Fire Products & Solutions

Operation / Technical Manual

Brooks OWS

Rev 3.2

Occupant Warning System

Grade 3

Document History

Issue	Date	Description	Written By	Checked By
Draft 0	25/09/2008	Original Draft Document.	Wallace Zhong	Anis Shenouda
Rev 1	17/08/2009	Update & finalise draft issue	W.Z. / A.S.	A. S.
Rev 2	01/05/2011	Add current calculation, add 20W model and update DIP switch table	W.Z. / A.S.	A.S.
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1 INTRODUCTION

1.1 Overview

The Brooks Occupant Warning System (OWS) is capable of providing reliable audio and visual warnings to building occupants. The system is designed to alert occupants to an emergency situation and evacuate the building in emergency conditions. The OWS system is available with a 60W amplifier, 120W amplifier and 225W amplifier. PSU and batteries have to resized accordingly.

This document provides the technical information required to configure, install, maintain and operate a Brooks OWS and its related components. This document should be read prior to installation. Should you have any queries, please contact Brooks for technical support.

Figure 1 Brooks Standalone OWS Control Panel

The OWS display and control front shown in Figure 1 above is the new 19” rack enclosures in 6U cabinet. Although the functionality remains unchanged, the mounting style and appearance has changed to suit the standard requirements, as shown in Figure 2 below.

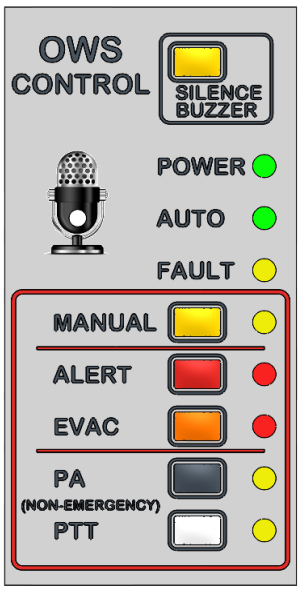

Figure 2 Standalone OWS User Interface

Note: The PA is not for emergency annunciation purposes

1.2 Features

A Brooks standalone OWS comprises a main control board, a main display board, an audio amplifier and Power Supply Equipment (PSE) within a 19' rack metal enclosure. An optional 4 Zone Splitter Board can be added to increase the number of speaker circuits. A Brooks single zone remote paging desk microphones can also be added[1].

The Brooks series of OWS systems have the following features.

1. Automatically switch between alert and evacuation tone in emergency conditions. Time is configurable to 0, 1, 3 or 5 minutes via a DIP switch. Refer to Table 16.
2. Configurable audio warnings with pre-recorded digital voice messages.
   - For Australian convention, the OWS meets the requirements of ISO7731, ISO8201, clause 3.22 of AS1670.1 and relevant clauses of AS1670.4. Conforms to AS4428.16 Grade 3.
   - For New Zealand convention, it meets the requirements of AS2220.1 as required in NZS4512 standard.
   - For non-regulatory applications, the tones and voice message can be customised[2].
   - Local PA facility via a built-in electret microphone for only public announcement, not used for emergency purposes.
   - Speaker output can be split into a max of 48 individual speaker circuits. Each circuit is individually supervised for short and open-circuit faults.

Note: Check space availability in the OWS enclosure to mount the 4 Zone Splitter Boards.

   - Optional remote desk microphone with an auxiliary input for background audio.
3. Fully supervised power supply equipment via AS7240.4:2004 power supply supervision module.
4. Intuitive indications and controls via well-grouped LED indicators and momentary switches.
5. A wide range of quality class-D audio amplifiers.
   - High power efficient amplifiers with standby input to maximise the power conservation.
   - The available standard amplifiers are 60W, 120W and 225W.
6. Inputs and outputs available to interface to the FDCIE.
   - One supervised trigger input (clean N/O contact) to activate the audible and visual warnings from the FDCIE or from any mechanical trigger device e.g., MCP.
   - One OWS changeover relay contact output to signal OWS fault condition to FDCIE.
   - Two changeover relays contact outputs for PSE fault and power fail provided by the PSE supervision module to connect to an input in the FDCIE. PSE fault, earth leakage fault and amplifier fault activate the common fault indicator and relay.
7. Earth leakage fault detection.
8. Software lockup fault detection.

Note: The OWS must be installed with an AS7240.2 complying FDCIE to satisfy AS4428.16 requirements.

[1] Only the optional PA-1 remote desk top microphone can be connected to the standard series of Brooks OWS

[2] Contact Brooks for customised tones and/or voice messages.

1.3 Specifications

The specifications of the Brooks OWS are shown in Table 1 below

Table 1 General Specifications

Feature		Specification
Mains Power Supply		230V AC, +/- 20%. Wattage 60W - 320W based on the system's power supply requirements.
Battery Backup		2 x 12V SLA batteries 7 - 21 AH in a standard enclosure. The battery capacity is based on the system's power requirements. MAX. 21AH.
Nominal System Voltage		27.6V ±10%
Access Level		**Access Level 1**: View all LED indicators and controls through the locked transparent front door. **Access Level 2**: All controls on the metal door are accessible by opening the front transparent door using a 003 key. **Access Level 3**: Open the outer door using a 003 key and unscrew the inner metal door. The controls and indicating circuits are located within the cabinet, behind the front plate. A technician is required to repair the OWS or upgrade its firmware.
Emergency Zone		1 Emergency zone. Only for use on Grade 3 systems.
Alarm Trigger Input		1 Supervised input, N/O clean contact, EOL resistor 47K .
Speaker Circuit		Mainboard: 1 Supervised 100V RMS speaker output, EOL 47K. Optional Splitter Board: 4 Supervised 100V RMS speaker output, EOL 47K.
Speaker Circuit Parameter		Maximum line resistance: 50Ω. Maximum line capacitance: 47nF. Minimum insulation rating: 250/250V, PVC V90 to AS/NZS 3808.
Strobe Output ◊		Non-compliant output, relabelled as fault input to generate common fault in case of a PSE fault, earth fault or amplifier fault. Supervised with EOL resistor 47K.
Common Fault Output		Voltage free relay output, 30 VDC, 5A, 120 W.
Aux Enable Input ◊		Non-supervised N/O clean contact trigger.
Aux Input Sensitivity		$1V_{peak\ to\ peak}$
Mic Enable Input ◊		Non-supervised N/O clean contact trigger.
Mic Input Sensitivity		$1V_{peak\ to\ peak}$
PA Microphone ◊		Built-in electret microphone for non-emergency purposes.
Remote Microphone ◊		Terminals for optional remote desktop microphone, PA-1.
Operating Temperature		0°C to +40°C.
Operating Humidity		5-95%, non-condensing.
Enclosure	IP Rating	IP30 (estimated).
	Material	1.5mm zinc anneal steel powder coated oyster.
	Dimension	6U enclosure 350mm H x 600mm W x 250mm D 13U enclosure 700mm H x 600mm W x 250mm D 22U enclosure 1050mm H x 600mm W x 250mm D
	Weight	18Kg for standard 6U enclosure. May vary depending on the enclosure size
Compliance		ISO 7731, ISO 8201, NZS4512, AS7240.4:2004 and AS4428.16:2015.

◊ Ancillary functions not required by AS4428.16-2015

2 OPERATIONS

2.1 Display Layouts

The Brooks OWS offers an alternative user interface for FDCIE connected applications as shown in Figure 3.

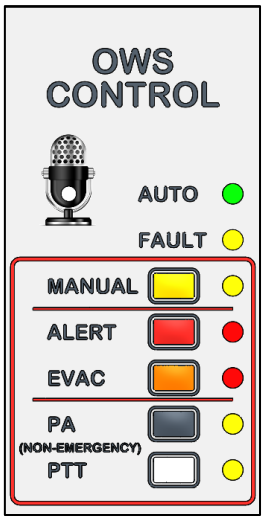

Figure 3 FDCIE Connected OWS User Interface

2.2 Mode of Operation

The OWS supports 2 modes of operation as shown in Figure 3, “AUTO” and “MANUAL” mode. In the 19” rack display, only one mode of operation can be selected at a given time. The AUTO mode is selected automatically if the manual mode is not selected. To select the manual mode, press the manual mode button on the display, which will be indicated by a LED next to the button. Pressing the manual mode button again, will de-select the mode and return to the default automatic mode.

2.2.1 Automatic mode

In AUTO mode, only the “AUTO” green LED indicator is illuminated. When the trigger input is activated, the following will occur:

- Audio warning signals (tone and voice) will be broadcasted to all the speakers.
- Either the Alert or the Evac LED will flash based on the setting.
- The buzzer will sound in the standalone OWS and can be silenced by the “SILENCE BUZZER” button.
- OWS interfaced to FDCIE, will activate the FDCIE sounder.

To de-activate emergency warning signals while in auto mode, perform one of the following:

1. In Standalone OWS, press the Manual button and subsequently press the button corresponding to the active tone/message (alert or evac). Either the alert or the evacuation LED will continue flashing until the trigger input is inactive.
2. In FDCIE OWS, press the “Silence alarm” button in the fire brigade section to stop the emergency warning.

Note: A fault signal will be generated if the manual mode remains active for more than 5 minutes (V1.5 and higher). This is to warn the user in case the OWS is left in manual mode which disables the automatic triggering of the emergency warning.

2.2.2 Manual mode

In manual mode, alert, evacuation or non-emergency PA can be activated manually by the relevant button.

The following describes how to access manual mode features:

- Press the “MANUAL” button and the LED will illuminate. Subsequently select “ALERT” or “EVAC” to broadcast the relevant warning signal or “PA” for a non-emergency public announcement.
- Press the “PA” button, illuminating its LED.
- Press and hold the “PTT” (press to talk) button and speak into the microphone.
- The “PTT” LED illuminates while the microphone is active and the “PTT” button is pressed.
- Press the “MANUAL” button if its LED is active to return to “AUTO” mode.

2.3 Fault Indications

When a fault in the OWS or in the PSE is detected, the fault LED on the front display illuminates and the fault relay will de-energise.

The buzzer in the standalone OWS will sound in fault conditions. To mute the buzzer, press the “Silence Buzzer” button firmly.

The common OWS fault contact can be used to provide a local warning or report to remote monitoring equipment.

A new feature is added to the OWS software version ≥ V1.5 to latch the fault condition when the system is left in the manual mode in excess of 5 minutes. This feature has been added to provide audible warning during routine maintenance or testing if the system is left in non-operative condition.

Note: The fault buzzer will re-sound upon recognition of a newly occurred fault condition.

2.4 Auxiliary Audio Input

The auxiliary audio input is available in both automatic and manual modes. The audio signal is fed into the “AUX” audio input terminals and enabled or disabled via the “AUX. EN” switch input located on the main control board. Local background music or a remote desktop microphone[3] can be used as an input.

The auxiliary audio input can only be activated in the non-alarm condition and will be automatically overridden by any alarm signal (activated via the trigger input).

[3] Brooks desk top microphone provides direct connection of BGM source via built-in audio socket.

3 PLANNING

3.1 System Components

In conjunction with one of the three available amplifiers, the following standard modules are used in the Brooks OWS:

- SUB860, OWS main control module
- 12OWS-S, 19" rack display module for standalone OWS or 12OWS for FDCIE version.
- SUB990, Power supply supervision module,
- One of the following class-D audio amplifiers:
  - SUB865, 60W amplifier or
  - SUB866, 120W amplifier or
  - SUB867, 225W amplifier
- SUB1037 Earth leakage detection board.
- SUB1038 Microcontroller daughter board – software lockup detection.

The following optional devices can be added to the OWS:

- SUB999[4] OWS 4 Zone Splitter Board fitted on CB574 and CB575 brackets.
- SUB999 can be used as supervised 24V output with 24V input feed instead of audio feed in speaker zone splitter in audio applications.
- PA-1 Brooks Remote Paging Desktop Microphone with BGM/PA enable/disable control.

The discontinued SUB862 has been replaced with SUB999, which is about 30% smaller. The board profile was replicated from 458x series of expansion boards used in the Addressable FDCIE's so that the mounting brackets CB575 & CB574 can be used for mounting up to 4 boards, see Figure 7

3.2 Monitored Inputs and Outputs

The Brooks OWS provides inputs and outputs as listed in Table 2 below, that are supervised for open or short circuit faults. All monitored inputs/outputs require an End Of Line (EOL) resistor, 47K, 1%, metal film, 1/2W.

Table 2 Supervised Inputs and Outputs

Board	Item	Terminal	Recommended Cable Specification
SUB860 OWS Main Control Board	Warning trigger input	TB1, 11 - 12	≥ 0.32mm², 57.4Ω/Km
	System fault (strobe output)	TB2, 3 - 4	≥ 0.32mm², 57.4Ω/Km
	Speaker line output	TB2, 13 - 14	≥ 1.50mm², 12.8Ω/Km, 75pF/m
Optional SUB999 OWS 4 Zone Splitter Board	Speaker zone 1 output	+ #1 -	≥ 1.50mm², 12.8Ω/Km, 75pF/m
	Speaker zone 2 output	+ #2 -	≥ 1.50mm², 12.8Ω/Km, 75pF/m
	Speaker zone 3 output	+ #3 -	≥ 1.50mm², 12.8Ω/Km, 75pF/m
	Speaker zone 4 output	+ #4 -	≥ 1.50mm², 12.8Ω/Km, 75pF/m

[4] Due to the requirements of AS1670.1, each OWS is fitted with one SUB999 as a standard option.

Note: Up to 12 x SUB999 Zone Splitter Boards can be added to the OWS with software version V2.0 and above depending on space availability. The above table shows the outputs and terminals for one splitter board.

3.3 OWS Main Control Board

The PCB layout of the OWS main control board is shown in Figure 4 and its terminals are described in Table 4. Figure 5 depicts the main OWS control board SUB860 with a 120W amplifier SUB866 mounted on top.

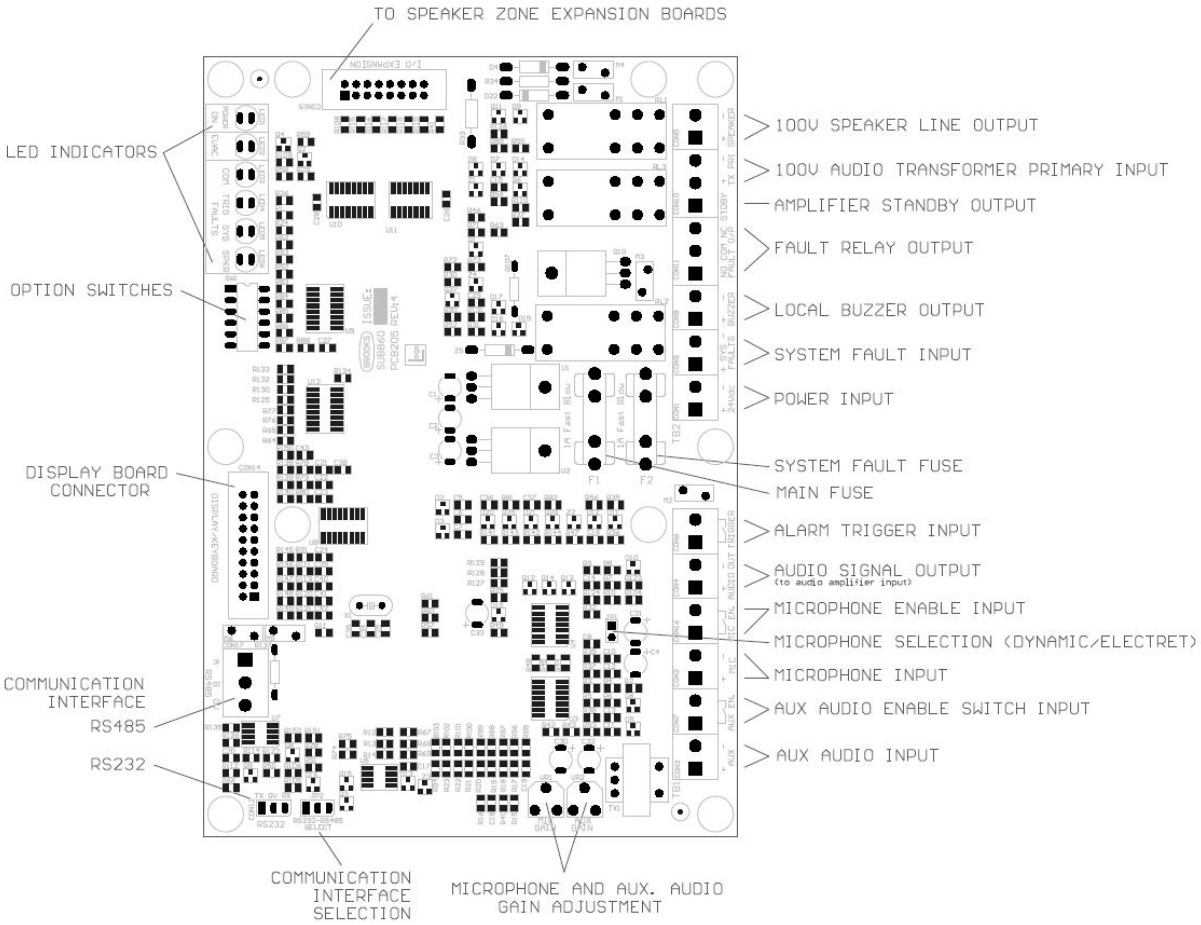

Figure 4 OWS Main Control Board Layout

The display/control modules 12OWS and 12OWS-S are connected to SUB860 via a 20-way ribbon cable.

The connection diagrams of the main control board connected to different amplifiers, zone splitter boards, PSE and display/control modules are shown in Figures 14 and 15 - Chapter 5 “Block Wiring Diagrams”.

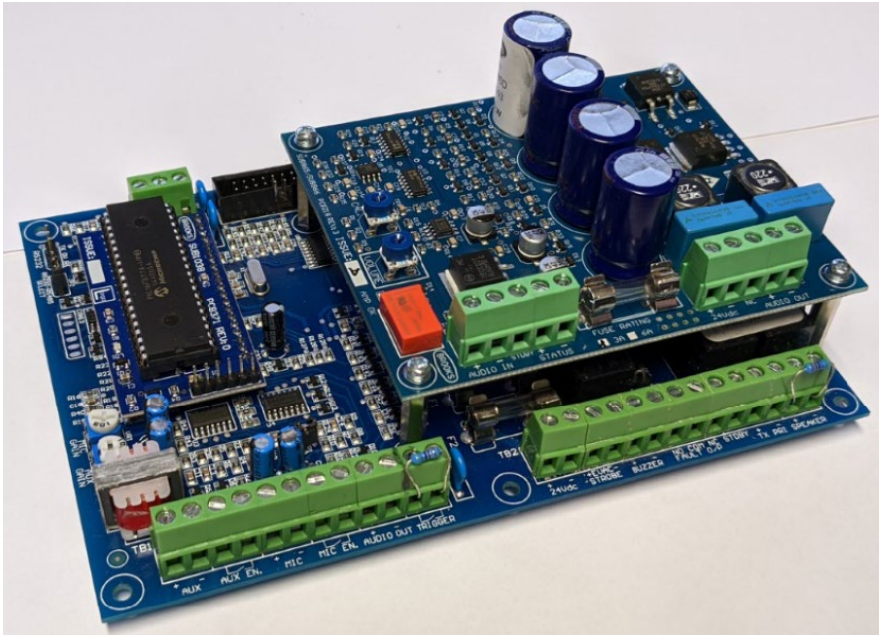

Figure 5 OWS Main Control Board C/W 120W Amplifier mounted

3.3.1 OWS Tones and Messages

The standard format of the OWS provides a T3 evacuation tone and message in alarm conditions. The alert tone/message can be activated manually from the OWS' Front Display and automatically after a pre-set time delay. When used in NZ, the DIP switch S6 must be in the ON position to provide AS2220.1 tones as required by NZS4512. The pattern, frequency and time of each tone are described in Table 3 below. The standard evacuation and alert messages are also in the same table.

Table 3 Tones and messages specifications

Audio Indication	Active conditions	Description
ISO8201 Evacuation tone & message **AS4428.16**	Alarm condition or manual activation via the front display	Pulsating 520Hz danger signals following ISO8201 temporal pattern. This is repeated 3 times then followed by the following voice message: *"Fire emergency, evacuate now".* When the voice message is completed, the cycle is repeated after a 4 sec silence.
Alert tone & message **AS4428.16**	Alarm condition (for the duration of delay time) or manual activation via the front display	Pulsating 520Hz danger signals following ISO7731 temporal pattern. This is repeated 3 times then followed by the following voice message: *"Attention, attention, a fire alarm has been detected within the building. Standby for further instructions".* Upon timeout of the preselected delay the output audio will automatically change to the evacuation tone and message.
AS2220 Evacuation tone & message **NZS4512**	Alarm condition or manual activation via the front display	Sweeping from 500-1200Hz with ON 3.75S and OFF 0.25S, followed by the following evacuation voice message: *"Fire emergency, evacuate now".* When the voice message is completed, the tone repeats again.
Alert tone & message **NZS4512**	Alarm condition (for the duration of delay time) or manual activation via the front display	Continuous 520Hz danger signals with the ON/OFF time of 0.6 sec. This is repeated for 15 cycles followed by the following voice message: *"Attention, attention, a fire alarm has been detected within the building. Standby for further instructions".* Upon timeout of the preselected delay the output audio will automatically change to the evacuation tone and message.

3.3.2 Cables Terminations

Table 4 Connections of the OWS Main Control Board

Designator	Type	No.	Label	Pin	Description
TB1	Screw terminals	1	AUX	+	Auxiliary audio input. <= 0.7V RMS
		2		-	
		3	AUX EN	+	Auxiliary audio enable input. Closed contact enables the input e.g., remote mic.
		4		-	
		5	MIC	+	Microphone input terminal Not to be used for emergency purposes.
		6		-	
		7	MIC EN	+	Used only to enable a dynamic mic (if used). Otherwise, leave it disconnected.
		8		-	
		9	AUDIO OUT	+	Audio output to amplifier <= 0.7V RMS.
		10		-	
		11	TRIGGER	+	Monitored trigger input. Connected to the N/O alarm contact in the CIE or N/O clean contact. EOL resistor: 47kΩ 0.5 Watt 1%.
		12		-	
TB2	Screw terminals	1	24Vdc (Supply)	+	20 – 30Vdc, 120mA
		2		-	
		3	SYSTEM FAULT	+/-	Used internally to activate OWS common fault EOL resistor: 47kΩ 0.5 Watt 1%.
		4		-/+	
		5	BUZZER Output	+	Open collector output < 100mA @ 24V. Drives the buzzer on the main display. (Used in standalone application)
		6		-	
		7	FAULT Output Contacts	NO	Wiring fault output. Dry-contact 30V @ 5A Connects to fault input in the FDCIE. Relay is normally energised.
		8		COM	
		9		NC	
		10	STDBY Signal	+	Standby, connected to Brooks amplifiers to reduce quiescent current consumption. When the logic is high (5V), amplifier is disabled.
		11	TX PRI	+	Transformer input. <100V RMS. Connected to transformer coil output. Maximum current based on amplifier type.
		12		-	
		13	SPEAKER	+	Monitored speaker output. Connected to the speaker line or the optional zone splitter board SUB999 for multiple circuits. EOL resistor: 47kΩ 0.5 Watt 1%.
		14		-	
CON7	Screw terminals	1	RS485	A	RS485 interface. Connected to optional remote microphone PA-8.
		2		B	
		3		0V	
CON12	Molex 3 Pin Header	1	RS232	TX	RS232 interface. TX – PC RX, RX – PC TX, 0V – PC GND. Used for digital voice message programming.
		2		0V	
		3		RX	
CON15	IDC header, 2X8	N/A	I/O EXPANSION	N/A	PA Expansion Interface. Connect to the first OWS 4 Zone Splitter Board.
CON14	IDC header, 2X10	N/A	DISPLAY / KEYBOARD	N/A	IDC connector to 12OWS or 12OWS-S.

3.3.3 On-Board LED indications

In addition to the LED indicators on the front display, other indicators are provided on the OWS main control, PSE and amplifier boards. Table 5 explains the system state described by the main control board's LED indicators.

Table 5 LED indicators on the OWS Main Control Board

Designator	Label	Colour	Active conditions
LED 1	POWER ON	Green	OWS main board power input is ON.
LED 2	EVAC	Red	Trigger input activated.
LED 3	FAULTS **COM**	Yellow	Common Fault, indicates speaker, PSE, amplifier or trigger fault. If only COM Fault is ON, it may be a wiring fault in the 4 Zone Splitter Board SUB999 (if fitted) or PSE fault.
LED 4	FAULTS **TRIG**	Yellow	Trigger input wiring fault. Flashing twice indicates an open-circuit fault detected.
LED 5	FAULTS **SYS**	Yellow	Internally wired to earth leakage board, power supply supervision board and amplifier boards.
LED 6	FAULTS **SPKR**	Yellow	The speaker output has a wiring fault. Flashing once per cycle indicates a short-circuit fault detected. Flashing twice indicates an open-circuit fault detected.

3.4 Optional OWS 4 Zone Splitter Board

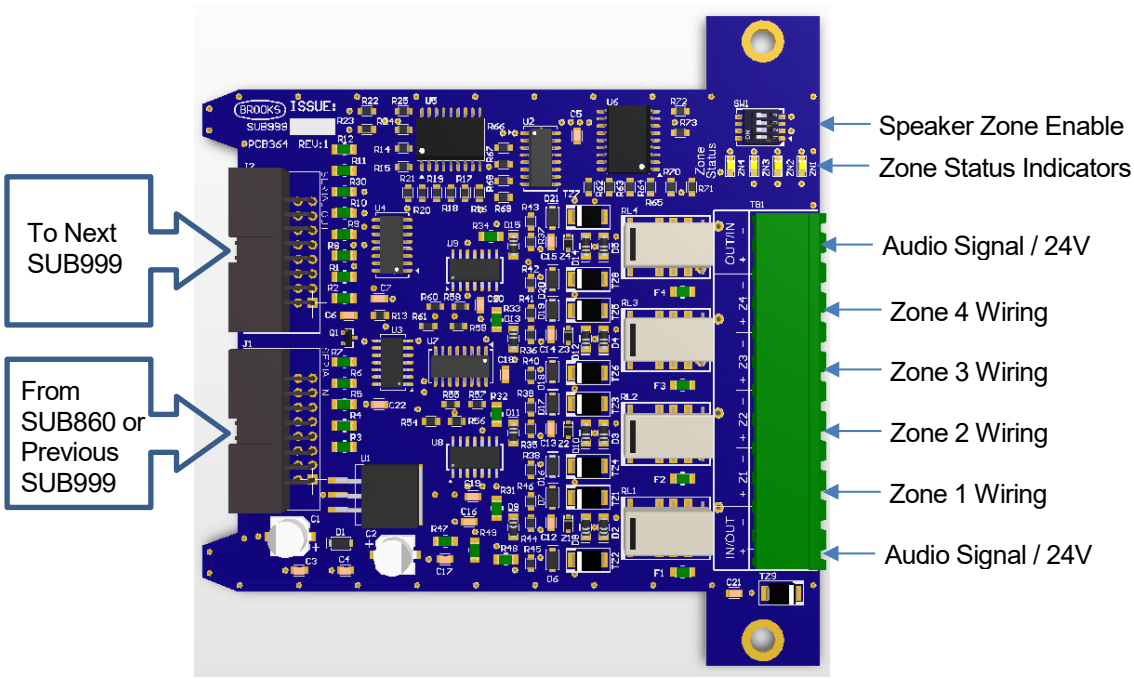

Figure 6 SUB999 Board Layout

The OWS main control board supports only a single emergency zone speaker output. The optional SUB999 4 Zone Splitter Board allows for the speaker output from the main board to split into 4 individual speaker circuits. Each of the four speaker outputs is individually monitored for short and open circuit faults.

Four status LED indicators are present on each SUB999. When illuminated, they indicate which zones are active.

Up to 12 boards (SUB999) can be daisy-chained to provide a maximum of 48 speaker zones.

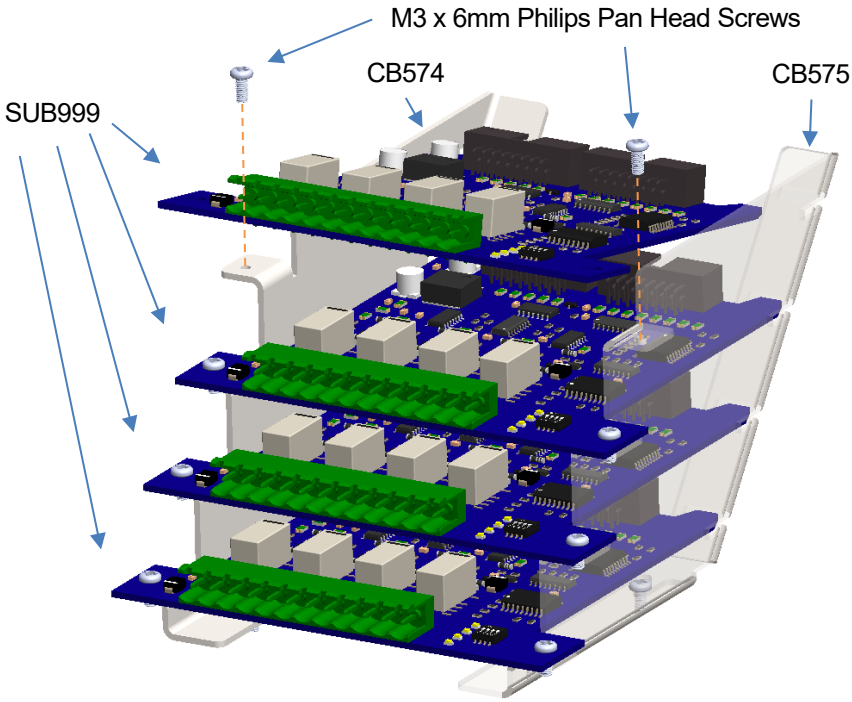

Figure 7 SUB999 fitted into Mounting Brackets CB575 & CB574

Table 6 SUB999 OWS 4 Zone Splitter Board Status Indications

Designator	Label	Colour	Active conditions
LED 1	ZONE STATUS	Yellow	**Steady**: Zone 1, 2, 3 and/or 4 activated via auxiliary enable or manual PA. **Flashing**: Wiring fault on the respective speaker zone.
LED 2			
LED 3			
LED 4			

Note: SUB999 can be used to provide a supervised 24V circuit to strobes when a 24V supply replaces the audio input. In this application, SUB999 must be mounted on a separate bracket to ensure segregation.

Table 7 Inputs / outputs on SUB999

Designator	Type	No.	Label	Pin	Description/Specifications
TB1	Screw terminals	1	IN/OUT	+	Audio source input/output terminals
		2		-	
		3	ZONE OUTPUT	+	Speaker Zone 1 output. ≤ 100V_{rms}, ≤ 2A, Max 60watts
		4		-	
		5		+	Speaker Zone 2 output. ≤ 100V_{rms}, ≤ 2A, Max 60watts
		6		-	
		7		+	Speaker Zone 3 output. ≤ 100V_{rms}, ≤ 2A, Max 60watts
		8		-	
		9		+	Speaker Zone 4 output. ≤ 100V_{rms}, ≤ 2A, Max 60watts
		10		-	
		11	OUT/IN	+	Audio source input/output terminals
		12		-	

3.5 Audio Amplifiers

Brooks OWS has a wide range of class-D audio amplifiers.

The following audio amplifiers are available:

1. SUB865 60-Watt audio amplifier
2. SUB866 120-Watt audio amplifier
3. SUB867 225-Watt audio amplifier

3.5.1 Amplifier Specifications

The specifications of Brooks class-D amplifiers are shown in Figure 8 below.

Table 8 Audio Amplifiers Specifications and fuse rating

Function	60W version	120W version	225W version
Voltage input range	20 to 32Vdc	20 to 32Vdc	20 to 32Vdc
Fuse	3A M205 fuse	6A M205 fuse	15A Blade fuse
Low voltage shutdown	-	-	19V (approx.)
Audio input impedance	10kΩ	10kΩ	10kΩ
Output load	4Ω	2Ω	1Ω
Current draw – quiescent (standby on)	40mA	40mA	40mA
Max Input Current – full load @ 27V	3.6A	6.4A	10A
Audio input level	<= 0.7V RMS		
Status Relay Contact rating	30VDC, 2A, 30W max		
Standby input	5VDC		

3.5.2 60/120-Watt Amplifier Module

Features:

- High energy efficiency class-D amplifier design.
- Available in 60W or 120W configuration.
- Standby function to reduce power consumption.
- Amplifier fault indication and relay outputs.
- Mounts on top of the main OWS control module to save space.

In the newly improved version, the 60W and 120W models utilise the same printed circuit board with the exception of the input protection fuse. Different audio transformers are to be used according to the system power required. Please refer to section 5 of Block Wiring Diagrams for further information. An image of the 60/120-watt amplifier board is shown in Figure 8 below.

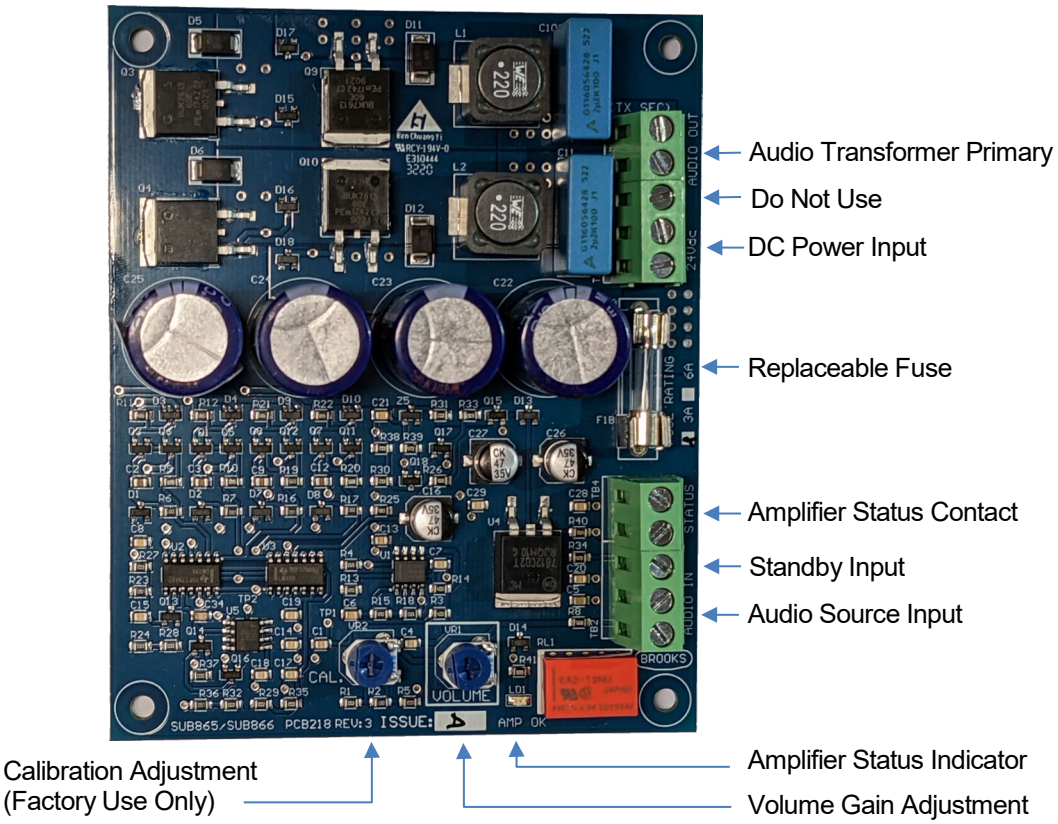

Figure 8 Class-D 60W and 120W Audio Amplifier Board

3.5.3 225-Watt Amplifier Module

- High energy efficiency class-D amplifier design.
- Low voltage protection.
- Over current protection.
- Standby function to reduce power consumption.
- Amplifier fault indication and relay outputs.

An image of the 225-watt amplifier board is shown in Figure 9 below.

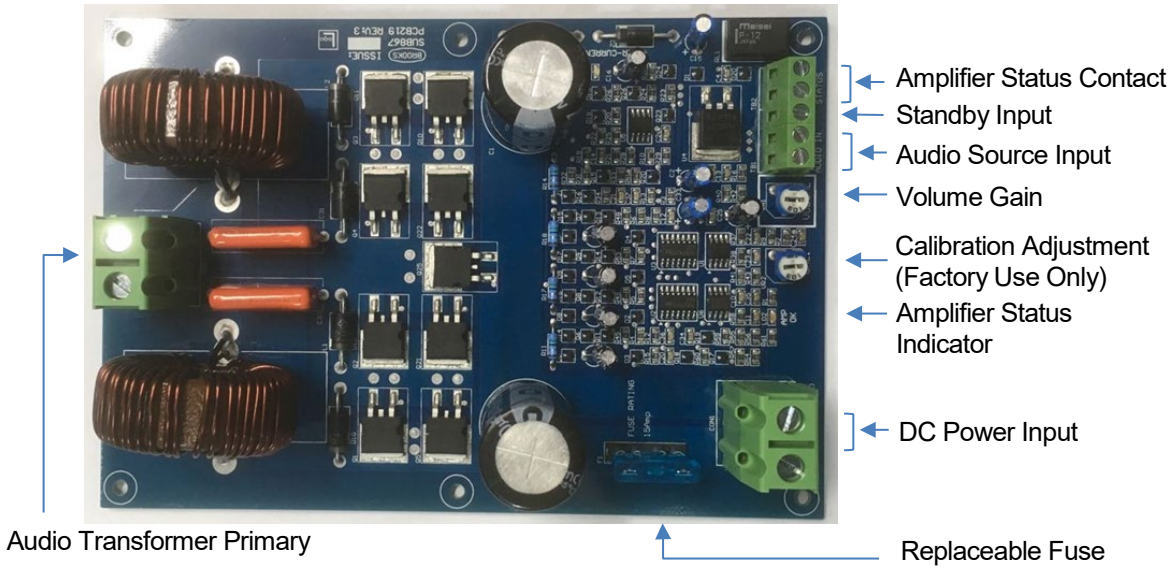

Figure 9 Class-D 225W Audio Amplifier Board Layouts

Table 9 Connection of the Audio Amplifier 60W, 120W and 225W

Designator	Type	No.	Label	Pin	Description
SUB865/SUB866 - TB1 SUB867 - CON1	Screw terminals	1	24Vdc	+	DC Power input.
		2		-	
SUB865/SUB866 - TB2 SUB867 - TB1	Screw terminals	1	AUDIO IN	+	Audio input from the main control board.
		2		-	
		3	STDBY		Audio amplifier enable/disable input, logic 5V, <= 5mA. It is used to minimize the system's power consumption. The amplifier output will be put into standby mode when the input is logic high.
SUB865/SUB866 - TB3 SUB867 - CON3	Screw terminals	1	AUDIO OUT	+	Audio output to the transformer primary side. Impedance matched to power rating accordingly. Please refer to Figure 16 for further information.
		2		-	
SUB865/SUB866 - TB4 SUB867 - TB2	Screw terminals	1	AMP OK	+	Clean contact output reflecting normal operation of the amplifier. Output is normally energised.
		2		-	

3.6 Power Supply Supervision

3.6.1 Description

The SUB990 power supply supervision module is designed to conform to the Australian AS7240.4:2004 Standard. An image of the module is as shown in Figure 10.

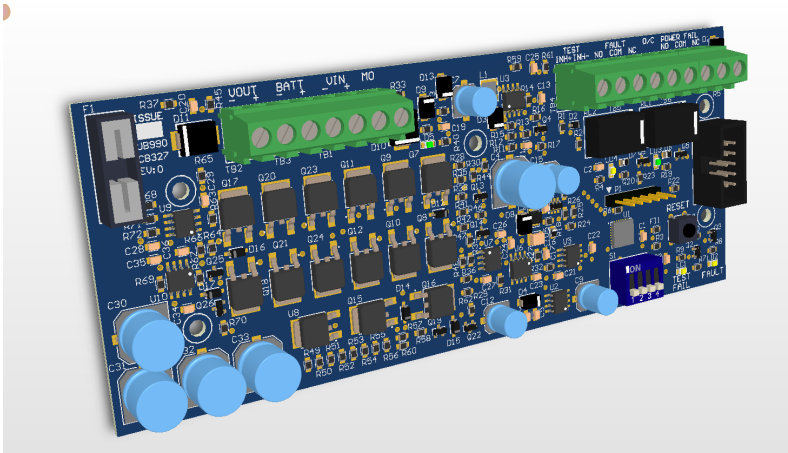

Figure 10 Power Supply Monitoring Board

The module constantly monitors and manages the primary and secondary power source for faults that may occur. Whilst monitoring, it also provides a set of voltage free contacts, to allow the PSE status to be transmitted to any connected equipment. The supervision board will periodically test the batteries to ensure they are still in their optimal operating conditions. The module will also automatically charge the connected batteries. In an event of mains failure, the module will seamlessly switch the connected system to the secondary power source.

The power supply supervision module continuously monitors the battery charger and batteries to detect any of the following fault conditions:

- Mains failure.
- Primary supply voltage out of tolerance.
- Battery disconnected.
- Battery voltage less than 24.4 volts.
- Automatic battery test failure.

3.6.2 Features

The supervision card provides the following inputs or outputs to signal the state of the module:

- Test inhibit input. Operates when the terminals Inh+ and Inh- are shorted together.
- Common Fault contacts. The voltage free contact changes state when a common fault occurs.
- Power Fail contact. The voltage free contact changes state when a mains failure occurs.
- Open collector fault output (O/C). The terminal is high impedance on normal state and active low when a fault occurs.
- Mains output (MO). The terminal is current limited to indicate a voltage presence on the primary power source.

The automatic battery test of this module is executed periodically, where the supervision card will temporarily stop charging the batteries and will use them to operate the complete system. This test will last for approximately 60 minutes and will be terminated automatically by the test inhibit input or manually by the reset switch. For further information, please refer to the technical datasheet TDS067 of the Power Supply Supervision.

Note: Battery charging stops once the battery test is inhibited.

3.6.3 Specifications

The specifications shown in the table below are the Absolute Maximum Ratings.

Stresses beyond those listed under Absolute Maximum Ratings cause permanent damage to the device.

Table 10 Power supply supervision specifications

Parameter	Value
Nominal Input Voltage	27.6V ±10%
Nominal Output Voltage	27.5V ±10%
Current Consumption @ Quiescent	6.7 mA
Max System Power	250watts
Max System Current	10A
Max Charge Current	7A
Recommended Battery Type	Valve Regulated Lead Acid
Min Battery Size	7Ah
Max Battery Size	21Ah
Relay Contact rating	30VDC, 2A, 30watts max

Note: The fuse installed on F1 should be sized according to the requirements of the installed system to allow for adequate protection.

3.6.4 DIP Switch Setting

The specifications for the dip switch settings are shown in Table 11.

Table 11 Power supply supervision configurations

Function	Dip Switch ON	Dip Switch OFF
Region Select	NZ	AU
System Select	12V	24V
Mains Fault Trigger Response	30 sec	60 min
Calibration mode	Cal mode on reset	N/A

Note: Only 24V PSE version conforms to AS7240.4:2004

3.6.5 Board Connection

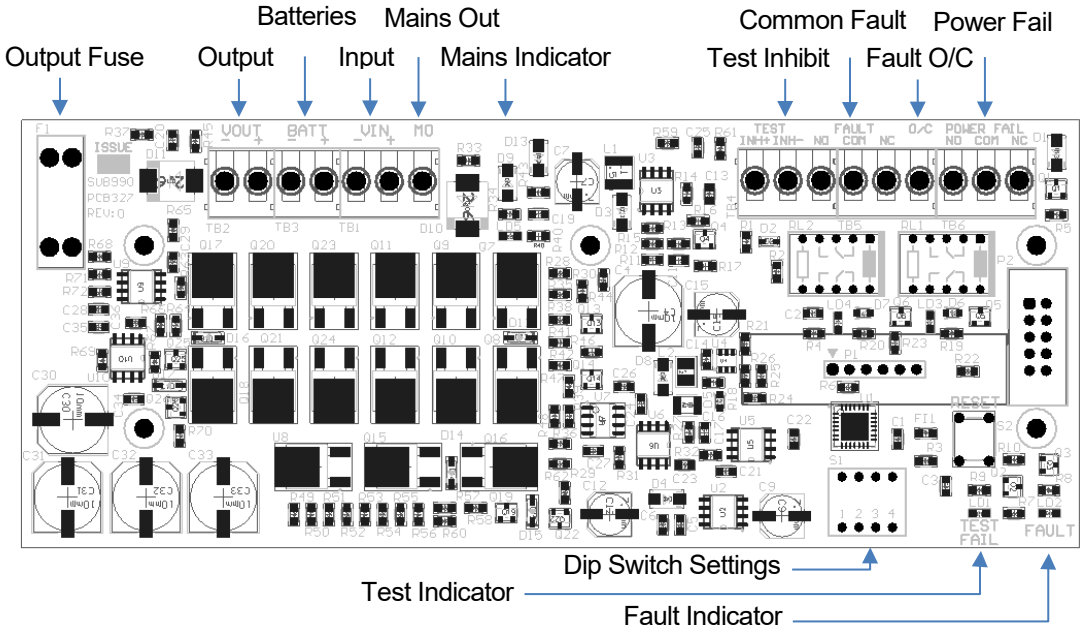

Table 12 Connection of the Power Supply Supervision Board

Designator	Type	No.	Label	Pin	Description
TB1	Screw terminals	1	MO	MO	Primary power source status output.
		2	VIN	+	Primary power source input.
		3		-	
TB2	Screw terminals	1	VOUT	+	Power Source Output.
		2		-	
TB3	Screw terminals	1	BATT	+	Secondary power source input.
		2		-	
TB4	Screw terminals	3	TEST	INH+	Test Inhibit Input. Shorting this contact will Inhibit the periodic battery test.
		2		INH-	
TB5	Screw terminals	1	FAULT	NO	Voltage free common fault relay contact output.
		3		COM	
		2		NC	
		1	O/C	O/C	Open collector fault output.
TB6	Screw terminals	3	POWER FAIL	NO	Voltage free primary power source fail relay contact output. This output is normally energised.
		2		COM	
		1		NC	
P2	IDC header, 2X5	N/A	N/A	N/A	Not to be used.

3.7 Earth Leakage Detection Module

3.7.1 Description

The Earth Fault Detection module SUB1037 is designed to provide monitoring for earth leakage detection in the OWS system for an added layer of protection. The module's layout is designed specifically for usage with the SUB990 power supervision module. When an earth leakage fault is detected, the on-board fault indicator will be lit and the voltage free contact will actuate.

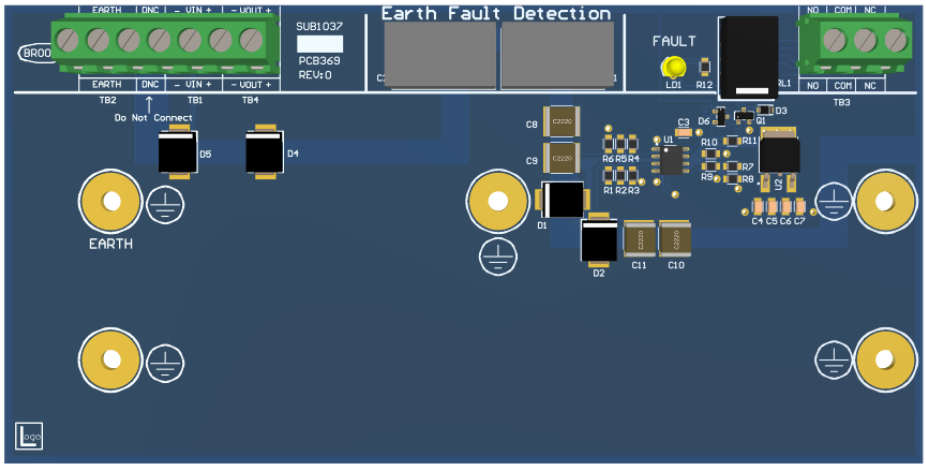

Figure 11 Earth Leakage Detection Module

3.7.2 Board Connection

Table 13 Connection of the Power Supply Supervision

Designator	Type	No.	Label	Pin	Description
TB1	Screw terminals	1	VIN	+	Power source input.
		2		-	
TB2	Screw terminals	1	DNC	DNC	Left black intentionally for isolation.
		2	EARTH	N/A	Earth connection.
		3		N/A	
TB3	Screw terminals	1	N/A	NC	Voltage free fault relay contact output.
		2		COM	
		3		NO	
TB4	Screw terminals	1	VOUT	+	Power source output.
		2		-	

3.8 Microcontroller Daughter Module

3.8.1 Description

The Microcontroller Daughter Board SUB1038 is designed to provide a fault indication in the event of a software lock-up or system failure. This would provide the operating technician with a clear indication of the fault present when troubleshooting the OWS system. The daughter board is designed to fit into the existing microcontroller socket while providing in circuit programming capability. Extra decoupling capacitors have been added near the microcontroller to improve the stability of the system.

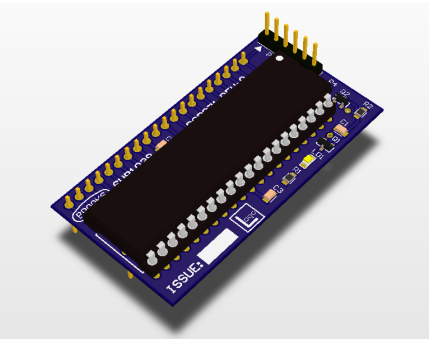

Figure 12 Microcontroller Daughter Board Module

3.9 Battery Calculations

The standard Brooks BOWS060W and BOWS120W are fitted with a 150-watt switch mode power supply. Batteries are also fitted with sizes dependent on the size of the amplifier. The battery capacity is determined by the following:

- Standby time - the system in quiescent condition and running on batteries only.
- Activation time - system in active condition and running on batteries only.
- Maximum speaker load.
- Size of audio amplifier in system.
- The quiescent and activation current consumptions of individual system components.

The OWS quiescent current, full load current and the recommended batteries for each system are shown in Table 14. For more details, refer to the OWS power supply and battery calculation spread sheet.

Table 14 Current consumption of OWS components

Module	Quiescent Current in mA[5]		Full Load Current	Battery[6] Capacity	Notes
	Standby	BGM Enabled			
60 Watt OWS	118	183	2.8 A	4.5 AH	7 AH can be used
120 Watt OWS	119	239	5.2 A	7 AH	
225 Watt OWS	119	240	10 A	12 AH	
OWS 4 Zone Splitter Board	35 (all OFF)	150 (all ON)			
1 Zone Desktop Mic	9		40 mA		

[5] Current calculated at 27V supply.
[6] Battery capacity calculated with BGM disabled, if enabled, larger batteries should be used. Calculation is based on 24 hours in quiescent and 30 minutes alarm conditions (activation).

3.10 System Fuses

The system fuses are listed in Table 15 below.

Table 15 Fuse Specifications

Board	Designator	Circuit Protected	Specification
Main Control Board	F1	Power Input	M205, glass sealed, fast blow 1A.
	F2	System fault	M205, glass sealed, fast blow 1A.
60W Audio Amplifier	F1	Amplifier Power Input	M205, glass sealed, fast blow 3A.
120W Audio Amplifier	F1	Amplifier Power Input	M205, glass sealed, fast blow 6A.
225W Audio Amplifier	F1	Amplifier Power Input	ATO blade fuse 32VDC, 15A.
Remote Desktop microphone	F1	Mic Power input	M205, glass sealed, fast blow 1A in-line fuse inside the control panel.
In-line battery fuse	N/A	Battery	Dependent on Amplifier size.
Power Supply Supervision	F1	Power Output	ATO blade fuse 32VDC, 15A.

3.11 OWS Configurations

3.11.1 DIP switch settings

The DIP switch on the OWS main control board SUB860 is used to configure the system for different applications. The default settings are highlighted as shown in Table 16. Careful consideration must be made when adjusting these settings.

Table 16 DIP Switch Settings

Function	Status		Descriptions
	S1	S2	
Time delay between Alert/Voice and Evac/Voice in auto mode	**OFF**	**OFF**	Evacuation tone / voice messages only **(no delay).**
	ON	OFF	**One** minute delay between alert tone/voice and Evac tone/voice message.
	OFF	ON	**Three** minutes delay between alert tone/voice and Evac tone/voice message.
	ON	ON	**Five** minutes delay between alert tone/voice and Evac tone/voice message.
Enable/disable voice with Alert	S3	**ON**	Voice message **enabled** with alert tone.
		OFF	Voice message **disabled** with alert tone.
Enable/disable voice with Evac	S4	**ON**	Voice message **enabled** with evacuation tone.
		OFF	Voice message **disabled** with evacuation tone.
Trigger input Latch/non-latch	S5	ON	Trigger input is latching. Must be disabled in manual mode.
		OFF	Trigger input is non-latching, follows the trigger input in auto mode.
AU / NZ Convention Configuration	S6	ON	New Zealand convention, tones / messages comply with the AS2220.1 and the NZS4512.
		OFF	Australian convention, T3 tone / message comply with the ISO7731, ISO8201 and AS1670.4.

Note: System settings must be configured to meet the application requirements.

4 INSTALLATION AND COMMISSIONING

The installation and commissioning of Brooks OWS must follow all the relevant installation standard requirements, such as AS1670.1, AS/NZS3000 and AS/NZS3100, and the additional requirements below.

4.1 Battery Check

Check the battery voltage before connecting the batteries. The voltage of each battery should be measured using a certified and calibrated multimeter.

If the voltage of the battery measures below 10.5V, the battery should be replaced immediately as it has been severely discharged and falls outside its operational life span.

4.2 AC/DC Power Supply Adjustment

Check the voltage output from the switch mode power supply before attaching the batteries. If the output voltage is out of the specified range of 27.6V, adjust the trimpot of the AC/DC power supply carefully until the voltage setpoint is met (turn anticlockwise to increase voltage).

4.3 Sound Pressure Level (SPL) Adjustment

The audio volume shall be adjusted to ensure that the required sound pressure level is met. The sound pressure level should be measured by a certified and calibrated sound pressure level meter that meets the requirements of the related standards, such as ISO7731.

Note: Selecting suitable speakers and adjusting the distance between them will also help to achieve the required sound pressure level.

The OWS utilises a trimpot on the main control board and on each amplifier to adjust the sound level. To adjust the sound level, tune the trimpots first then measure the sound level according to the related standards.

Please note that the warning sound level must be adjusted first.

Table 17 Sound Volume Adjustment

Sound	Board	Trimpot	Sound Activation
Warning sound	Audio Amplifiers	VR1, Volume	Enter the manual mode, Press the evacuation key.
Local microphone PA	Main control board	VR1, MIC GAIN	Enter the manual mode, Press the PA key. Press and hold the PTT button. Speak to the built-in microphone or the hand-held microphone if present.
Auxiliary audio	Main control board	VR2, AUX GAIN	Enter Auto mode and confirm the system is in quiescent conditions. Connect the sound source, e.g., an mp3 or CD player. Keep the auxiliary enable input active.
Remote desktop microphone	Remote desktop microphone board	Refer to the remote desktop microphone technical datasheet.	
Remote desktop microphone background music	Remote desktop microphone board	Refer to the remote desktop microphone technical datasheet.	

4.4 Cabinet Installation

Every Brooks Occupant Warning System is factory assembled in Sydney and fully tested prior to delivery. Upon receipt, the system should be carefully checked for any possible damage during transit before commencing installation.

Brooks manufactures a wide range of cabinet sizes to meet a diverse range of applications. The cabinets housing the control boards for the occupant warning system have been carefully designed with robustness and usability in mind to meet the basic requirements of the standard.

The two keyholes located on the top edge of the cabinet will accommodate bolt sizes M10 to M12. For extra strength, there are four extra stain relief points located on the lower part of the cabinet right behind the battery tray, which will also accommodate bolt sizes M10 to M12.

The previous cable gland knockouts has been replaced with a slotted cable entry point. Cover plates can be easily be accessed by removing the M4 locking nuts that secure the cover plates in place.

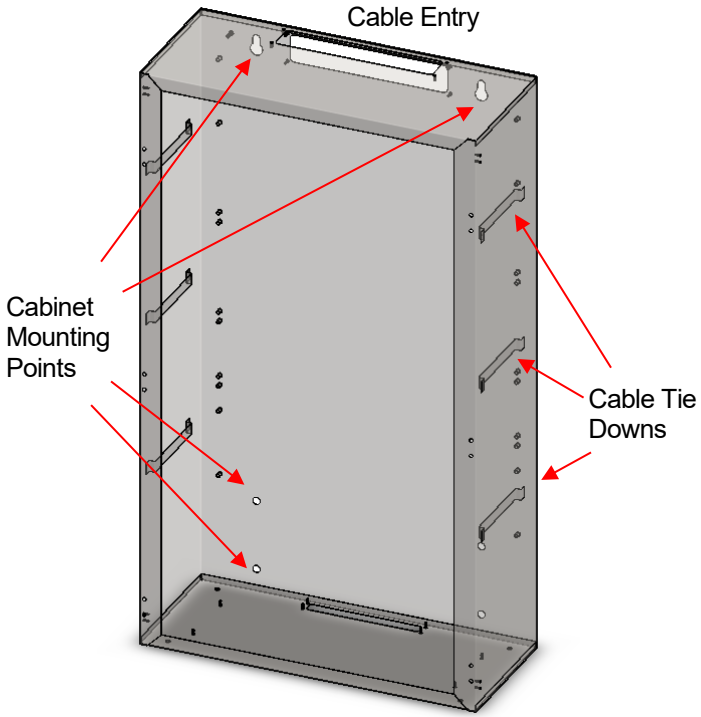

Figure 13 Designated Mounting Location

4.5 Commissioning

It is recommended to follow the following procedure when commissioning a Brooks OWS.

1. Configure the system on all the modules via the dip switches. Relevant information is available in the board description section above.
2. Measure the 100V line load impedance(s) using a suitable meter and check each circuit is below the rating of the output it will be connected to. Add up the total load and check it is below the connected amplifier rating.
3. Before connecting the field wiring, power up the system using Mains power only and check the operation. Each supervised circuit is being delivered with the EOL attached to their terminals. Identify and correct any existing faults before proceeding to the next step. The battery missing fault will remain.
4. Turn off the system Mains via the isolation switch and connect the field wiring to the system. Care must be taken when terminating the field wiring, ensuring that the correct polarities are connected. Make sure the relevant EOL is moved to the end of each field circuit.
5. Make sure the amplifier gains are set in the lowest setting before proceeding to the next step. This is done by carefully adjusting the trimpot labeled “Volume” in a counter-clockwise manner.
6. Power up using Mains only and check the operation. Activate the evacuation tone and messages manually using the control display. Carefully adjust the amplifier gain by turning the “Volume” trimpot clockwise to obtain the desired SPL output.
7. Test the trigger inputs, speaker outputs, strobe outputs, etc.
8. Connect a suitably sized battery for the system to clear the battery fault. The system should revert to its idle state now.

When measuring the sound pressure levels, record the sound pressure measurement at each particular location as these measurements can be used as references in annual test of AS1851 Items 3.9 and 3.10.

4.6 Maintenance

To ensure optimal system performance, as part of periodic maintenance schedule, the battery contacts should be inspected for evidence of corrosions. It is recommended to replace the batteries every 2 years or verify the battery condition by carrying out a battery load test.

As for system service, observe the independent fault indication located on each of the boards to determine the nature of the fault that has occurred. As a general rule, a system operating normally would only indicate green indications. To identify possible faults, locate and compare the system indication against the listed combination in the fault diagnostic table below.

Table 18 Fault Diagnostic table

Board	Indicator 1 Condition	Indicator 2 Condition	Possible Cause
SUB860	POWER ON - OFF	-	Main Fuse F1 blown
	COM FAULT - ON	-	• Fault in zone splitter board **OR** • Fault in power supervision board **OR** • Checksum memory fault
	COM FAULT - ON	TRIG FAULT - FLASH	Missing EOL on trigger circuit
	COM FAULT - ON	SYS FAULT - ON	• Fuse F2 Blown **OR** • Missing EOL on sys fault circuit
	COM FAULT - ON	SPKR FAULT - FLASH	• Short circuit on speaker circuit **OR** • Missing EOL on speaker circuit
SUB999	ZONE - FLASH	-	• Short circuit on zone circuit **OR** • Missing EOL on zone circuit **OR** • Inline zone protection fuse blown
SUB865	AMP OK – OFF	-	• Fuse F1 ruptured **OR** • Amplifier circuit damaged
SUB866	AMP OK – OFF	-	• Fuse F1 ruptured **OR** • Amplifier circuit damaged
SUB867	AMP OK – OFF	-	• Fuse F1 ruptured **OR** • Amplifier circuit damaged
SUB990	POWER FAIL – OFF	COM FAULT – ON	Input voltage absent. Check for absence of mains.
	POWER FAIL – ON	COM FAULT – ON	• Supply voltage out of tolerance **OR** • Battery voltage low **OR** • Battery absent **OR** • Battery inline fuse ruptured **OR** • Output blade fuse F1 ruptured
	TEST FAIL – ON	COM FAULT – ON	Automatic battery test failed
	TEST FAIL – FLASH	COM FAULT – ON	Currently undergoing automatic battery test
SUB1037	FAULT – ON	-	Earth fault detected within the system
SUB1038	FAULT – ON	-	Software execution failure

5 Block Wiring Diagrams

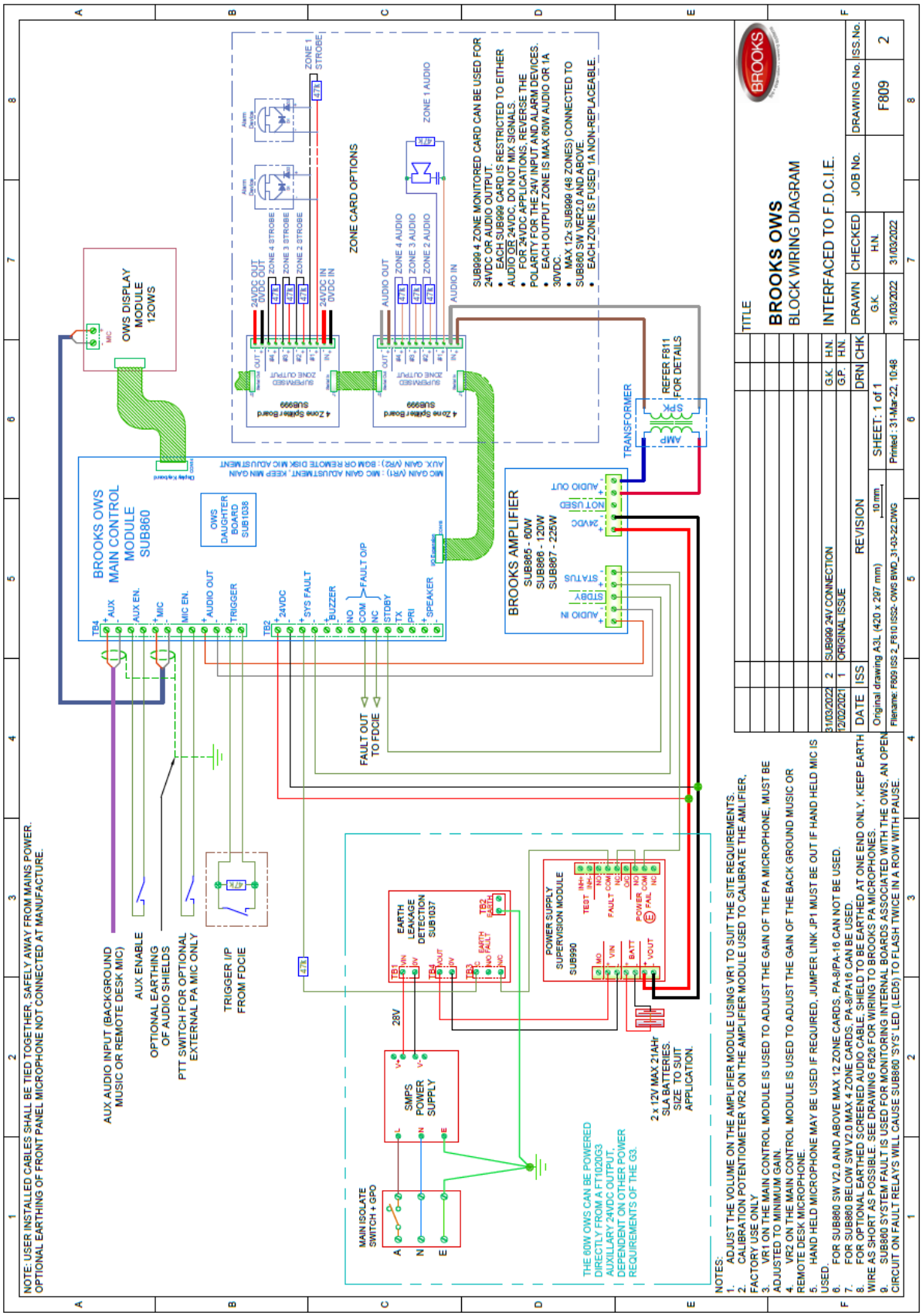

Figure 14 F809 Iss 2 Brooks OWS Interfaced to FDCIE

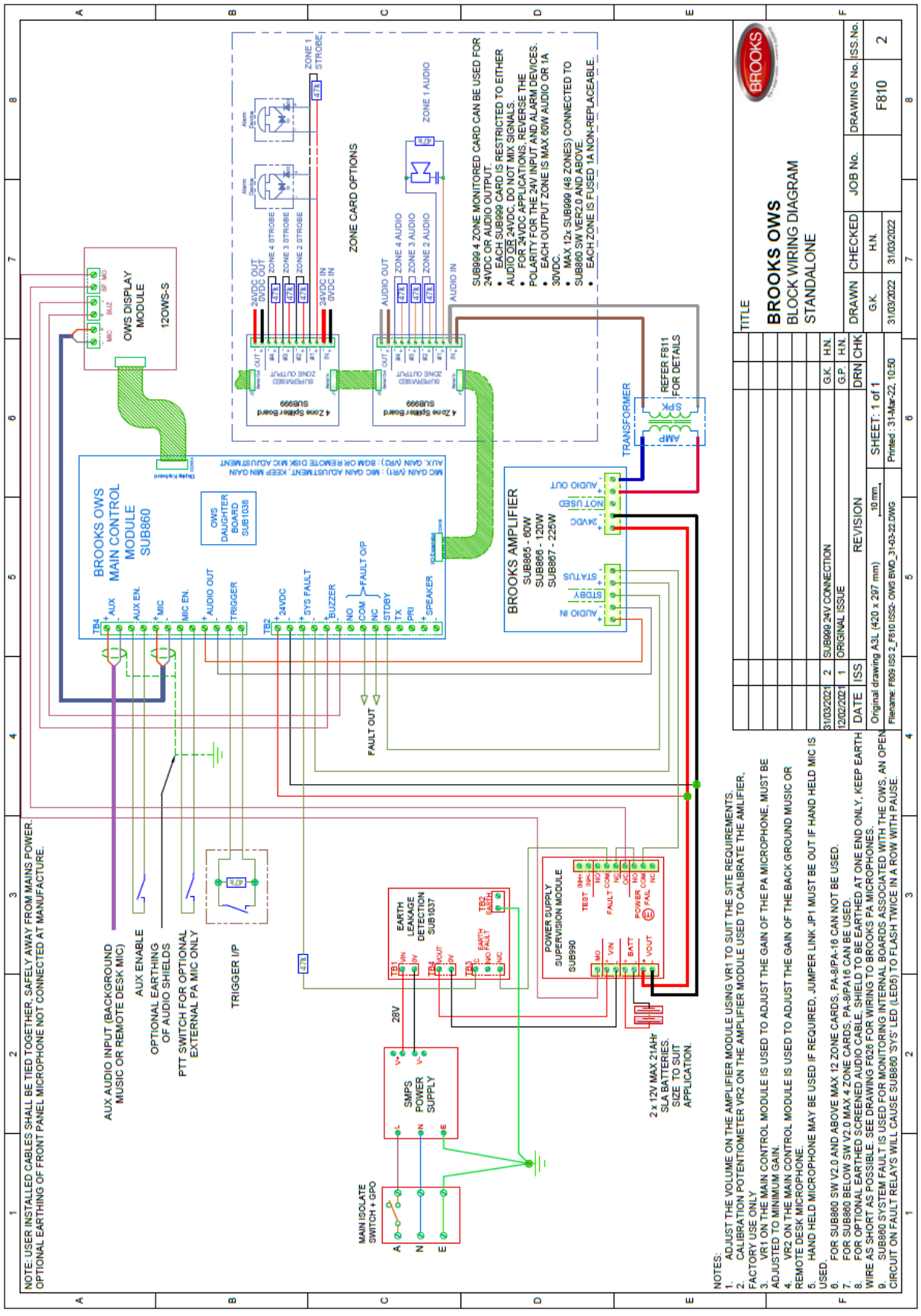

Figure 15 F810 Iss 2 Brooks OWS Standalone

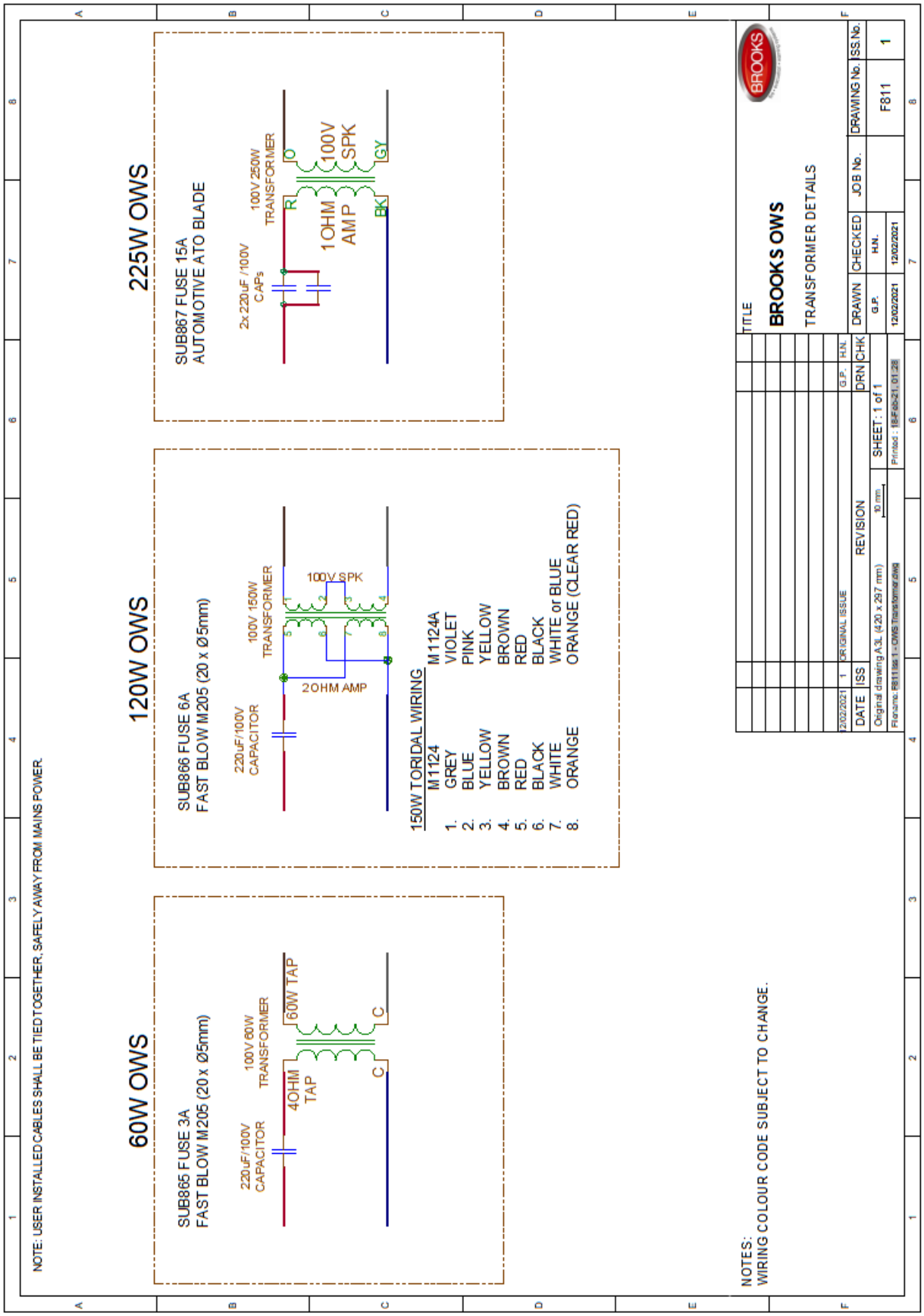

Figure 16 F811 Iss 1 Brooks OWS Transformer Details

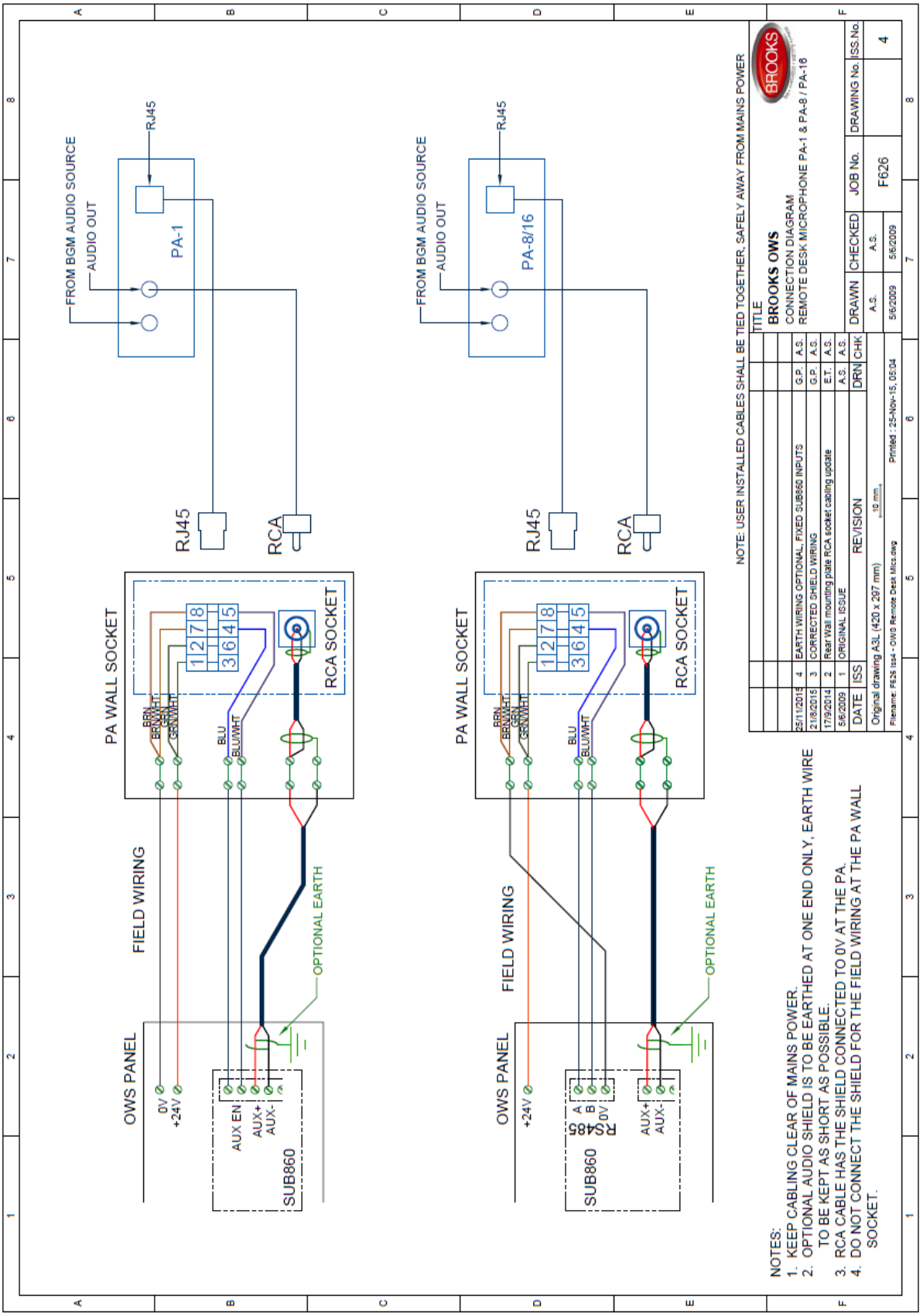

Figure 17 F626 Iss 4 Optional Remote Desktop Microphone


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