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# VOICECOM TUNNELLING VAA MODULE

## User Manual


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Part Number: 143039, 143041


Revision: 0 – February 2014


Designed and manufactured in Australia by Ampcontrol CSM Pty Ltd



<p><b>WARNING!</b></p> 	<p><b>This safety alert symbol identifies important safety messages in this manual and indicates a potential risk of injury or even death to personnel. When you see this symbol, be alert, your safety is involved, carefully read the message that follows, and inform other operators.</b></p>
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<p><b>CAUTION!</b></p> 	<p><b>This safety alert symbol identifies important information to be read in order to ensure the correct sequence of work and to avoid damage or even destruction of the equipment, and reduce any potential risk of injury or death to personnel.</b></p>
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	<p><b>Supplementary information not directly affecting safety or damage to equipment. Carefully read the message that follows, and inform other relevant personnel.</b></p>
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 <p><small>ENVIRONMENTAL ALERT</small></p>	<p><b>Information concerning possible impact on the environment and actions required for prevention and proper response.</b></p>
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## Before You Begin

We would like to take a moment to thank you for purchasing the Ampcontrol Voicecom Tunnelling VAA Module.

<p><b>WARNING!</b></p> 	<p><b>To become completely familiar with this equipment and to ensure correct operation, we strongly recommend that you take the time to read and thoroughly understand this user manual.</b></p>
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# 1 SAFETY AND OTHER WARNINGS

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*For safety reasons, the Voicecom Tunnelling VAA Amplifier must be installed, operated and serviced only by competent personnel. Read and understand this instruction manual completely before installing, operating or servicing this equipment. Failure to install or operate this instrument in accordance with the instructions contained in this manual may create hazardous operating conditions.*

## 1.1 Safe Use of Equipment

The equipment supplied has been manufactured according to the state of the art, and designed to ensure a safe operation. The equipment may only be used within the design parameters.

The instructions within this manual must be observed as an aid towards achieving maximum safety during operation.

**The owner/user is responsible for observing the following instructions:**

### 1.1.1 Changes to Equipment

Changes in the design and modifications to the equipment are not permitted. Unauthorised changes made to the hardware or operating firmware will void the manufacturer's warranty, and may compromise the integrity of the system into which it is installed and other connected equipment.

### 1.1.2 Equipment Knowledge

Experience with, or understanding of, this equipment is essential for the safe installation and removal of the equipment. Therefore, in case of a question on how to safely proceed, contact Ampcontrol immediately.

### 1.1.3 Manual Handling

Precautions have been taken to ensure all equipment is safe to handle and free from sharp edges. However care should always be taken when handling enclosures and gloves should be worn.

### 1.1.4 Installation

Correct operation and safety depend on the Voicecom Tunnelling VAA Amplifier and associated equipment being installed correctly. Mechanical and or electrical installation and maintenance of plant and equipment must only be carried out by appropriately qualified personnel and must be tested thoroughly prior to operation.

### 1.1.5 Operation

As safety depends on the Tunnelling VAA Amplifier functioning correctly it is highly recommended that all safety functions of the module be periodically tested to ensure correct operation.

## 2 RECEIVING AND STORAGE

### 2.1 Receiving

All possible precautions are taken to protect the equipment against damage or losses during shipment, however before accepting delivery, check all items against the packing list or bill of loading. If there are shortages or evidence of physical damage, notify Ampcontrol immediately.

Notify Ampcontrol within 7 days (maximum) in case of shortages or discrepancies, according to the packing list. This action will help ensure a speedy resolution to any perceived problems. Keep a record of all claims and correspondence. Photographs are recommended.

Where practicable do not remove protective covers prior to installation unless there are indications of damage. Boxes opened for inspection and inventory should be carefully repacked to ensure protection of the contents or else the parts should be packaged and stored in a safe place. Examine all packing boxes, wrappings and covers for items attached to them, especially if the wrappings are to be discarded.

### 2.2 Inspection

Equipment that is found to be damaged or has been modified away from its published specification must not be used. Please contact Ampcontrol if the equipment is suspected to be different than that ordered or if it does not match the published specifications.

### 2.3 Storage after Delivery


When the equipment is not to be installed immediately, proper storage is important to ensure protection of equipment and validity of warranty.

All equipment should be stored indoors, preferably on shelves and protected from the elements.

### 2.4 Unpacking of Equipment

The method of packing used will depend on the size and quantity of the equipment. The following cautions should be interpreted as appropriate.

<b>CAUTION!</b> 	<p><b>Take care when unpacking crates as the contents may have shifted during transport.</b></p>
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 <small>ENVIRONMENTAL ALERT</small>	<p><b>The disposal of packaging materials, replaced parts, or components must comply with environmental restrictions without polluting the soil, air or water.</b></p> <p><b>Ensure that any timber and cardboard used as packaging is disposed of in a safe and environmentally responsible manner.</b></p> <p><b>Where possible, dispose of all waste products i.e. oils, metals, plastic and rubber products by using an approved recycling service centre.</b></p>
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## 3 INSTALLATION

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### 3.1 General Warnings

These instructions have been designed to assist users of the Voicecom Tunnelling VAA Module with installation.

Before the VAA Module can be installed, there are a number of things that need to be considered and understood to prevent incorrect or unsafe operation of the module or the system into which it is installed.

Along with relevant competence, and an understanding of the target application, the following points should be considered:

#### 3.1.1 Ensure that the information provided in this user manual is fully understood.

It is extremely important that the limitations and functionality of the VAA Module are understood to prevent incorrect installation and use from creating a potentially dangerous risk. If in doubt as to the nature of the limitations or their implication, consult a competent authority such as a supervisor or Ampcontrol technical representative.

#### 3.1.2 Ensure that the application into which the Voicecom Tunnelling VAA Module is being installed has been properly defined, designed and approved.

Any system intended to mitigate the risk of injury needs to be properly designed and implemented. Such a system must be the result of structured risk analysis with the outcomes used to define the system requirements. These requirements, in turn, will guide the choice of instrumentation, logic solvers and actuators needed to implement the system. Understanding the needs of the system will ensure proper selection of equipment.

#### 3.1.3 Ensure that the Voicecom Tunnelling VAA Module will properly perform the required functions within the system design.

It is important to understand how the VAA Module is intended to interact with other equipment within a system. For safe and reliable use, it is crucial that neither the module's logical operation nor its signalling be compromised by incompatibilities with connected equipment.

#### 3.1.4 Modifications of any form to the Voicecom Tunnelling VAA Module are prohibited.

The Voicecom Tunnelling VAA Module as supplied has been designed and manufactured to comply with the requirements of protection standards. If modifications of any form are made to the module, the equipment may no longer be fit for use. If any modifications or damage to the module is evident, do not use the equipment and contact Ampcontrol for advice.

### 3.2 Mandatory Installation Practices

The following information must be adhered to when installing the Voicecom Tunnelling VAA Module. Failure to adhere to this information may give rise to unsafe operation.

Using the unit in a manner that exceeds its electrical, functional or physical specifications, or in a way that is contrary to its operating restrictions, may create risks to personnel and/or equipment resulting in injury or death.

- The module must be powered within the specified voltage range.
- The installation of the module must be carried out by suitably trained and qualified personnel.
- Identification labels fixed to the module must not be damaged, removed or covered before, during or after installation.
- The installation is to be in accordance with the relevant installation Standards/Codes of Practice.

- Modifications must not be made to any part of the Voicecom Tunnelling VAA Module. As supplied, the unit is built to, and complies with the relevant standards. Modifications to its construction will render the unit non-compliant.
- Complete and accurate records of the installation must be kept as part of the site installation.



## 4 VOICECOM TUNNELLING VAA MODULE OVERVIEW

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Ampcontrol's Voicecom Tunnelling Amplifier (VAA) is a field communication module used either as a standalone system or as part of the Voicecom Communication System. It provides intercom capability with integrated microphone and speakers for use in mining and tunnelling applications.

The Tunnelling VAA operates on a supply input of -9 to -36VDC, with a nominal -24VDC supplied to the module.

### Key Features

- IP66 ingress protection rating when enclosed in a standard Ampcontrol stainless steel housing
- LCD display showing operational status values such as line voltage
- Durable four button membrane keypad
- Dust and moisture protected microphone
- Connection for two external speakers
- Address, microphone gain and speaker volume configurable at the VAA
- Class D high efficiency amplifier
- Individual modules identified by unique serial number.

The VAA Amplifier monitors line voltage which allows for fault finding of issues along the communication line. The VAA programmable settings can be changed locally at the VAA Module using the unit's programming mode. Locally generated call function tones and configurable operational settings allow each VAA module to be set up to suit installation conditions.

The VAA has four speaker volume levels and two microphone gain levels that can be configured, depending on the level of background noise. The VAA also has a seven level threshold setting that prevents unwanted noise from being amplified. This results in a high quality and clearly understood audio output, for reliable and effective communication.

## 5 SYSTEM CONFIGURATION

### 5.1 Application

The Tunnelling VAA modules are connected together to form a communication line. In tunnelling applications, the -24VDC power supply can be installed anywhere in the system. Multiple power supplies may be required depending on the length of cable and the number of VAA modules installed. When an operator speaks on one of the VAA modules, it is broadcast across all of the connected units. Figure 1 shows a basic example of this application.

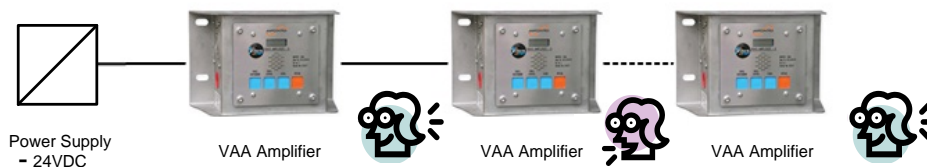


Figure 1: VAA Module System Application

### 5.2 Installation

#### 5.2.1 VAA Physical Installation

The VAA is available as a panel mountable module for installation into an existing enclosure or door. Figure 2 shows the general arrangement of the panel mounted module. The VAA is also available in its own stainless steel enclosure. The VAA stainless steel IP66 enclosure includes two speakers and gland entries. Figure 3 shows the dimensions of the VAA module standard enclosure.

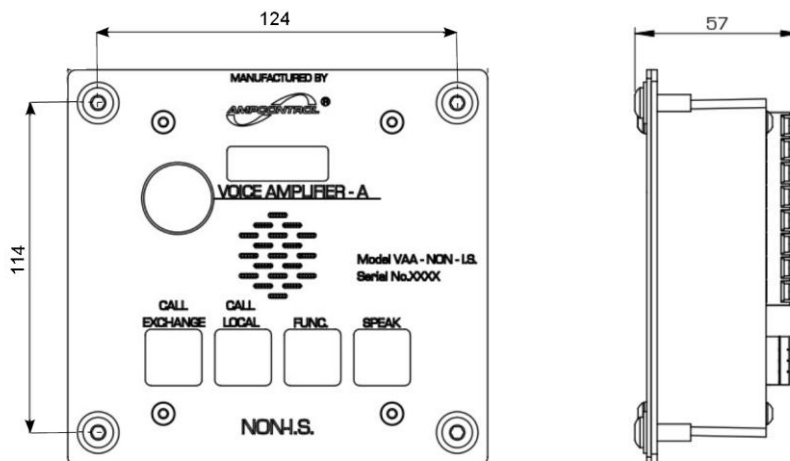


Figure 2: VAA Panel Mountable Module

The VAA module consists of the following items:

1. VAA amplifier sub-assembly
2. 4-way mini plug for speaker connection
3. Terminal connection for Voicecom communication line
4. Four M6 x 20mm Allen head bolts
5. Four M6 nylon flat washers

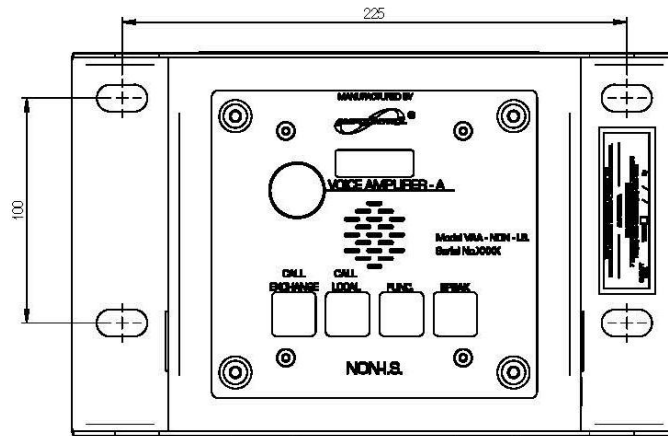



Figure 3: VAA Module Standard Enclosure

	<p><b>Only the approved speakers can be connected to the Voicecom VAA Amplifier. Two 12W, 8Ω speakers are available as a separate item.</b></p>
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### 5.2.2 Connections and Wiring

The VAA module is connected up as per Figure 4 below:

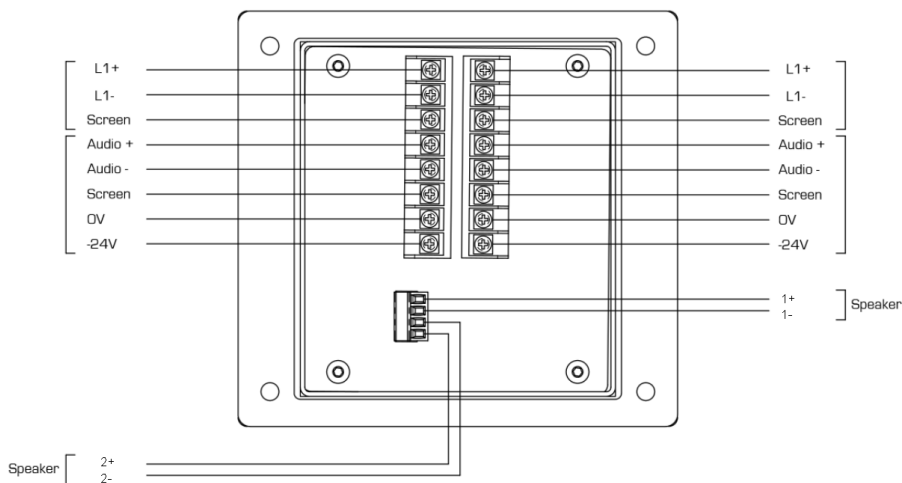



Figure 4: VAA module connections details

Terminal connections for the VAA Module are outlined in the table below:

Terminal	Function
L1+	iMAC Communications/digital line
L1-	iMAC Communications/digital line
Screen	iMAC Screen
Audio+	Voicecom Audio line
Audio-	Voicecom Audio line
Screen	Voicecom Screen
0V	0V supply line
-24V	-24V supply line
1+	Speaker 1 positive
1-	Speaker 1 negative
2+	Speaker 2 positive
2-	Speaker 2 negative

	<p style="text-align: center;"><b>The 4-way speaker terminal allows for the connection of two speakers. Wire length between the speakers and the VAA should not exceed 300mm. Cable must be a minimum of 0.1mm in diameter and have insulation of 0.25mm minimum. Take note of speaker polarity when wiring.</b></p>
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### 5.3 Making and Receiving Calls

Calls can be made either locally (between VAA Modules), or to connected telephone lines via a Telephone Exchange. These calls are made via the keypad on the VAA unit.

## 6 SYSTEM COMPONENTS

### 6.1 VAA Tunnelling Amplifier Module

#### 6.1.1 Brief Description

The Voicecom Tunnelling Amplifier is a field communication module for the Ampcontrol Voicecom system. The VAA has an internal microphone and connections for two external speakers. Four buttons are provided for controlling calling functions and an LCD display shows Voicecom line and VAA status information.

The VAA is available as a stand-alone panel mount assembly or in a standard stainless steel IP66 rated enclosure complete with two speakers and glanded or socketed entries. The panel mount assembly contains an integrated gasket providing IP66 protection when installed to specification.

#### 6.1.2 Display

The LCD display cycles through the VAA’s key operating parameters such as the communication line voltage, battery voltage, battery current and a system digital communication “heart beat”.

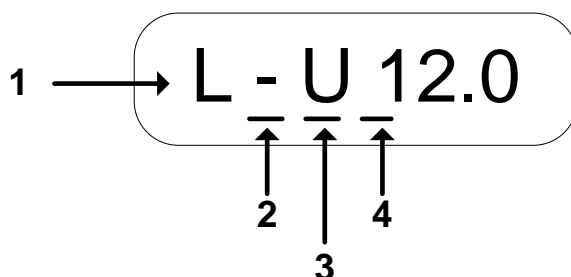



Figure 5: LCD Display

1. VAA operational parameters (cycles between L-U = line volts, B-U = battery volts and B-I = battery current)
2. Amplifier on status indicator bar
3. Digital communications heartbeat status indicator bar
4. VAA data polling status indicator bar

	<p style="text-align: center;"><b>Some of the operational parameters shown on the LCD display are not used for VAA standalone systems, for example, this model does not contain a battery.</b></p>
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The display shows the VAA’s current operational parameters and status including line voltage, battery voltage and battery current in milliamps. The display continuously cycles through these three operational values as shown in Figure 6 below.

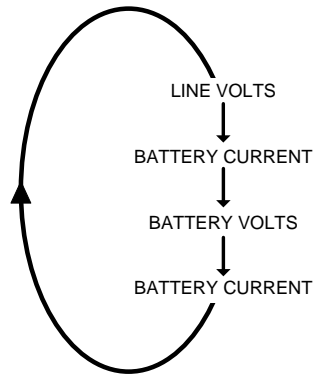


Figure 6: Display Cycle

### 6.1.3 Display Segments

The VAA display has three horizontal status segments to assist in fault finding. From left to right these segments are:

- *VAA Amplifier on* – while the VAA’s amplifier circuit is enabled, this segment will remain on. The amplifier circuit is enabled when the VAA amplifies sound through its speakers.
- *Digital communication heart beat* – when a VAA is connected to a healthy Voicecom communication line. This segment is not used in VAA standalone systems.
- *VAA data poll* – The Voicecom Controller Module does a “round robin” scan of all 31 VAA addresses. Every time a VAA is polled this segment will flash. This segment is not used in VAA standalone systems.



**VAA’s with Version 1 firmware do not have these status segments.**

### 6.1.4 Keypads

The four buttons on the VAA keypad are SPEAK, FUNC, CALL LOCAL and CALL EXCHANGE as shown below. These buttons control operation of the unit and also allow configuration of the VAA settings. Figure 7 shows the front fascia of the module.

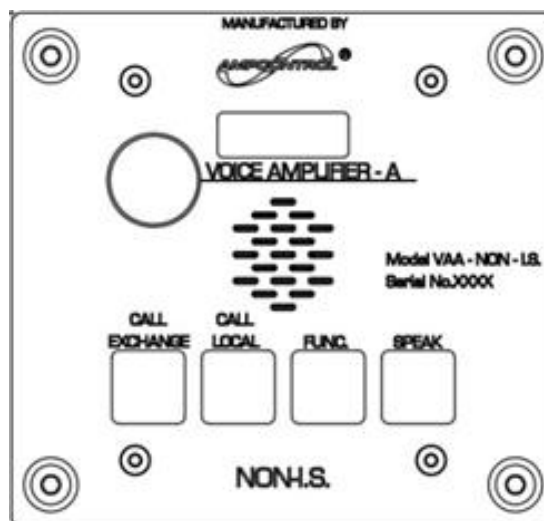
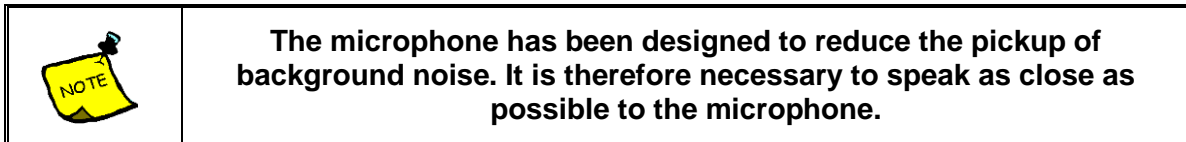


Figure 7: VAA module front fascia

Each of the four VAA keypad buttons generate a different tone when pressed. The SPEAK button generates a brief tone when pressed and then a higher pitch tone when released. Pressing the CALL LOCAL button also generates a tone that can also be used to get the attention of other users. The CALL EXCHANGE button generates a low frequency tone for a short duration (200Hz for 5 seconds) that can be used to open telephone circuits. The FUNC button, when pressed, closes one of the VCA Controller's digital outputs. This output can be used to trigger an external event, such as prompting a PLC to initiate certain voice messages.

#### 6.1.4.1 SPEAK

Press the SPEAK button to communicate with another user. This voice communication will be broadcast on all connected VAAs. When pressed, a brief, low frequency tone (752Hz) is generated, which is used to get the attention of other users. When the SPEAK button is released, a second, brief tone (1002Hz) is heard, higher in frequency than the first to indicate that speaker has ended their broadcast. The LCD display shows the text "SPEECH" while the button is pressed.



#### 6.1.4.2 FUNC

The FUNC (Function) button, when pressed, can be used to trigger an external event when connected in a Voicecom communication system. In a standalone system the main use of this button is to allow the user to enter the VAA Setup Mode, and to make changes to the VAA settings. A brief tone is generated when this button is pressed that is only heard locally at that VAA.

#### 6.1.4.3 CALL LOCAL

The Call Local button causes the VAA to generate an 848Hz tone while being pressed. This tone is heard at that VAA and all other VAA's connected across the whole system. It can be used for signalling other users. The display shows the text "CALL Lo" while the button is pressed. This button is also used to make changes to the VAA parameters while in Setup Mode.

#### 6.1.4.4 CALL EXCHANGE

The Call Exchange button, when pressed, causes the VAA to generate a 5 second low tone (200Hz). This tone is heard at that VAA and all other VAA's connected across the whole system. If the Voicecom system is connected to telephone pair, this tone can be used to open a voice circuit for communication with the surface. The display shows the text "CALL EH" while the button is pressed.

### 6.2 DC-DC Converter

A third party DC-DC Converter is used to provide power to the Tunnelling VAA Module. This module allows for a fully regulated supply output with low noise. The DC-DC Converter also has the benefit of a wide temperature operating range which is advantageous in tunnelling applications. No minimum load is required for the supply to operate and short-circuit protection is provided to ensure safe and reliable supply to the VAA Amplifier unit.

## 7 SYSTEM SETUP

### 7.1 Setup Mode


The VAA Setup Mode allows the VAA's user programmable settings to be changed locally at the VAA unit. This allows the VAA to be correctly set up when it is connected to the communication line. These settings are:

- VAA operating mode
- Local volume
- Threshold
- Battery charging current (not relevant for this VAA Model)
- VAA address.

### 7.2 Entering Setup Mode

A special key sequence is required to enter VAA setup mode. To enter setup mode follow the procedure below:

Step	Description	Display
1	Press and hold the VAA's SPEAK and FUNC buttons at the same time.	SPEAK
2	After a few seconds the screen will show the text SETUP F. The F will begin to flash slowly, on for one second, and then off for one second. Press and release the FUNC key in time with the flashing F. Release the FUNC button when the F disappears and press the FUNC button when the F reappears. <b>The SPEAK button must remain pressed.</b>	SETUP F
3	If the FUNC button presses mimic the flashing F closely enough, access to Setup mode is granted. The display will briefly show the firmware version before displaying the first VAA setting. The SPEAK and FUNC buttons can then be released.	VAA V4

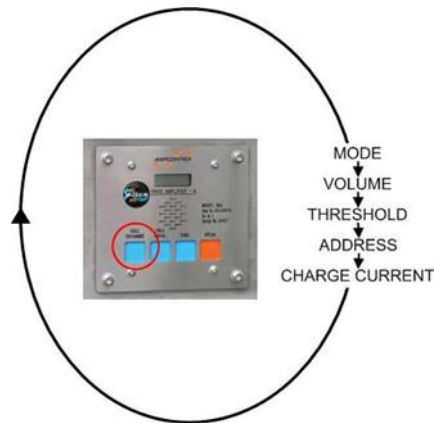
	<p><b>The VAA display will quit out of Setup Mode if no keys are pressed for 5 seconds and any changes will not be saved. Continually pressing the CALL EXCHANGE button will reset the timer and will keep the VAA in Setup Mode.</b></p>
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### 7.3 Changing Settings

Once setup mode has been entered, the following process can be used for changing settings. The available settings are shown in Figure 8.

1. Press the CALL EXCHANGE button to scroll through the 5 settings.
2. Press the FUNC button to increase the setting value or the CALL LOCAL button to decrease the value.
3. Press the SPEAK button to save the new settings.





*Figure 8: VAA Programmable Settings*

### 7.3.1 Programmable Settings

Display	Meaning	Values	Description
MD	VAA Mode	VCA or ---	If connected to a Voicecom system which does not include a VCA, this should be set to ---. In cases where a VCA is connected, the setting should be set to VCA.
VOL	Volume/Gain	L0 to L3 and H0 to H3	The amplifier speaker volume and microphone gain are combined into one setting, for example “L3” where L is the gain level and 3 is the volume level. The volume can be set to a value from 0 to 3 where 3 is the maximum. This applies to voice communication only. The microphone gain can be set to “L” for low or “H” for high. Low gain would be appropriate for an environment with a high level of background noise. It requires the operator speaks close to the VAA with a raised voice. High gain is suitable for most other low noise environments.
THRS	Threshold	0 to 7	This setting determines what level of audio present on the communication line will be amplified by the VAA unit. The threshold can be set from 0 to 7 where 7 would provide the highest level of noise immunity. A higher value is used if there is some induced noise on the line causing the VAA units to turn on unintentionally.
ICHG	Charging Current	5 to 40 (in mA)	This setting is the amount of current the VAA will draw from the communication line to charge its battery (This settings is not applicable for this VAA model).
ADDR	VAA Address	1 to 31	In cases where a VCA is connected, each VAA must be given a unique address. Setting two VAAs to the same address will cause an address clash.

## 8 TROUBLESHOOTING

Problem	Cause	Remedy
<i>Constant digital noise on line</i>	Poor/Faulty wiring	Possible issues <ul style="list-style-type: none"> <li>- Spare cores on line not earthed at one point</li> <li>- Shield not earthed at one point</li> <li>- Spare cores not continuous</li> <li>- Shield not continuous</li> </ul>
	Thresholds on VAA units too low	Adjust threshold settings on the VAA units emitting the digital noise
	VAA fault	Isolate individual unit and replace
<i>Nil speaker output</i>	Speaker cable fault	Check speaking wiring
	Speaker fault	Replace Speaker
	VAA amplifier fault	Replace VAA
<i>Nil microphone</i>	SPEAK button fault	Check SPEAK button
	Microphone fault	Replace VAA
<i>Blank LCD</i>	No power	Check -24VDC power supply
	LCD fault	Replace VAA

## 9 SERVICE, MAINTENANCE & DISPOSAL

### 9.1 Equipment Service

The Voicecom Tunnelling VAA Module requires no internal servicing during its normal operating life. A number of external system based checks should however be completed on a regular basis. These 'routine inspections' must be carried out by suitably trained people with knowledge of the Tunnelling VAA Module and the systems into which it is fitted. Routine inspections may take the form of either visual-only checks, or visual and 'hands-on' checks.

#### 9.1.1 Visual Only Inspections

A basic visual inspection focuses on looking at the installation for signs of physical damage, water or dust ingress and the condition of cables and labels. This level of inspection may also include cleaning display windows that have become obscured by dirt.

Observations would typically be:

- Check that equipment enclosures, cable trays, conduits, etc. are in good order with no physical damage.
- Check that sealed wall boxes are free from water and dust ingress internally. Door seals are in good condition.
- Check that connected cables are free from cuts, abrasions and obvious signs of damage. Cable restraints are in good order and correctly fitted.
- Check that labels on equipment, wall boxes and cables are present and in good condition (especially certification labels).
- Check that no modifications have been carried out to installed equipment.


#### 9.1.2 Hands-On (Detailed) Inspections

A more detailed inspection would include all of the elements of a visual inspection, plus some checks that cover the integrity of connections, fixtures and fittings.


In addition to basic visual observations, more detailed integrity checks would involve:

- Verify that equipment housings, wall boxes and other mechanical fixtures are secured in place. This includes terminal box lids, tightness of cable glands, integrity of wall-box mountings, security of equipment fixing to walls/DIN rails etc.
- Verify all electrical connections are secure with no loose screw terminals or DIN rail terminals not fitted to rails etc.

### 9.2 Equipment Maintenance

<p><b>WARNING!</b></p> 	<p><b>The Voicecom Tunnelling VAA Module has no user-serviceable parts. All repairs must be carried out by Ampcontrol only. If a fault develops, return the relay to Ampcontrol for repair. It is essential that no attempt be made to repair the module as any attempt to dismantle or repair can seriously compromise the safety of the unit.</b></p>
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## 9.3 Disposal

 An icon depicting a person standing on a pile of waste next to a tree, with the text "ENVIRONMENTAL ALERT" below it. <p>ENVIRONMENTAL ALERT</p>	<p><b>The electronic equipment discussed in this manual must not be treated as general waste. By ensuring that this product is disposed of correctly you will be helping to prevent potentially negative consequences for the environment and human health which could otherwise be caused by incorrect waste handling of this product.</b></p>
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## 10 SPECIFICATIONS

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<b>Supply Voltage</b>	
<i>Voltage</i>	-9VDC to -36VDC (-24VDC nominal)
<i>Nominal input current</i>	20mA at no load 110mA at full load
<i>Operating Temperature</i>	-20°C to +50°C

<b>Default Operating Settings</b>	
<i>Volume</i>	3
<i>Microphone Gain</i>	High
<i>Audio Threshold</i>	2

<b>Mechanical</b>	
<i>Dimensions (standard enclosure)</i>	170x270x121.5mm (HxWxD)
<i>Dimensions (panel mount assembly)</i>	137x145x57mm (HxWxD)
<i>IP Rating</i>	IP66

## 11 EQUIPMENT LIST

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<b>Part Number</b>	<b>Description</b>
143039	AMPLIFIER VAA STANDARD ENCLSURE GLANDED NO BATTERY
143041	AMPLIFIER VAA PANEL MOUNT NO BATTERY

### 11.1 Optional Equipment

<b>Part Number</b>	<b>Description</b>
120712	KIT VCOM SPEAKER 8ohm 12W 400mm LEAD & GSKT
144372	KIT VCOM SPEAKER 8ohm 12W 400mm LEAD & GSKT & GRILL
121100	VIA AUDIO ISOLATION MODULE