

Speaker Isolation Module for 100V PA lines

Model: **SIM-Mk2** (formerly model PISOL Mk2)



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To prevent PA loudspeakers in a secure area from being used as microphones, the Speaker Isolation Module SIM-Mk2 is installed within the secure area between an incoming 100V speaker circuit and the speakers to be secured.

The secure area speaker circuit is physically disconnected from the main 100V line by a double pole relay whenever it is not being used to broadcast announcements or warning tones. The relay also shorts out any AC signal on the secure speaker circuit by placing a capacitor across the secure 100V line.

The speaker circuit in the secure area is connected to the main 100V line by a Voice Operated Switch (VOX) whenever audio above a preset trigger threshold is present. The isolated output then reproduces all tones and PA announcements.

The secure speaker wiring is monitored for open and short circuits by the use of a 56k ohm end-of-line (EOL) resistor. Any faults are communicated to the Control Panel by the SIM's fault relay connecting an 8.2k ohm resistor in parallel with the input 100V line.

An isolated and uncommitted Auxiliary change-over contact on the SIM fault relay is also available for connection to other supervisory equipment.

Multiple loudspeakers up to a maximum of 20 watts may be connected to the 100V Isolated Output of the module. Up to 2 speaker circuits may be connected.

The load presented by the secure speakers is driven by the amplifier driving the incoming 100V Input. The SIM does not have an inbuilt amplifier.

The module draws a maximum current of 70 milliamps and is supplied from the Control Panel. It does not need any additional power supplies or batteries.

The module can also be used on 70V systems. In this case, the secure speakers will also be driven at 70V.

Four diagnostic LEDs indicate the status of the module.

It is fully compliant with the functional requirements of AS2220, AS1670.1-2004 and AS1670.4-2004.

Advantages of using the Speaker Isolation Module SIM-Mk2

1. Reduces AS1851 maintenance and inspection requirement within secure areas, as the module does not require a mains supply or back-up batteries.
2. Provides continuous monitoring of secure area speakers for fault conditions.
3. Easy to install on existing wiring.
4. Analogue technology. No RF emissions.
5. Compact circuit board unit that can be mounted anywhere within the secure area.
6. Four diagnostic LEDs on each module allow easy diagnosis of problems such as: loss of power, loss of audio and open/short circuit faults.
7. Any number of speakers up to 20 watts total load can be connected.
8. The isolation module utilises existing power supply from the Control Unit.
9. Not a significant heat source - requires no additional ventilation.
10. Auxiliary contact on the fault relay.

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Description

The Speaker Isolation Module consists of two sections:

- 1: Voice Operated Switch (VOX)
- 2: Secure area speaker wiring monitor

1: Voice Operated Switch (VOX)

The speaker circuit in the secure area is connected to the main 100V line by a Voice Operated Switch (VOX) whenever audio on the main 100V line is above a preset trigger threshold.

The input to the VOX is fed via a bandpass filter which makes it less sensitive to signals outside the speech band. When the trigger threshold is exceeded, a double pole audio isolation relay is energized which connects the secure area speaker wiring to the main 100V line.

A 47uF 50V bi-polar capacitor in series with each 100V line isolates the fault monitoring circuit of the secure area speaker wiring from the main 100V line. Apart from these 2 x 47uF capacitors, there is no other circuitry to limit the pass-thru signal bandwidth.

When the audio signal drops below the trigger threshold, the double pole relay is de-energized after a delay (typically 6 seconds). This physically disconnects the secure area speaker circuit from the main 100V line whenever it is not being used to broadcast announcements or warning tones. The audio isolation relay also shorts out any AC signal on the secure speaker circuit by placing a 10uF capacitor across the secure area 100V line.

A green **AUDIO** LED (Fig 3) lights whenever the audio isolation relay is energized (secure area connected). If the 24V power supply is interrupted, the audio isolation relay will be de-energized and hence disconnect the secure area speaker wiring. The Fault relay (see below) is also de-energized, communicating a fault condition.

2: Secure area speaker wiring monitor

The secure area speaker wiring is monitored for open and short circuits by the use of a 56k ohm end-of-line (EOL) resistor. Two speaker runs can be connected, in which case each run is terminated with a 110k ohm EOL resistor.

Secure speakers require a DC blocking capacitor to be fitted to each speaker. Typical capacitor size is 1uF (50V bi-polar) per watt of speaker load.

Any faults are communicated to the Control Panel by the Speaker Isolation Module's fault relay connecting an 8.2k ohm resistor in parallel with the input 100V line. The Fault relay is de-energized when a fault is detected.

An isolated and uncommitted Auxiliary change-over contact (Fig 3) on the SIM fault relay is also available for connection to other supervisory equipment.

A looping terminal **EOL Loop** (Fig 4) is provided to allow for the installation of an EOL resistor for the Auxiliary contacts.

Two red LEDs (Fig 3) indicate **Open** and **Short** circuit faults on the secure area speaker wiring.

When a short circuit is detected on the secure area speaker wiring, the audio isolation relay is held de-energized so that the main 100V line is not shorted out should the VOX be triggered.

A green **OK** LED (Fig 3) lights whenever the fault relay is energized indicating that there are no faults on the secure area speaker wiring.

There is no separate **Power** LED as the **OK** LED or one of the two **Fault** LEDs will always be lit.

End-of-line (EOL) Resistors

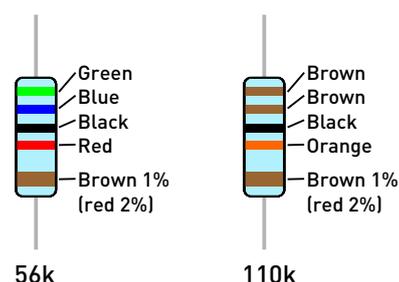
Suitable resistors are supplied.

56k ohms 2% 0.5 watt metal film resistor.

e.g. Altronics R7600 (Pk of 10)
or Element 14 (Farnell) 9340742

110k ohms 2% 0.5 watt metal film resistor.

e.g. Altronics R7607 (Pk of 10)
or Element 14 (Farnell) 9339868





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Absolute Maximum Ratings

Supply Voltage 30 volts
 100V Input 130V AC
 Operating Temperature Range 0-50 deg C
 Storage Temperature Range 0-90 deg C

Speaker Isolation Module SIM-Mk2

Electrical Characteristics 0dB = 0.775V RMS

Parameter	Conditions	Min	Typ	Max	Units
Supply Voltage		18	24	28	Volts
Supply Current (Max)	Supply = 28V. Audio and OK LEDs on	50	55	70	mA
Supply Current (Idle)	Supply = 28V. No audio, OK LED on	20	25	35	mA
Power dissipation	Supply = 28V		0.8	2.0	Watts
100V line Input	100V AC audio line from power amp		100	120	Volts
100V Line Output	In parallel with 100V input. For connection of additional unsecured speakers.	Same as 100V Line input			Volts
100V Isolated Output	100V signal to secure area speakers. Powered from main 100V line	Same as 100V Line input			Volts
End Of Line resistance	EOL at end of Isolated speaker wiring	54k	56k	58k	Ohms
Time to respond to change of EOL resistance			8	40	Seconds
Short Circuit detection	Must trip. EOL value	31k			Ohms
Open Circuit detection	Must trip. EOL value			83k	Ohms
VOX trigger threshold	Must not trigger. 1kHz sine wave			10	Volts AC
				-20	dB below 100V
	Must trigger. 1kHz sine wave			20	Volts AC
				-14	dB below 100V
	Low frequency -3dB corner frequency	65	80	110	Hz
	High frequency -3dB corner frequency	3	3.8	5	kHz
VOX trigger response time	20V 1kHz sine wave		5	15	mS
VOX Release time	1kHz sine wave less than 10V Recovery time until isolation relay opens	4	6	8	Seconds
Fault signalling	DC resistance switched in parallel with the input 100V line under fault conditions	7.7k	8.2k	8.9k	Ohms
	Auxiliary <i>voltage free</i> fault relay contact	1A 30V DC or 0.5A 125V AC (resistive load)			
Secure Area Audio Isolation	50Hz to 1kHz		125		dB
	50Hz to 20kHz	100	> 110		dB

Typical speaker wiring



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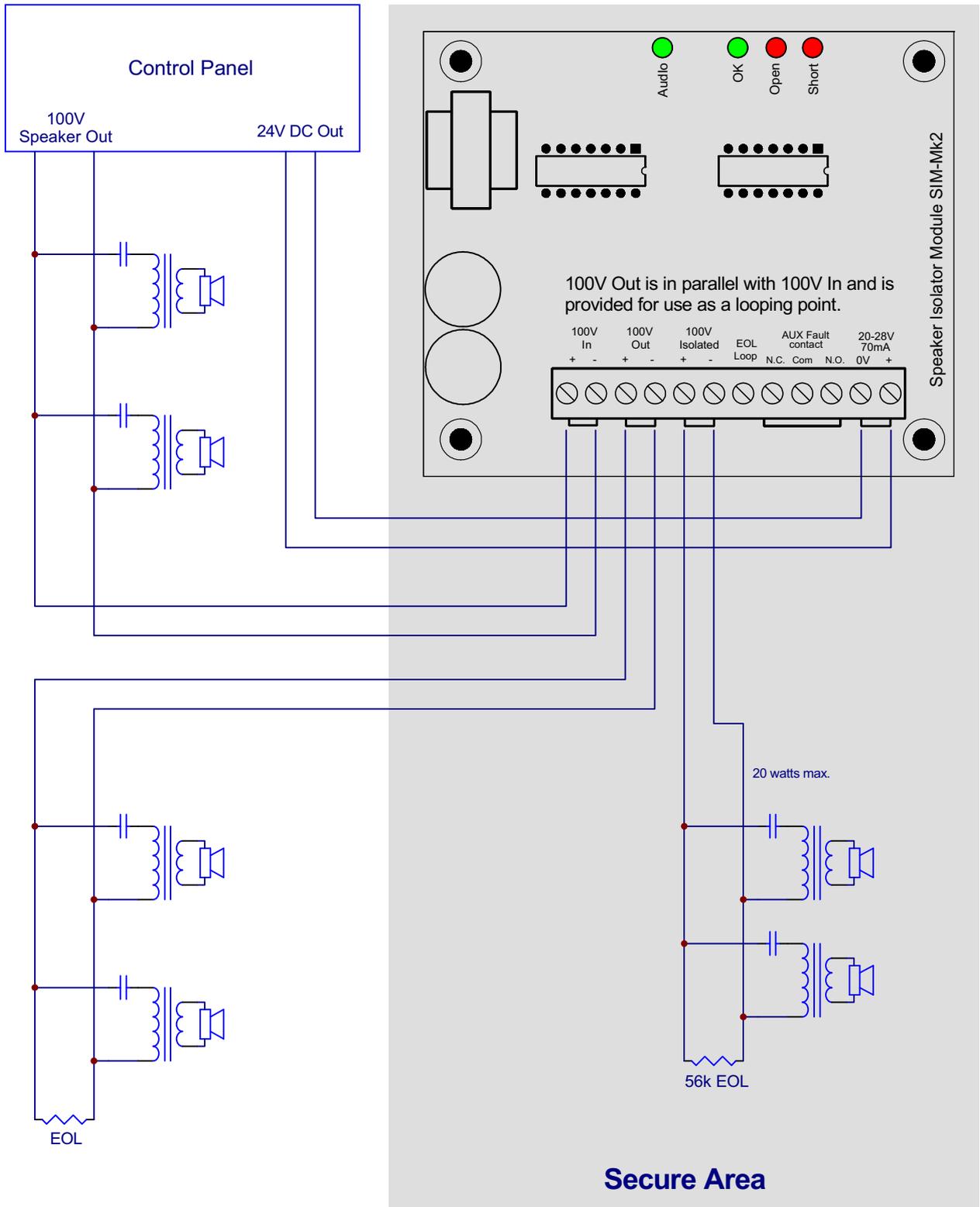


Fig 1.

Wiring with 2 secure area speaker runs



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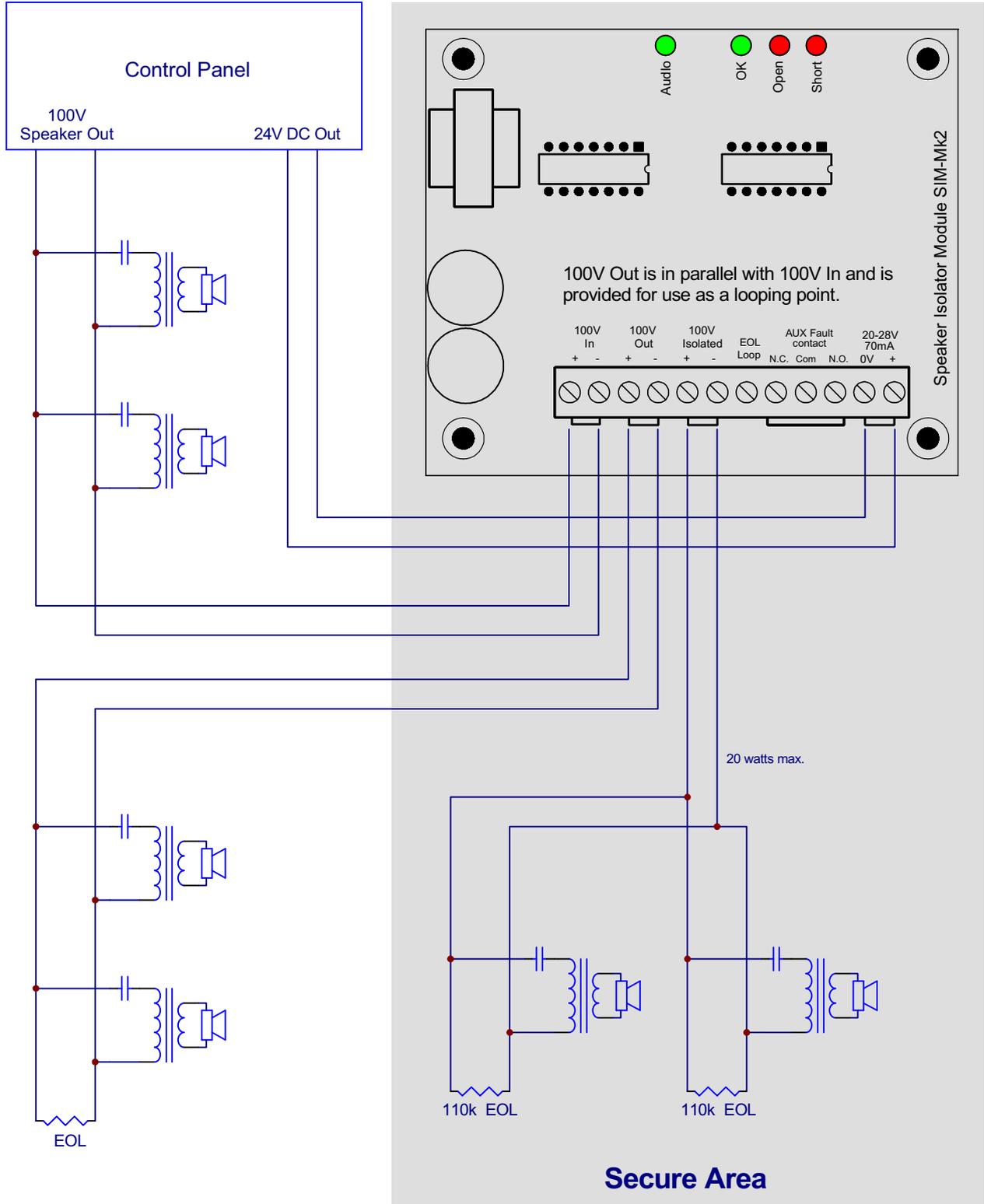


Fig 2.

PCB Dimensions and monitoring LEDs

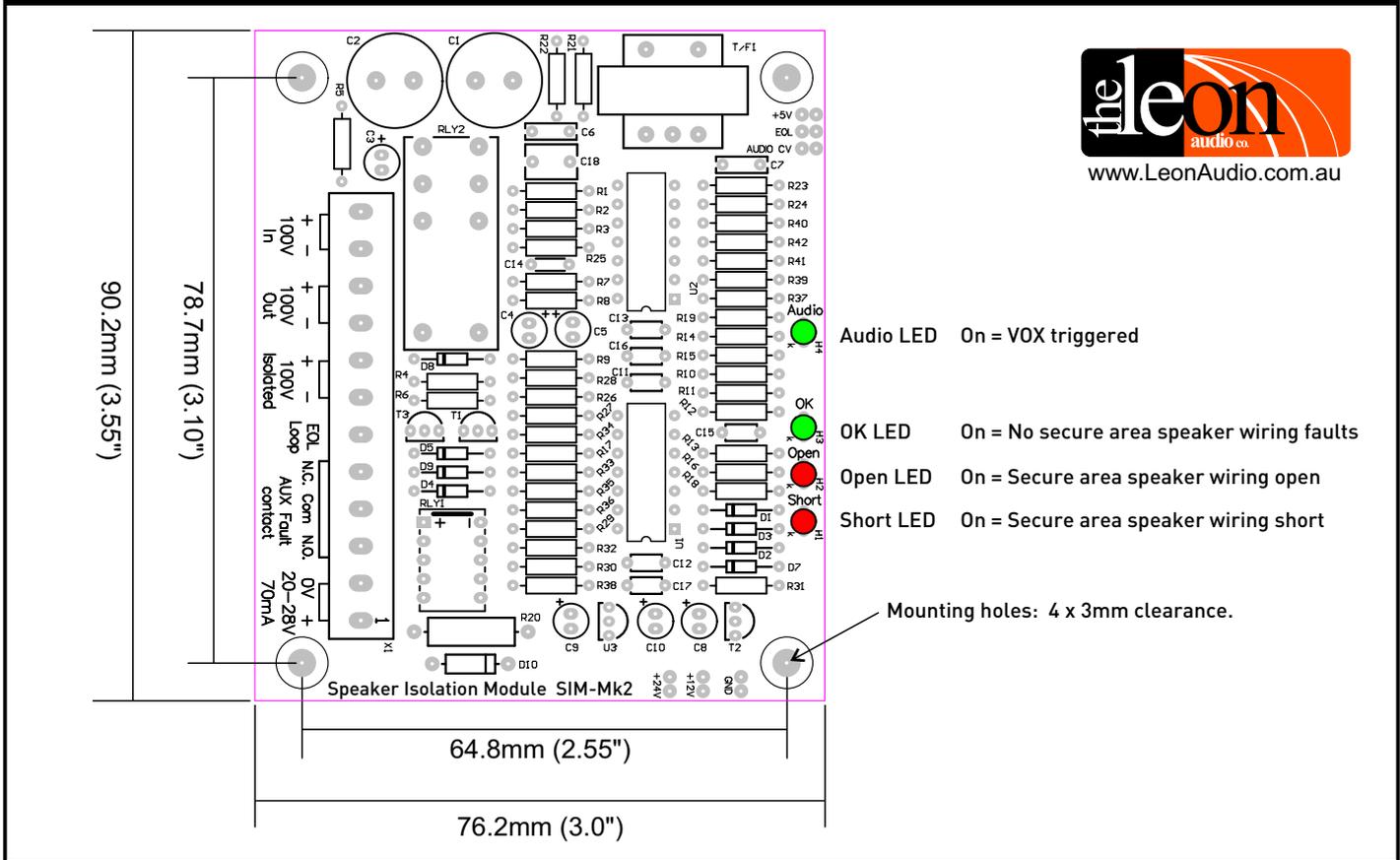


Fig 3.

AUX fault EOL resistor connection

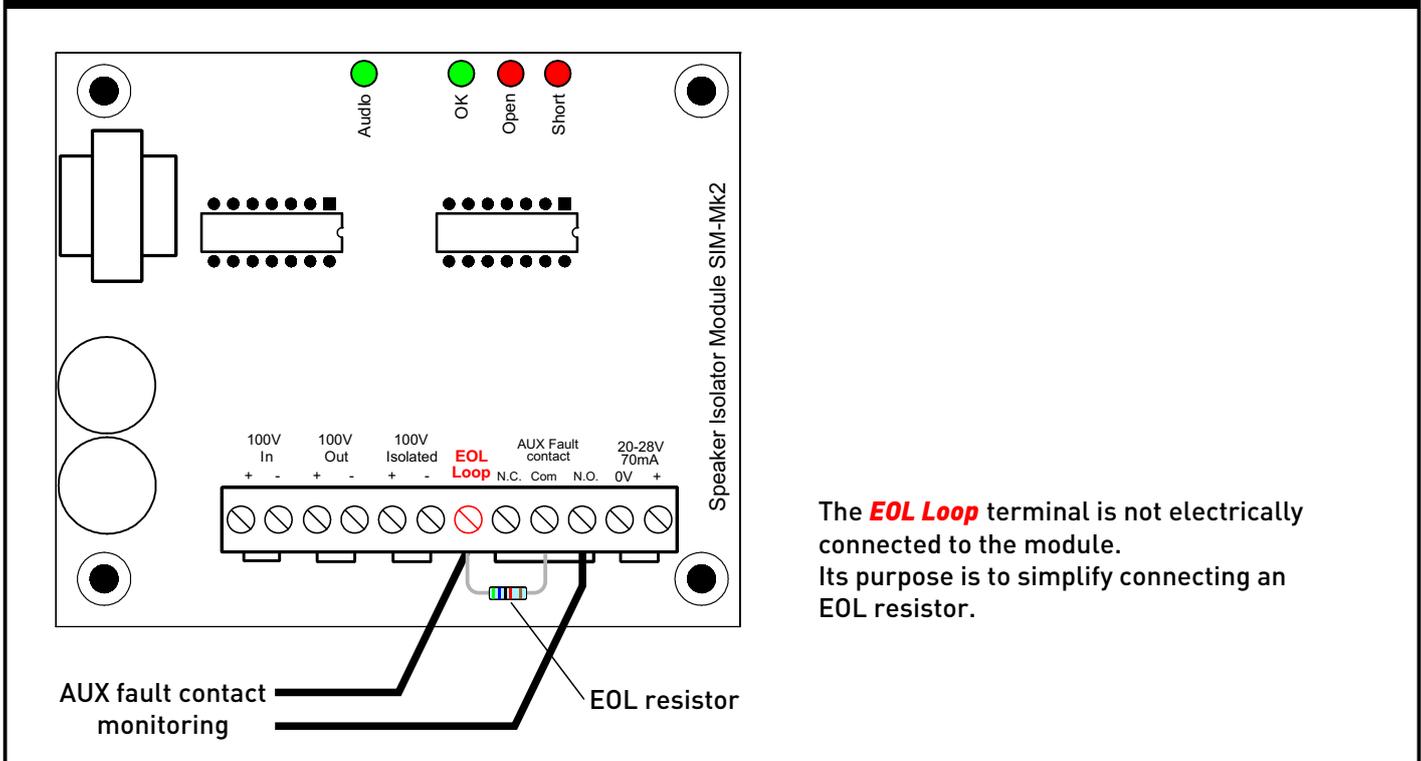


Fig 4.