the plastic cover protecting the 240VAC terminations use extreme caution. Always ensure the cover is replaced correctly.

The standard FT2GAS system accommodates up to 12AH batteries.

2.6.2 PSU Supervision

The system constantly monitors the mains power supply, battery charger voltage and batteries and will initiate a PSU fault if the voltage of the charger or batteries exceeds the limits as in Table 13.

Table 13 Power Supply Supervision Characteristics

Characteristics	Threshold
Secondary Low Fault	24V, Measured on the battery terminals
Battery Automatic Cut Off	20.7V, Measured on the battery terminals, when the mains is not available.
Main Power High Fault	30.5V, Measured on the main power source output terminals
Main Power Low Fault	22.1V, Measured on the main power source output terminals
Secondary Charging Voltage Low Fault	24.3V, Measured on the battery terminals
Automatic Battery Test	The system automatically runs on battery only for one hour every 70 hours and closely monitors battery voltage during this period. The test terminates automatically should any power supply fault or alarm condition was detected.

2.6.3 PSU Current Calculations

The following shall be calculated according to the application requirements of the related current standards, such as AS7240.2, AS1670.1, NZS4512 and AS4214.

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

The typical system current consumptions are listed below.

- Quiescent Current, $I_Q = 75 \text{ mA}$
- Alarm Current, $I_A = 250 \text{ mA}$

The alarm state current is measured when two zones are in high priority alarm conditions, all the outputs are activated. The quiescent state current is measured when all the common condition relays except the common fault relay are de energized. No power output current has been included.

WARNING: The current consumption data above does not include any current supplied to the external devices. The actual current consumption shall be re-calculated based on the actual system configurations. Refer to the power and battery calculation spreadsheet in Appendix D on page 39.

3. INSTALLATION AND COMMISSIONING

The installation and commissioning of Brooks FT2GAS shall be carried out by qualified installers following the requirements of all the related current standards and regulations, such as AS1670.1, AS/NZ 3000 and AS/ACIF S-009. Additional procedures detailed in this chapter shall also be followed.

If any measurements are required during the installation and commissioning, only calibrated and certified multimeter shall be used. The CIE test results and maintenance history shall be recorded in the form provided in Appendix E – Commissioning Record on page 42, Appendix F – Equipment Record on page 44 and Appendix G – Maintenance Record on page 45.

3.1 Visual Inspection Checklists

Before applying any power to the panel, the following visual inspection shall be performed:

- Check cabinet general appearance for damage or dents.
- Ensure all modules firmly mounted and secured.
- Ensure mains cabling are correctly terminated before power up.
- Check earthing correctly terminated and secured before power up.
- Check that all ribbon cables are firmly secured without cuts on the insulation.
- Check all field cables and detector connections for correct polarity.
- Check that the End of Line (EOL) resistors are fitted to each detector circuit at the last detector.

Check that the EOL resistors are fitted to every supervised output at the last device and ensure that the resistance values are configured as shown in the Block Wiring Diagrams section 5, page 55.

- Check all the jumpers and DIP switches are set correctly.

Should any of the above be compromised, please contact Brooks Australia Technical Support.

3.2 Resistance Check

Before applying any power to the system, resistance checks shall be carried out as per Appendix E – Commissioning Record on page 42. The multimeter readings and inspection results shall be recorded in the related spreadsheet shown in:

- Appendix E – Commissioning Record on page 42,
- Appendix F – Equipment Record on page 44 and
- Appendix G – Maintenance Record on page 45.

3.3 Functional Testing

This section describes the system testing and commissioning procedures to ensure that the FT2GAS is fully functional. All field wiring shall be terminated in FT2GAS control panel **except the gas release circuit**

3.3.1 FT2 System Test

3.3.1.1 Power Supply Check

Before applying any power to the system, ensure that the gas release circuit is replaced by a dummy load. This load should be installed at the extinguishing gas equipment location **NOT** in the control panel. It is recommended to use match head devices to simulate gas firing.

The voltage of each battery shall be measured, if the voltage is less than 10.7V, the battery shall be replaced since it could have been deeply discharged or over its allowed life cycle.

- Disconnect the battery leads to the battery terminals.
- Turn ON the mains isolate switch and measure the voltage across the battery leads without physical connection to the batteries.
- The DC voltage shall be 27.3V – 27.6V (factory set). If the voltage is not within the specified limits, adjust the trimpot of the switch mode power supply until the voltage becomes within 27.3-27.6V.
- Reconnect the batteries.
- Only the green “Operation” LED and “Gas Fault” LED should be illuminated.
- Press reset, only the “operation” LED would remain ON, any other indicators and the buzzer must be OFF.

3.3.1.2 Alarm Test

1. Press the “Fire” test button of zone 1, the buzzer will sound and the fire LED illuminates steady for approximately 3 seconds then turns OFF and the buzzer silences. No other LEDs shall be illuminated.
2. Repeat step 1 for zone 2.
3. Use a smoke can to spray near a detector in the zone input (Alternatively, connect a 680Ω resistor to the respective zone inputs to simulate zone alarm). Check for the following conditions:
 - a) Both indicators on the panel for Zone 1 “Fire” LED and Alarm Devices-Silence “Act.” LED should flash once every 0.5 second.
 - b) “1st Alarm” LED flashes once every 0.5 second
 - c) “Fire Alarm” warning sign illuminates (it may flash, depending on the DIP switch setting).
 - d) Audible Alert tone is activated (if Brooks sounder is used).
 - e) Press “Silence Buzzer” button, the buzzer should mute.
 - f) Press “Silence Alarm Devices” (if audible sounders are used) then press “Reset” to reset the alarm.

Note: Always push “RESET” after pushing “Alarm Devices-Silence”. This sequence should be followed.

4. Repeat Step 3 for Zone 2 while zone 1 is inactive (i.e. no alarms) by pushing on “Disable button under Zone 1.

3.3.2 Gas Extinguishing System Test

1. Simulate the actual alarm test in either one of the two zones following steps 3a) to 3d) under the "Alarm Test" in section 3.3.1.2 page 26 and check the following:
 - The "Fire" LED of the tested zone, "Silence Alarm Devices Act." and "1st Alarm" LED should illuminate.
 - "Fire Alarm" signs and audible alert tone (if used) should activate if configured via the DIP switch (SW1) located on the Warning Signs Circuit Board (PCB291R1/SUB937). Refer to area D2 in the Warning Signs Circuit Board layout in section 4.1.3 on page 33.
2. Continuing from step 3d), to simulate actual alarm test on the other zone, check for the following:
 - The "Fire" LED of the zone under test and "2nd Alarm-Timer Running" LED should both illuminate.
 - Gas release timer will be running for the time delay set by the 8 way DIP switch SW1 on the gas board control board (SUB928).
 - "DO NOT ENTER" and "EVACUATE" signs will activate.
 - Audible Evac tone will activate (if used).
 - When the timer times out, the "Gas Initiated" LED illuminates and gas will release.
 - Gas discharge confirmation via gas discharged input will illuminate the "Gas Discharged" blue LED if the Gas Discharge input is simulated to be active.
 - Press "Silence Alarm Devices" button then press the "Reset" button.
3. Repeat step 3 and press the "Service Master Abort" switch before the timer times out, check the following:
 - "Service Master Abort" LED and "Gas Disabled LED" illuminate.
 - The Gas is not released i.e. the "Gas Initiated" LED should never illuminate.
 - Press "Silence Alarm Devices" button then press the "Reset" button.

3.3.3 Local Control Station (LCS) Test

1. Lift up the MCP cover then press the "Gas Release" switch, check the following:
 - The LED integrated in the MCP switch illuminates.
 - The "2nd Alarm-Timer Running" LED illuminates.
 - "Gas Externally Released" LED illuminates.
 - Gas release timer starts running for a time delay set by the DIP switch.
 - "DO NOT ENTER" and "EVACUATE" signs will illuminate
 - Audible Evac tone will activate (if used).
 - When the timer times out, the "Gas Initiated" LED illuminates and the gas releases.
 - Gas discharge confirmation via gas discharged input will illuminate the "Gas Discharged" blue LED if the input is simulated to be active.
 - Using a small screw driver, lift up the MCP button to mechanically reset the switch

-
2. Lift up the “Gas Isolate” flap then press the switch, check the following:
 - “Gas Isolate” lamp integrated in the switch body illuminates.
 - “Gas Discharge Inhibited” LED on the FT2GAS panel illuminates.
 - Simulate the first and the second alarms, and ensure that the initiated LED remains OFF i.e. gas is not released.
 - Press the “Gas Isolate” switch again, system returns back to normal.

3.3.4 Fault Test

1. Press zone 1 and zone 2 “Fault Test” button, “Zone Fault” LED of each zone illuminates steadily for approximately 3 seconds.
2. Remove a detector head or end of line resistor, the corresponding “Zone Fault” LED flashes once every 2.5 seconds (open circuit), “Gas Fault” LED illuminates steadily and the “System Inoperative” sign will activate.
3. Simulate short circuit across a zone, the “Fault” LED of that zone flashes twice every 2.5 seconds, “Gas Fault” LED illuminates steady and the “System Inoperative” sign will activate.
4. Remove the end of line resistor of the ACF on the FT2 Main Control Board output and the “Alarm Devices-Silence Flt.” LED flashes once every 2.5 Seconds. For short circuit test, the LED flashes twice every 2.5 seconds.
5. Simulate open and short circuit on the warning sign output (Do not enter /Evacuate), “Gas Fault” LED illuminates steady and the “System Inoperative” sign will activate.
6. Simulate open or short circuit on the system inoperative sign output and “Gas Fault” LED illuminates steadily.
7. Simulate open or short circuit on the LCS outputs, “Gas Fault” LED illuminates steadily and the “System Inoperative” sign will activate.

4. APPENDICES

4.1 Appendix A - Connections

The following are the connection details and printed circuit board layouts of the FT2 Control board and Gas Extinguishing control board. The connection details to the remaining boards and equipment (PSU, display boards, LCS, and Warning Signs) are shown in the block wiring Diagrams in on page 55.

4.1.1 FT2 Main Control Board

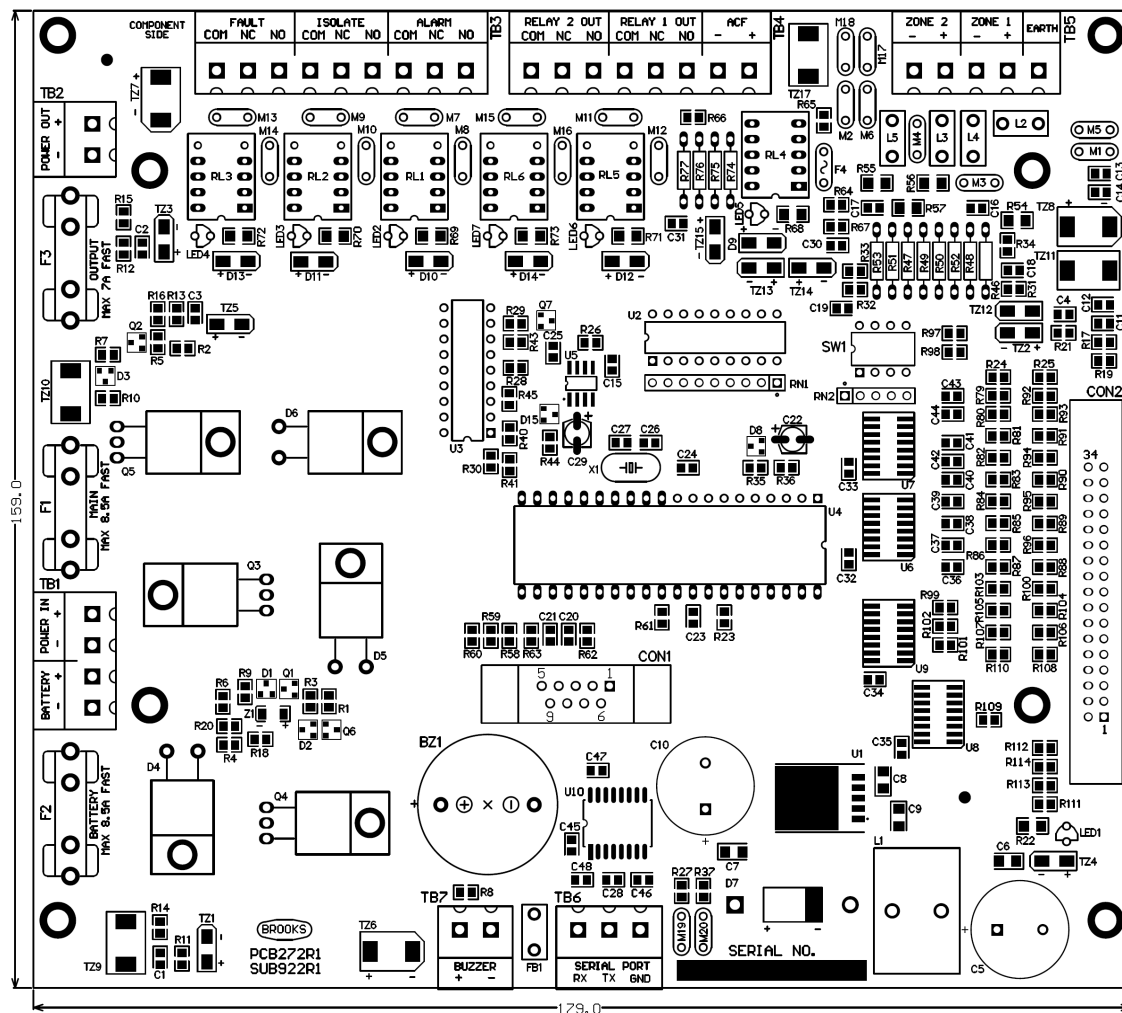


Figure 9 FT2 Control board PCB Layout (SUB922)

Table 14 FT2 Control Board Connections

Designator	Type	Pin	Label	Description
TB1	Removable screw terminal block	+	POWER IN	Power Input from the AC/DC power supply. 22-27.6V DC, <= 5A
		-		
		+	BATTERY	External battery connection 22-27.6V DC, <= 5A
		-		
TB2	Removable screw terminal block	+	POWER OUT	Power output to the Gas Module power input 22V-27.6V DC, <= 5A
		-		
TB3	Removable screw terminal block	NO	ALARM	Alarm relay output Dry-contact output. <= 2A, < 30V
		NC		
		COM		
		NO	FAULT	Fault relay output Dry-contact output. <= 2A, < 30V NOTE - Relay is normally energized
		NC		
		COM		
		NO	ISOLATE	Disables relay output, Dry-contact output. <= 2A, < 30V
		NC		
COM				
TB4	Removable screw terminal block	+	ACF	22V-27.6V DC, <= 1A
		-		
		NO	RELAY 1 OUT	Zone alarm level 1 relay output. Dry-contact output <= 2A, < 30V
		NC		
		COM		
		NO	RELAY 2 OUT	Zone alarm level 2 relay output. Dry-contact output <= 2A, < 30V
		NC		
COM				
TB5	Removable screw terminal block	N/A	EARTH	Solid Earth connection shall be provided.
		+	ZONE 1	Compatible with approved detectors and MCPs. With the following features, <ul style="list-style-type: none">Alarm latching or non-latchingAlarm Verification enabled or disabled.
		-		
		+	ZONE 2	
		-		
TB6	Removable screw terminal block	RX	SERIAL PORT	
		TX		Send Pin. Connects to Web Server RXD (R)
		GND		Ground. Connects to Web Server GND (G)
TB7	Removable screw terminal block	+	BUZZER	External buzzer output, An external buzzer is required only when the sound level of the internal buzzer is insufficient.
		-		
CON1	DB9 female connector	N/A	N/A	Connect to Gas board plug-in connector CON1.
CON2	IDC 34 connector	N/A	N/A	Connect to the FT2 Display Board.

Figure 10 Gas Control board PCB Layout (SUB928)

Table 15 Gas Control board Connections

Designator	Type	Pin	Label	Description
TB1	Removable screw terminal block	EARTH	E	Earth connection to the gas module
		+24	LCS INTERFACE	LCS +24V output, 22V-30V, <=0.5A
		GND		LCS GND
		MCP		LCS remote gas release input
		ISO		LCS remote gas isolate input
TB2	Removable screw terminal block	+	LOCK-OFF I/P	gas lock-off valve input from lock off valve
		-		
		+	RELEASE I/P	Manual gas release input from Mechanical switch
		-		
		+	DISCHGED I/P	Gas discharged sensor input from discharge pressure switch
		-		
TB3	Removable screw terminal block	SYS INOP +	WARNING SIGNS	Gas system inoperative warning output, 22V-30V, <=0.5A
		SYS INOP -		
		L1+/L2-		<p>Level 1 & Level 2 alarm to warning signs, "FIRE ALARM / EVACUATE" and "FIRE ALARM / DO NOT ENTER", strobes and sounders as required.</p> <p>At monitoring: Polarity order at this pin pair is at '+' and '-' 6V.</p> <p>When activated: '+' and '-' polarity for level 1 alarm, '-' and '+' polarity for level 2 alarm. 22-30V DC, <=3A</p>
		L1-/L2+		
TB4	Removable screw terminal block	+	GAS DISCH O/P	Gas discharge output, 22V-30V, <=3A to solenoid actuator or detonating device on gas cylinders
		-		
TB5	Removable screw terminal block	+24	POWER	Connect to the FT2 control board TB3 power output, 22V-30V, <=5A
		GND		
CON1	DB9 male connector	N/A	N/A	Connect to the FT2 control board CON1
CON2	IDC 16 connector	N/A	N/A	Connect to the gas display board

4.1.3 Warning Signs PCB Layout

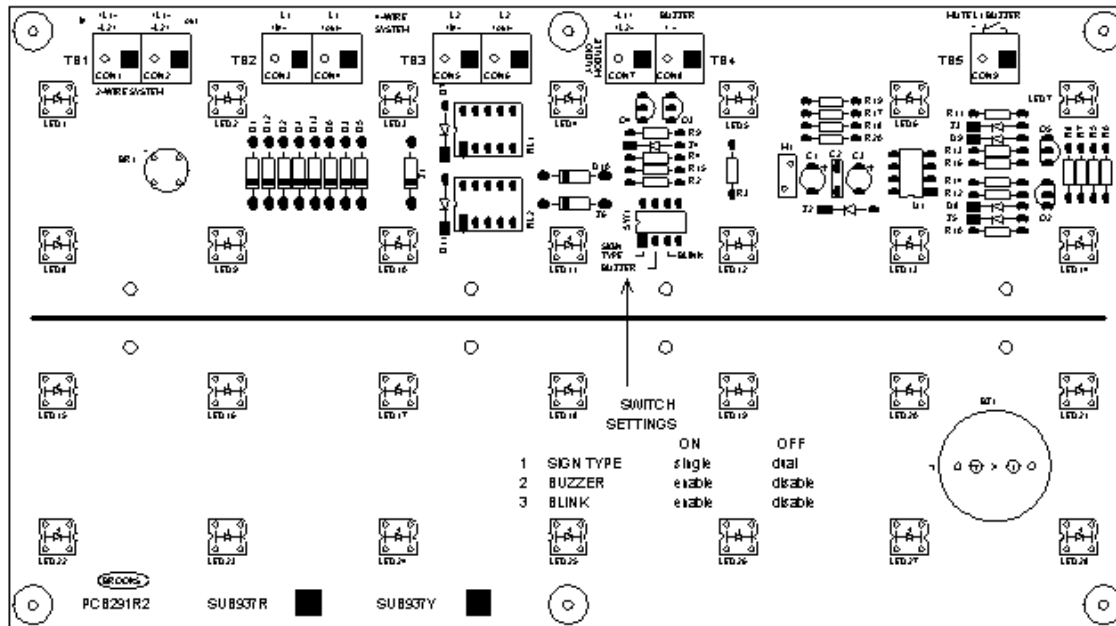


Figure 11 Brooks Warning Signs PCB Layout

Table 16 Warning Signs DIP Switch Setting

Purpose	Switch Number	Status 1 = ON 0 = OFF	Description
Mode	SW1	1	Single mode, the whole sign illuminates
		0	Dual mode, level 1 alarm illuminates the top half "FIRE ALARM" while level 2 alarm illuminates the bottom half "DO NOT ENTER" or "EVACUATE"
Buzzer	SW2	1	Enable warning sign buzzer
		0	Disable warning sign buzzer (default setting)
Sign Flashing	SW3	1	Enable sign flashing
		0	Disable sign flashing (default setting)
Not used	SW4		

Table 17 Extinguishing System Warning Signs Connections

Designator	Type	Pin	Label	Description
TB1	Removable screw terminal block	L1+/L2-IN	2-WIRE SYSTEM	Connect to TB3 L1+/L2- in the gas control board, level 1 and level 2 alarm
		L1-/L2+ IN		Connect to TB3 L1-/L2+ in the gas control board, level 1 and level 2 alarm
		L1+/L2-OUT		Connect to next warning sign
		L1-/L2+ OUT		
TB2	Removable screw terminal block	L1 (+) IN	4-WIRE SYSTEM Typically used for retrofit – not used in Brooks system	Connect to level 1 (+) in a gas system
		L1 (-) IN		Connect to level 1 (-) in a gas system
		L1 (+) OUT		To next level 1 sign
		L1 (-) OUT		
TB3	Removable screw terminal block	L2 (+) IN	4-WIRE SYSTEM Typically used for retrofit – not used in Brooks system	Connect to level 2 (+) in a gas system
		L2 (-) IN		Connect to level 2 (-) in a gas system
		L2 (+) OUT		To next level 2 sign
		L2 (-) OUT		
TB4	Removable screw terminal block	L1-/L2+	AUDIO MODULE	To Brooks Alert/Evac/Voice module
		L1+/L2-		
		BUZZER +		Connect to optional external buzzer for level 1 alarm
		BUZZER -		
TB5	Removable screw terminal block	+	MUTE L1 BUZZER	Connect to a switch to mute the optional external buzzer
		-		

Notes:

1. Brooks warning signs require only 2 wire connection. The 4 wire option is provided for retrofit situations where an existing 4 wire warning sign circuit is installed.
2. Brooks audio (Alert/Evac) / voice sounder can be connected to the same two wire system as the warning signs.
3. If 4 wire system is used, the speaker shall be connected to TB4 in the warning sign board.

4.1.4 Local control station

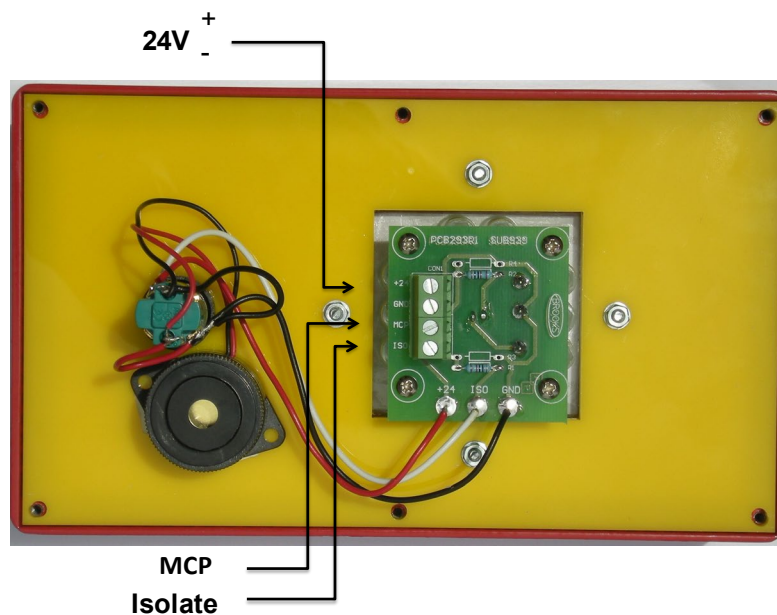


Figure 12 (Photograph 2) Rear of Local Control Station

Table 18 Local control station connection

Type	Label	Description
Screw Terminal	24V	24V Supply from the control board
	GND	
	MCP	Connected internally to the gas release switch on the front of LCS, "MCP" terminals from the control board
	ISO	Connected internally to the gas isolate switch in LCS, "ISO" terminal from the control board

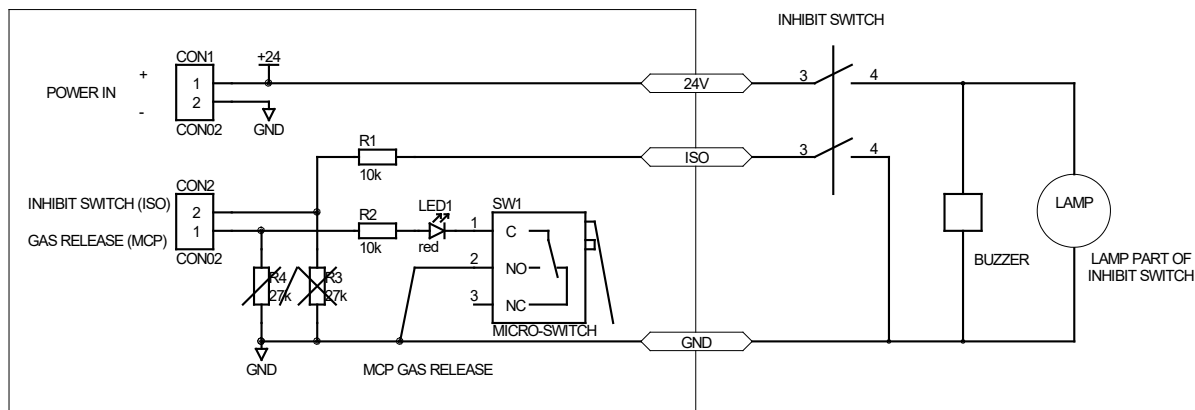


Figure 13 Local Control Station Schematics

4.2 Appendix B – System Fuse Details

The system fuses are listed in Table 19 below.

Table 19 Fuse Specifications

Board	Designator	Circuit Protected	Specification
FT2 Control Board SUB922R1	F1	Main power input	M205, glass sealed, fast blow or very fast blow, $\leq 5A$, defined by the application.
	F2	Battery power input	M205, glass sealed, fast blow or very fast blow, $\leq 5A$, defined by the application.
	F3	Power output	M205, glass sealed, fast blow or very fast blow, $\leq 5A$, defined by the application.
	F4	ACF	Resettable, poly fuse, 1.1A, $\leq 30V$.
Dual zone Control Board SUB928R1	F1	LCS Station	Resettable, poly fuse, 0.5A, $\leq 30V$.
	F2	System inoperative warning output	Resettable, poly fuse, 0.5A, $\leq 30V$.
	F3	Gas discharge output	M205, glass sealed, fast blow, $\leq 5A$, defined by the application.
	F4	Alarm warning output	M205, glass sealed, fast blow or very fast below, $\leq 3A$, defined by the application.
LCS Circuit Board SUB939	NIL	NIL	Protection provided to voltage input by fuse F1 on Dual Zone Control Board SUB928R1
Warning Signs Circuit Board SUB937	NIL	NIL	Protection provided to voltage input by fuse F2 & F3 on Dual Zone Control Board SUB928R1

4.3 Appendix C - Cable Types and Calculations

4.3.1 General Requirement

The CIE cable type and cable installation shall follow all the application related current standards and regulations, such as the AS/NZS 3000, AS/ACIF S-009, AS1670 and NZS4512 standards.

4.3.2 Real Cable Resistance

The maximum system cable length determined primarily from its cable cumulated resistance. The cumulative cable resistance is the total resistance of all installed copper wire used in the related circuit loop that includes both the forward path and the returning path.

The manufacturer's specified cable resistance is specified in ohms per meter.

To calculate,

Real Cable Resistance = (Manufacturer's Specified Cable Resistance Cable Resistance x 2) x overall length

For example,

A cable length of 5m is required with a return path. Electra Cables, FC7402LD was to be used.

Electra Cables, FC7402LD from Table 20 gives 0.02Ω/m for its Manufacturer specified cable resistance.

Hence, the overall Real Cable Resistance over 5 metres will be,

$$(0.02 \times 2) \times 5 = 0.2\Omega$$

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

Table 20 Cable Resistance of the Reference Cables

Cable Type	Copper Area	Insulation	Manufacturer specified cable resistance	Real cable resistance
Electra Cables, FC7502HD	1.0mm ²	250 / 250 V	0.02 Ohms / m	0.04 Ohms / m
Electra Cables, FC7502HD	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

4.3.3 Zone Cable

The zone cables are required to have less than 50 Ohms of the total cumulated cable resistance. The cable maximum length is calculated by the following equation.

$$L_{MAX} = 50 / R_{RPM} \quad \text{(Equation 1)}$$

While L_{MAX} - the maximum cable length,

R_{RPM} - the real resistance per metre.

Example:

If the manufacturer specified cable resistance of a two-core cable is 0.02 Ohms per metre, the real resistance will be 0.04 Ohms per metre and the maximum zone cable length will be $50 / 0.04 = 1250$ metres.

4.3.4 Output Cable

For each dry-contact output, the cable length shall be determined by the connected equipment or devices and the total cumulated cable resistance should be less than 50 Ohms.

For each power output, the maximum cable length can be calculated by the following equation.

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

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.

Example:

The lowest voltage of the system power supply is fixed at 22V. For example, the device minimum working voltage is 18V, the maximum current is 0.5A and the real cable resistance is 0.04 Ohms per metre. The calculated maximum cable length will be $(22 - 18) / (0.04 \times 0.5) = 200$ metres.

4.3.5 Requirements and Reference Cable Types

The requirements and the reference cable types are listed in Table 21 below. All specified maximum distances specified in Table 21 shall be adhered to or more superior than the ones listed shall be used.

Table 21 Cable Types for Different Connections

Connection	Requirement	Cable Specifications	Maximum Length	Cable
Zone circuits	Use Equation 1	Two core, Red, 1mm ² conductive area, Specified Cable Resistance 0.02 Ohm/m, Real Cable Resistance 0.04 Ohms / m	1250 metres	
Dry-contact output	Use Equation 1. Shall also meet the external equipment requirement.	Two core, Red, 1mm ² conductive area Specified Cable Resistance 0.02 Ohm/m, Real Cable Resistance 0.04 Ohms / m	The shorter distance of either 1250 metres or the length required by the external equipment	
Alarm Devices Output (ACF)	Use Equation 2	Two cores, Red, 1.5mm ² conductive area Specified Cable Resistance 0.0128 Ohm / m, Real Cable Resistance 0.0256 Ohm/m	156 metres with up to 1A current and the lowest voltage of 18V	
System Inoperative output	Use Equation 2	Two core, Red, 1.5mm ² conductive area Specified Cable Resistance 0.0128 Ohms / m, Real Cable Resistance 0.0256 Ohm/m	312 metres with up to 0.5A current and the lowest voltage of 18V	

Connection	Requirement	Cable Specifications	Maximum Cable Length
Alarm Warning Signs Output	Use Equation 2	Two cores, Red, 1.5mm ² conductive area Specified Cable Resistance 0.0128 Ohm / m, Real Cable Resistance 0.0256 Ohm / m	52 metres with up to 3A current and the lowest voltage of 18V
Gas release output	Use Equation 2	Two cores, Red, 1.5mm ² conductive area Specified Cable Resistance 0.0128 Ohm / m, Real Cable Resistance 0.0256 Ohm / m	31 metres with up to 5A current and the lowest voltage of 18V

4.4 Appendix D – Power & Battery Calculation Spreadsheet

In order to configure the Brooks dual zone gaseous extinguishing system, a power calculation of shall be performed.

The following Table 22 shows the quiescent and alarm current of FT2GAS, different warning signs, ancillary and optional equipment.

Table 22 Table of current consumption

System Components	Description	Quiescent Current (mA)	Alarm Current (mA)
FT2GAS	Standard FT2GAS system	75	250
BWS-XXXX	Warning or System Inoperative Sign	0	95
BLCS1	Local Control Station	0	60
Gas Discharge Output	Instant discharge device	0	3A for <1 Min.
B24V-SPEAK	Brooks 24V Alert / Evac / Voice Module	0	135
SUB938 (Rev 2)	Optional Dual Strobe Driver Board	0	30
Strobes	Red or yellow strobes	N/A	Depends on selected strobe type

The current consumption shown in Table 22 is calculated at the nominal voltage (24V DC) in normal state (quiescent) state and in the alarm state (active) with ambient temperature at 25 degree Celsius.

In normal conditions, the power supply shall be capable of delivering the total current consumption of the system including the battery charging current. In alarm, the power supply shall deliver the total current in alarm condition excluding the battery charging current. FT2GAS is fitted with 150 Watt switch mode power supply which can deliver up to 5.5A @ 28V.

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

$$C_{20} = 1.25 [(I_Q \times T_Q) + F_C (I_A \times T_A)]$$

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 96 hours (non-monitored systems) and 24 hours (monitored 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

Note: In most of the applications, the output required to discharge the gas is only instantaneous i.e. a few seconds. From Table 22, one minute is long enough to supply the current (up to 5A) to fire the discharge device.

WARNING: Check the datasheets of the gas initiating devices and the application requirements carefully.

Typical example

FT2GAS is supplied with 12AH batteries and 150W power supply. Assume a gaseous extinguishing system required protecting a risk area with 3 entries, the following equipment may be installed:

1 x FT2GAS

3 x LCS

3 x "Fire Alarm / Do Not Enter" Signs

3 x "Fire Alarm / Evacuate" Signs

3 x "System Inoperative" Signs

Optional 6 x speaker/horn tone and voice sounder

From Table 22, I_Q for a standard FT2GAS system = 75 mA

Typical	/A		calculations:	
	Qiescent Current (mA)	Alarm Current (mA)	Qty	Total Alarm Current (mA)
Items				
FT2GAS	75	250	1	250
Local Control Station (LCS)	0	60	3	180
"Fire Alarm / Do Not Enter" Sign	0	95	3	285
"Fire Alarm / Evacuate" Sign	0	95	3	285
"System Inoperative" Sign	0	95	3	285
3A Gas Discharge for 1 min	0	50		
Optional Tone / Voice Sounders	0	135	6	810
Total Load current (mA)	75			1995

$$\begin{aligned} \text{C20, Required Battery Capacity} &= 1.2[(0.075 \times 96) + 2(1.995 \times 0.5 + 0.05)] \\ &= 11.15 \text{ Ah} \end{aligned}$$

Battery Charger Calculations

$$\begin{aligned} \text{Battery charger Ah required for 96 hours} &= (5 \times I_Q) + F_c(0.5 \times I_A) \\ &= (5 \times 0.075) + 2(0.5 \times 1.145) \\ &= 1.52 \text{ Ah} \end{aligned}$$

$$\begin{aligned} \text{Battery charging current required} &= \frac{\text{Battery Charger Ah Required}}{T_Q \times \eta} \quad , \text{where } \eta \text{ is efficiency of battery manufacturer typically } 75\%-85\% \text{ (BB Battery)} \\ &= \frac{1.52}{(96 \times 0.75)} \\ &= 21.11 \text{ mA} \end{aligned}$$

Therefore, a battery capacity close to 11Ah battery or next higher with a battery charging current of 21.11 mA would be sufficient for this example.

Standard FT2GAS is equipped with 5.5 Amp switch mode power supply and space for 12 AH SLA batteries.

4.5 Appendix E – Commissioning Record

Table 23 Resistance Check

Module	Feature	Probe +	Probe -	Expected Resistance Range (Ohms)	Result
FT2 Module	Power input	TB1 POWER IN +	TB1 POWER IN -	8K - 54K	
	Battery	TB1 BATTERY+	TB1 BATTERY-	30K – 100K	
	Power outputs	TB2 24V OUT +	TB2 24V OUT -	Reducing gradually (caused by capacitor charging)	
	Zone 1 input	ZONE +	ZONE -	2.5K – 5K	
		ZONE -	ZONE +	2.5K – 5K	
	Zone 2 input	ZONE +	ZONE -	2.5K – 5K	
		ZONE -	ZONE +	2.5K – 5K	
	Alarm device relay output (labeled as ACF on the PCB)	TB4 ACF-	TB4 ACF+	10K – 54K	
		TB4 ACF+	TB4 ACF-	> 24	
	Earth	TB5 EARTH	TB1 POWER IN +	30K – 150K	
		TB5 EARTH	TB1 POWER IN -	30K – 150K	
	Alarm conditional relay	Follow the requirements of the equipment connected. Vision inspection of the connections.			
	Fault conditional relay				
	Isolate conditional relay				
	Alarm Level 1 Relay				
	Alarm Level 2 Relay				
Gas Module	Alarm warning output	TB3 L1 +, L2-	TB3 L1 -, L2+	8K – 30K	
		TB3 L1 -, L2+	TB3 L1 +, L2-	8K – 30K	
	System inoperative warning output	TB3 SYS INOP +	TB3 SYS INOP -	> 48	
		TB3 SYS INOP -	TB3 SYS INOP +	8K – 30K	
	Gas release output	TB4 GAS DISCHG O/P+	TB4 GAS DISCHG O/P-	> 48	
		TB4 GAS DISCHG O/P-	TB4 GAS DISCHG O/P+	8K – 30K	
	Mechanical lock-off valve input	TB2 LOCK OFF I/P +	TB2 LOCK OFF I/P -	8K – 30K	
		TB2 LOCK OFF I/P -	TB2 LOCK OFF I/P +	8K – 30K	
	Mechanical gas release input	TB2 RELEASE +	TB2 RELEASE -	8K – 30K	
		TB2 RELEASE -	TB2 RELEASE +	8K – 30K	
	Gas discharged sensor input	TB2 DISCHGED I/P +	TB2 DISCHGED I/P -	8K – 30K	
		TB2 DISCHGED I/P -	TB2 DISCHGED I/P +	8K – 30K	

Table 24 Pre-commissioning Battery Cell Voltage Measurement Record

Battery	Multimeter Probe +	Multimeter Probe -	Expected Voltage	Multimeter Readings (V)
Battery 1	Battery +	Battery -	> 10.7V	
Battery 2	Battery +	Battery -	> 10.7V	
Battery 3 (if any)	Battery +	Battery -	> 10.7V	
Battery 4 (if any)	Battery +	Battery -	> 10.7V	

Table 25 Power ON AC/DC Power Supply Calibration Record

Multimeter Probe +	Multimeter Probe -	Expected Voltage	Initial Measured Voltage (V)	Calibrated Voltage (V)
TB1 –(Battery +) of the main control board	TB1 – (Battery -) of the main control board	27.3V – 27.5V		

4.6 Appendix F – Equipment Record

Table 26 Equipment record

Description		Record
FT2GAS Model No.		
FT2GAS Serial No.		
FT2GAS Date of Manufacturing		
FT2 Main Control Module	Serial No.	
	Firmware version	
Gas Control Module	Serial No.	
	Firmware version	

4.7 Appendix G – Maintenance Record

Table 27 Maintenance record

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

4.8 Appendix H –Spare Parts List

Table 28 FT2GAS panel parts

Component	Item Description
BAPS24V150W	SM Power Supply 24V/6.25A Adj.
CA107	16 Way Ribbon Cable Assembly 500+80mm
CA125	34 Way Ribbon Cable Assembly 1 Metre
SUB922	FT2 Main Control Module
SUB923	FT2 Display board PCB273 Rev1
SUB928	FT2 Gas Control Module
SUB929	FT2 Gas Display Module

Table 29 Local Control Station parts

Component	Item Description
MRCY	MCP Yellow for BLCS1
PM130	BLCS1Yellow Acrylic Plate Rev2
SO350	PIEZO Buzzer 85db 24V
SP270	Push Button 4 PST Toggle Orange
SP271	Globe 24V to Suit SP270
SP272	Protective Cover to Suit SP270

Table 30 Warning Signs parts

Component	Item Description
CB580	Warning Sign Front BKT M413A_1
CB581	Warning Sign Rear BKT M413B_1
PM150	FA / DO NOT ENTER Warning Sign
PM160	FA / EVACUATE Warning Sign
PM170	SYSTEM INOPERATIVE Warning Sign
SUB937R	Red Warning Sign Board
SUB937Y	Yellow Warning Sign Board

4.9 Appendix I Data Sheets

4.9.1 FT2GAS Gas Extinguishing System Control Panel



Figure 14 Gas Extinguishing Control Panel

The Brooks FT2GAS comprises a 2 zone conventional CIE (AS7240.2) to which a plug-in gas control board is added. The combination of the CIE and plug-in gas extinguishing control board is designed to comply with the Detection, Actuation and Control Systems section of AS4214 2002 Gaseous Fire Extinguishing Systems.

The FT2GAS provides all inputs and outputs required for monitoring and control of a gas extinguishing system including the warning signs and local control station. See block wiring diagram shown in Figure 19 page 55.

Features

- Intelligent dual microprocessor system which combines both the two zone CIE functions and the dual zone gas control functions.
- Built-in dual power sources.
- The system maximum current capacity is limited to 5A at 27.5V DC.
- Adjustable gas release timer
- Detection zone settings, e.g. AVF, via built-in DIP switches.
- Compatible local control station, warning signs, strobes and sounders.
- Optional web server interface for Ethernet connectivity with web pages and email alerts.

4.9.2 Warning Signs



BWS-FDNE

BWS-ESI

BWS-TS-FEVAC

Figure 15 Extinguishing System Warning Signs

General Description

Brooks range of warning signs are designed to meet the requirements of Australian standard AS4214. They provide a suitable visual warning in the risk area when a gas extinguishing system is installed.

Designed for use with the Brooks FT2GAS Conventional 2 zone Gas Control Panel the LED based design allows for the warning sign to be configured for single line operation e.g. "FIRE ALARM" or "DO NOT ENTER" or for dual line operation within the one sign e.g. "FIRE ALARM" for level 1 alarm and "DO NOT ENTER" for a level 2 alarm. The text may be configured for flashing or steady illumination.

Each sign is manufactured from two interlocking steel brackets. The display bracket holds the specific warning message as shown in the picture above. The mounting bracket includes the main PCB and wiring terminations. The two-piece approach makes for simple and easy installation.

Brooks warning signs with an integrated speaker and countdown timer are also available. It provides suitable visual and audio warning in the risk area when a gas suppressing system is used.

Features

- Two wire system to the gas control panel.
- Steady or Flashing
- No current consumption in quiescent state
- Rugged rigid steel construction
- Built in warning buzzer.
- Buzzer may be configured to steady or pulsing sound (2Hz) or disabled.
- Option for external buzzer and buzzer mute switch.
- High intensity LEDs to increase the illumination and greater light output.
- Common enclosure may be used for single or dual sign.
- Brooks OWS series of electronic sounders can be used utilizing same warning signs wiring.

In addition to the above features, BWS-TS-FDNE and BWS-TS-FEVAC have the following features:

- Built in speaker module with Alert/Evac tones and gaseous extinguishing messages
- Built in countdown timer module for gas release

Standard Configurations

Brooks warning signs are available in the following standard configurations:

BWS-FA	“FIRE ALARM” only
BWS-DNE	“DO NOT ENTER” only
BWS-EVA	“EVACUATE” only
BWS-ESI	“EXTINGUISHING SYSTEM INOPERATIVE (pictured above)”
BWS-FDNE	“FIRE ALARM – DO NOT ENTER combination (pictured above)”
BWS-FEVAC	“FIRE ALARM – EVACUATE” combination
BWS-TS-FDNE	“FIRE ALARM DO NOT ENTER” combination
BWS-TS-FEVAC	“FIRE ALARM EVACUATE AREA” combination (pictured above)”

Note: Only BWS-FDNE, BWS-ESI and BWS-TS-FEVAC are shown above.

Table 31 Warning Signs Specifications

	Standard Warning Signs	Warning Signs with timer and speaker
Voltage	20 – 30V DC, nominal voltage 24VDC	20 – 30V DC, nominal voltage 24VDC
Current	Nominal < 100mA (@24Vdc) (70 – 130mA depends on configured options)	Nominal <215mA (@24Vdc) (170 – 300mA depends on configured options)
Relay Output	30V @ 1A dry contacts.	30V @ 1A dry contacts.
Sound pressure level	N/A	83dBA to 86dBA at 1m
Material	1.5mm steel powder coated yellow 300 x 200 x 60 mm	1.5mm steel powder coated yellow 380 x 200 x 60 mm

Table 32 Warning Signs Operation Mode

Mode	Alarm Level	Standard Warning Signs	Warning Signs with timer and speaker
Single Illumination	Level 1 / Level 2	Both top line “FIRE ALARM” and bottom line “DO NOT ENTER” or “EVACUATE AREA” illuminate	
Dual Illumination	Level 1 Alarm	Only top line illuminates “FIRE ALARM”	
	Level 2 Alarm	Both lines illuminate “Fire alarm” and “DO NOT ENTER” / “EVACUATE AREA”	
Flashing	Level 1 / Level 2	Sign flashes in both level 1 and/or level 2 alarm	
Tone / Message	Level 1 Alarm	N/A	Alert tone with stage one gas message
	Level 2 Alarm	N/A	Evacuation tone with stage two gas message
Countdown Timer†	Level 1 Alarm	N/A	Set time displays
	Level 2 Alarm	N/A	Countdown timer starts††
Buzzer	Level 1 / Level 2	L1: Pulsing at 2Hz / Level: Steady on	Must be disabled

† Countdown timer can be set between 0 and 95 seconds in 5 sec increments

†† At the end of the count down, a relay on the timer board activates for switching of external equipment or any other application.

For more details, refer to technical datasheets TDS005, TDS025 and block wiring diagram shown in this manual in Figure 20 page 56 and Figure 21 page 57.

4.9.3 Local Control Station BLC1



Figure 16 Local Control Station BLC1

General

The Local Control Station (BLC1) provides for the manual release and discharge inhibit of the gas extinguishing agent.

BLC1 is interfaced to Brooks FT2GAS control panel via a supervised 4 wire connection.

The GAS RELEASE function provides a manual initiate switch, incorporating a two-step action which initiates the normal system discharge sequence including fire and evacuation alarms, time delays, and equipment shutdowns and overrides the discharge inhibit switch. The operation of this switch has a visual indication at both the LCS and FT2Gas panel

The GAS ISOLATE function provides a discharge inhibit switch that prevents automatic discharge of the extinguishing agent; stops and resets the normal system actuation control sequence; but does not override the operation of the manual initiate switch. The operation of this switch causes an audible and visual indication at the LCS and a visual indication at the FT2GAS panel

The BLC1 has been designed to be highly visible to the occupants when placed adjacent to the main entry to the protected area.

Features

- Attractive design concept
- Built in audible warning for gas isolate

- Two steps operation for gas release prevents accidental operation
- Resettable gas release control
- 4 wire interface to the gas panel
- No current draw in quiescent state
- Designed to meet AS4214 for automatic control.

Operation

To release the gas:

1. Lift the flap of the gas release switch
2. Press the square switch in the centre of the housing. Once pressed, the gas control panel activates the 24Vdc signal to gas actuators. The built in LED of the switch body illuminates.

Upon the completion of the gas release procedures, the release switch must be restored to normal. To restore the switch, using a small screwdriver or a ball pen, press the “Reset” latch the switch body will come forward.

To isolate the gas:

1. Lift the flap of the gas isolate switch
2. Press switch

The gas discharge will be inhibited, audible warning sounds and the LED in the switch body illuminates.

To reset lift flap and press switch once. Buzzer silences and led in switch body extinguishes.

4.9.4 24V Tone and Voice Sounders

General

The Brooks range of electronic sounders provide both tones and warning messages. The combination of tone and voice message elicits a more positive response from building occupants during an emergency. Tone only relies upon the occupant’s awareness of the tones meaning and purpose.

The Brooks electronic sounder consists of a speaker and digital voice/tone module which can be custom programmed for tonal frequency, voice message and language to meet specific client needs.

Available Models



B24VSPS Surface Mount Speaker

B24VSPF Flush Mount Speaker

B24VH Surface Mount Horn Speaker

Figure 17 Brooks Electronic Sounders

Operation

The BROOKS electronic sounder has two inputs, typically used for Alert and Evacuation but may also be two evacuation signals providing the same tone but differing language messages. The sounder requires a 24Vdc signal applied at the appropriate polarity. When power is applied to the digital voice/tone module the unit will sound the tone for approximately 10-12 seconds followed by a digital voice message. The tone and message are repeated until power is shut off.

Selection of tones and messages, messages only, or tones only is available using Brooks' Audio Utility software.

There is a jumper for selection of Australian or New Zealand evacuation/alert tones.

Tones

The standard tones available:

For New Zealand	AS2220.1 Alert tone
	AS2220.1 Evacuate tone
For Australia	ISO7731 Alert Tone
	ISO 8201 Evacuate Tone (T3)

Voice messages

All models come pre-programmed with a default alert and evacuate message. The sounder is also available with gas warning messages. Custom messages can be easily uploaded using software and serial cable. For customised tones and voice messages contact your nearest Brooks office.

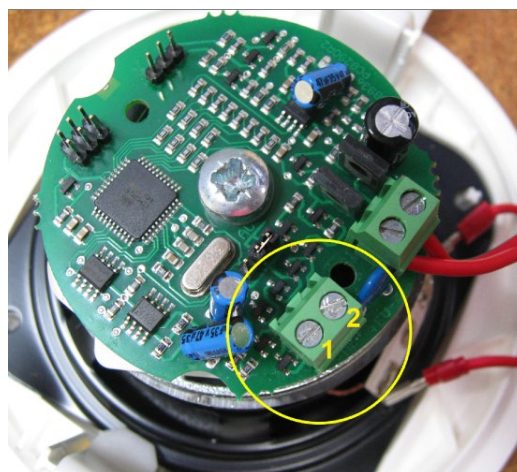
Connection

Horn Sounder: Flying leads are supplied for termination to a 24Vdc source. The message will switch between Alert/Evac depending on the polarity of the supplied DC voltage.

Flush And Surface Mount Speaker Sounders: These can be terminated directly to the screw terminals as shown circled in the attached picture.

For Alert 1st Stage Message Terminate: 0Vdc to "1"
+24Vdc to "2"

For Evac 2nd Stage Message Terminate: +24Vdc to "1"
0Vdc to "2"



Note: The polarity of connected 24Vdc signal determines which tone/message is selected.

End of line devices

Turn on voltage is 14V. Below this voltage no current is drawn, this allows for the use of end of line resistors for the supervision of the sounder circuit.

Specification

Voltage		24V (range 20-30Vdc)
Current		<100mA (24Vdc; Australian evacuation tone) <150mA (24Vdc; New Zealand evacuation tone)
Output	Speaker	85dB (24Vdc; Australian evacuation tone)
	Horn	100dB (24Vdc; Australian evacuation tone)

4.9.5 Gas Strobe Interface (SUB938)

The strobe interface module shown in Figure 18, is designed to interface Brooks warning sign output of FT2GAS to a dual strobe e.g. amber / red combo.

Table 15 Gas Control board Connections page 32, terminal block TB3 explains the states for warning signs.

The strobe module is connected to the same wiring used to connect the warning signs and provides two outputs to drive amber strobe on first alarm (Level 1) and red strobe on second alarm (Level 2). This module also provides an output to activate external buzzer as well as a mute function.



Figure 18 Dual Strobe Driver Board SUB938

Specifications

Voltage	24V
Current (quiescent)	0mA
Current (alarm)	20mA

Wiring

Inputs:

- L1+ (Level 1 alarm)
- +L2 - (Level 2 alarm)

The polarity of connection determines whether evacuation or alert mode is selected. A second set of terminals is provided to continue the wiring to the next device.

MUTE BUZZER / L1 STROBE terminal allows for connection of an external momentary switch, which when activates will turn of the buzzer and the L1 strobe.

Outputs: (all outputs are 24Vdc)

1. Buzzer
2. L1 strobe (level 1)
3. L2 strobe (level 2)

Operation:

The polarity states sequence of the Gas Control board PCB Layout (SUB928) for the warning signs is explained in Table 33.

Table 33 Polarity state sequence for Warning Signs

	Monitoring	L1	L2
Sequence	+	+	-
	$\cong 6V$	$\cong 24V$	$\cong 24V$
	-	-	+

The required polarity states sequence for strobes is shown in Table 34. Note that the difference lies in the polarity state change from Monitoring to Level 1 (L1). For strobes, the polarity and voltage change immediately to -/+24V as on Table 34 while for warning signs, only the voltage changes as on Table 33. This is the reason why the Gas Strobe Interface (Sub938) module is required.

Table 34 Required polarity state sequence for Strobes

	Monitoring	L1	L2
Sequence	+	-	+
	$\cong 6V$	$\cong 24V$	$\cong 24V$
	-	+	-

Miscellaneous conditions:

- L1: Alert strobe and buzzer are activated, can be de-activated by connecting a switch to the MUTE BZZER L1 STROBE input.
- L2: Evacuation strobe and buzzer are activated (and cannot be muted/turned off)

Figure 19 FT2GAS Block Wiring Diagram

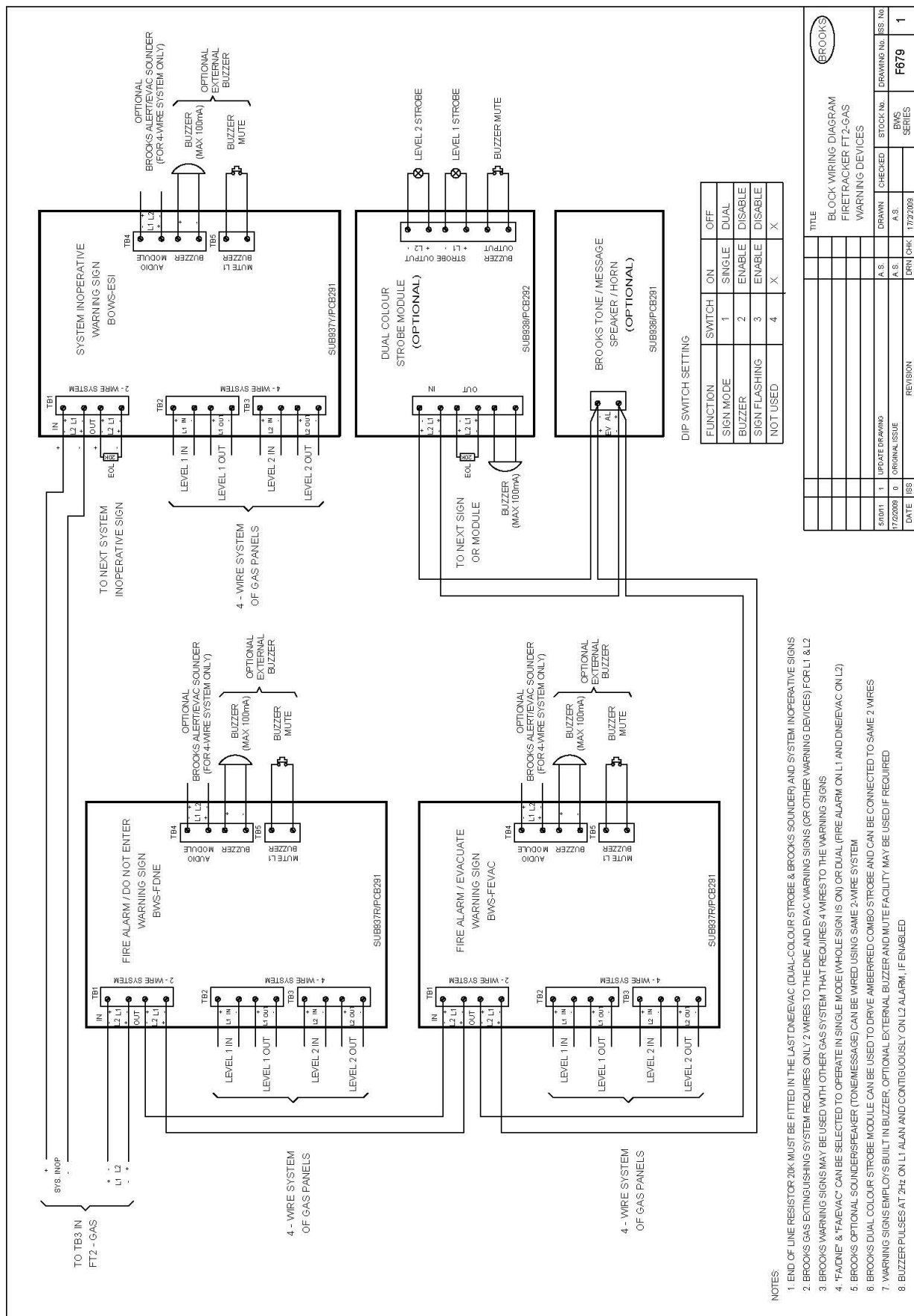


Figure 20 FT2GAS Warning Signs Connection Diagram

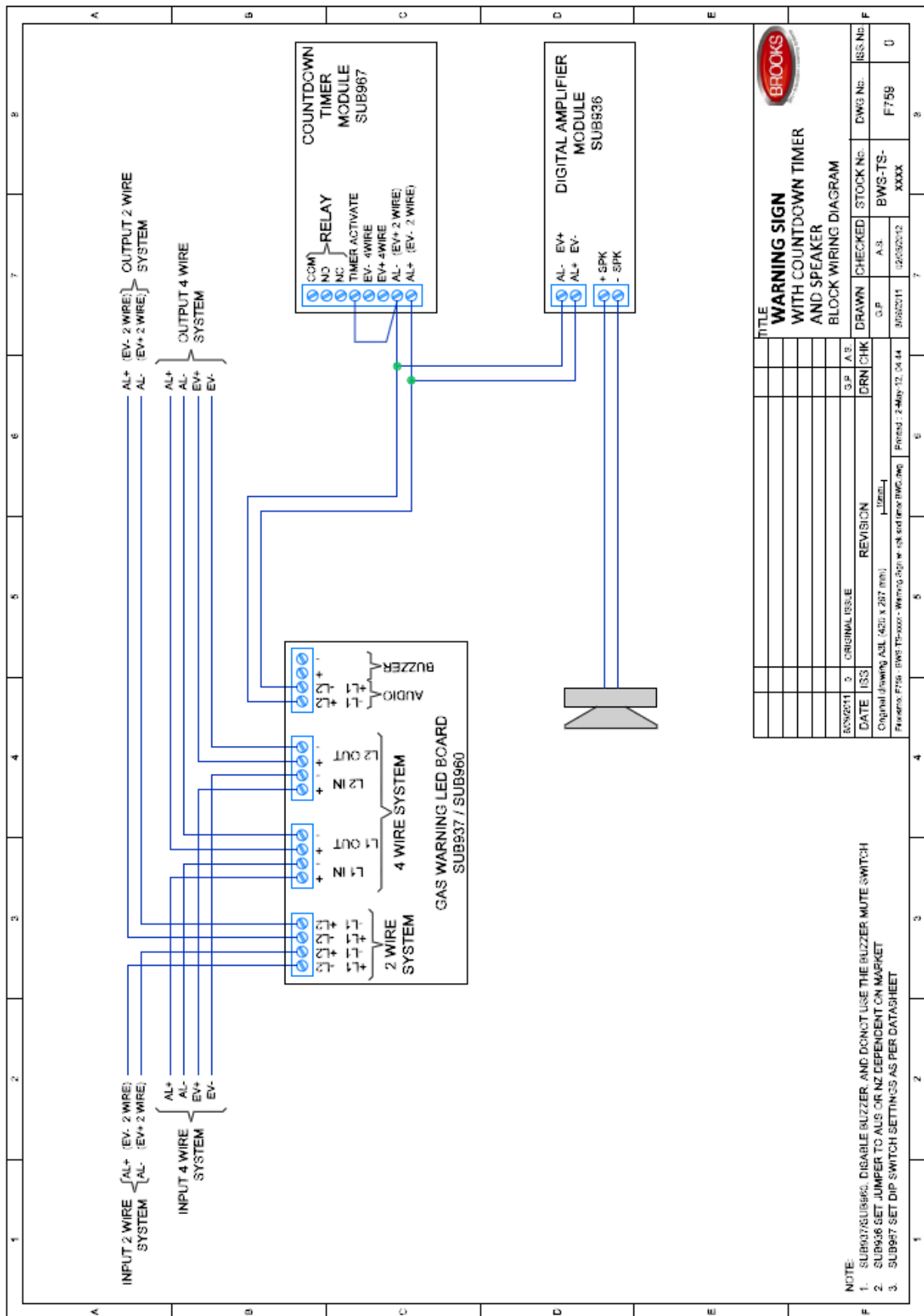


Figure 21 Warning Sign with Voice and Timer connection

NSW - Head Office

P.O. Box 7050 Silverwater NSW 1811

4 Pike Street Rydalmere NSW 2116

Ph: 02 9684 1466

Website: www.Brooks.com.au

VIC

9/71 Victoria Crescent, Abbotsford VIC 3067

Ph: 03 9879 5294

SA

P.O. Box 101 Woodville SA 5011

729A Port Road, Woodville, SA 5011

Ph: 08 8347 0000

QLD

P.O. Box 511 Archerfield QLD 4108

2/49 Boyland Ave Coopers Plains, QLD 4108

Ph: 07 3373 8222

WA

P.O. Box 2114, Midland DC W.A. 6936

6/91 Leach Highway, Kewdale WA 6105

Ph: 08 6262 8095

Or National Australian Sales Number: 1300 78 FIRE (3473)

For the cost of local call.

