OV4 Owners Manual

Orange Amplifiers
OMEC House
108 Ripon Way
Borehamwood
Hertfordshire
WD6 2JA
ENGLAND
Tel: +44 20 8905 2828
Fax: +44 20 8905 2868
Email:info@omec.com

Orange USA
2065 Peachtree Industrial Ct.
Suite 208
Atlanta, GA 30341
USA
Tel: 1-404-303-8196
Fax: 1-404-303-7176
Email: info@orangeusa.com

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Thank You For Choosing Orange.

Since 1968, when the company was founded, Orange has been a pioneering force in the guitar amplification industry. Today, with a team of the world's finest amplifier engineers, Orange continues to push back the boundaries of conventional valve amplifier design.

Our commitment to craftsmanship and quality control has allowed our amplification products to stand the test of time, giving their owners as much pleasure now as the day they were bought. To maintain this level of excellence, each Orange product is put through many rigorous test procedures before leaving the factory.

The warmth, tonal quality and rich harmonics generated by a valve amplifier cannot be reproduced by 'artificial' means. Many guitarists have reached the same conclusion: neither the transistor nor microchip is a suitable alternative to valve technology.

This booklet contains valuable technical and safety information. Please take the time to read this manual as the information may enhance the sound and performance of your amplifier.

Amplifier Biasing Background Information

Put simply, bias is your idle adjustment for your valves - it's like making sure your car is ticking over properly. In fixed bias amplifiers, this is achieved by applying a negative voltage to the valves control grid - literally a grid of wire that sits between the cathode and plate. When you switch your amp on, electrons are generated at the cathode and pulled towards the plate, causing current to flow. This happens because electrons are negatively charged particles and the plate is energised with a strong positive voltage opposite poles attract.

Varying the control grid's negative voltage means this flow of electrons can be slowed to a trickle, or even stopped - like poles repel. Although people often refer to the negative bias voltage setting, it's the actual idle current that is important. All valves have an ideal idle current, typically around 30-50 milliamps, and for the amp to operate at its best it's important that all your output valves are idling equally. This is done by fitting valves that have been matched in pairs or quartets. However even the best matching doesn't mean that valves will wear equally, so in order to keep your amp operating at its best, an occasional small adjustment to the bias is sometimes necessary. Usually these adjustments are at best a compromise as individual output valves rarely draw the same idle current.

The Orange DIVO OV4 addresses these issues and takes care of the biasing keeping the most wayward valves on the straight and narrow. It also does much more!

Before Operating Read These Important Safety Instructions

	The lightening flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated ‘dangerous voltage’ within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock.
	The exclamation point within an equilateral triangle and “WARNING” are intended to alert the user to the presence of important operating instructions. Failure to heed the Instructions will result in severe injury or death.

Read these instructions, keep these instructions. Heed all warnings, follow these instructions.

WARNING : Amplifiers and components inside them contain potentially fatal high voltages. Voltages are present when the amplifier is turned on and also for some time after the amplifier has been turned off. You can still get an electric shock when an amplifier is turned off and disconnected from the power.

All installations and product adjustment / removals must be performed by an Orange Amplifier approved fitting centre.

Disclaimer: Orange Amplifiers, its suppliers and subsidiaries accept no liability for any damage(s), injury(s) or death incurred from or while installing or using this product.

It is the responsibility of the authorised installer to perform the installation strictly in accordance with the installation guidelines. The installer will take full responsibility for the installation. Orange Amplifiers will only accept liability for their own branded product. For the avoidance of doubt, not the customers amplifier or installation work undertaken.

Do not open the equipment case. There are no user serviceable parts in this product. Refer all servicing to qualified service personnel. Unauthorised modification of this equipment is strictly forbidden.

If the product does not operate normally when the operating instructions are followed, then refer the product to a qualified service engineer.

All electrical and electronic products should be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or local authorities.

DIVO OV4 General Overview

The OV4 product is designed to be retrofitted into fixed bias100w/50w guitar valve amplifiers to improve the reliability and performance. For the safety reasons mentioned and to ensure correct installation and configuration within your amp, the OV4 must be installed by qualified personnel via an authorised dealer.

Key Features

Automatically biases output valves and continually adjusts bias to ensure the full potential of each valve within the amp is realised. Once fitted, power valve bias is automatic.

Valves can be exchanged ‘plug and play’ fashion.

Negates the need to purchase valves matched pairs / quads.

Can be used with different combinations of power valves to create different tones, using EL34s, 6L6s KT88s, etc.....
Improves the longevity of the amp valves by an estimated 40%
Timed initial start up sequence, to prevent cathode stripping of the valves
Valves can drop to a low bias level if no audio is detected.

Half power input (via a separate footswitch) to turn a 100W head into a 50W head.
User definable switching between power valves during half power operation.

‘Share the wear’ feature. Alternates between valves when the half power switch is used, to share the wear between output power valves.

Optional selectable switch between custom bias levels i.e. ‘standard’ and ‘custom’

Visual indication to display when a valve has gone faulty so only the faulty valve needs to be replaced.

Visual fault indication via an optional footswitch to display when a valve is faulty or what pair of valves is selected during half power operation.

Dynamic valve fault detection.

Switches out faulty valves and runs the amp at half power until the defective valve can be changed (100w amp)

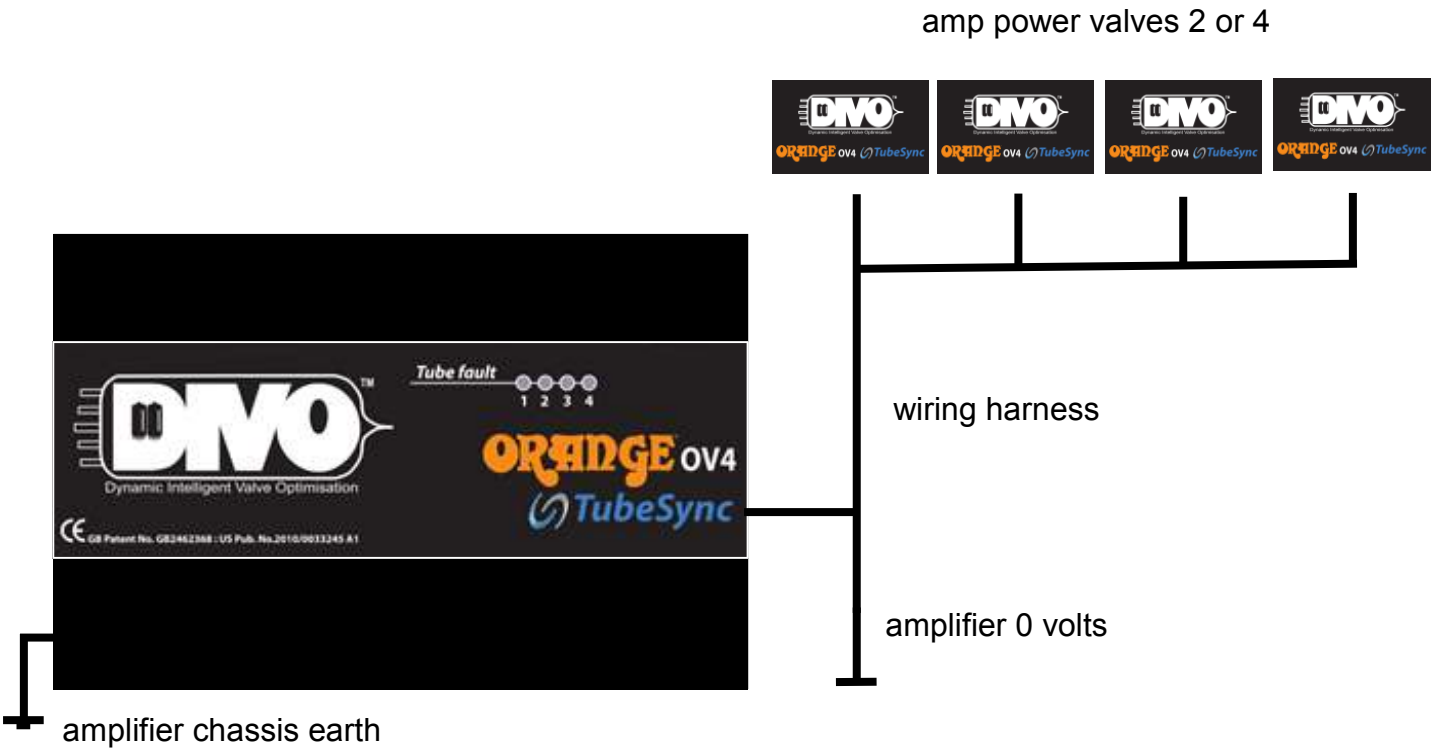
Can help prevent the amp from catastrophic damage, by isolating the faulty valve, thus, saving the end user money in expensive repair bills.

Automatically compensates for variation in various mains supplies.

If progressive standby is used the amp power consumption is reduced by an average of 30%

Custom configuration when taken to an approved service point.

System Block Diagram and Functions



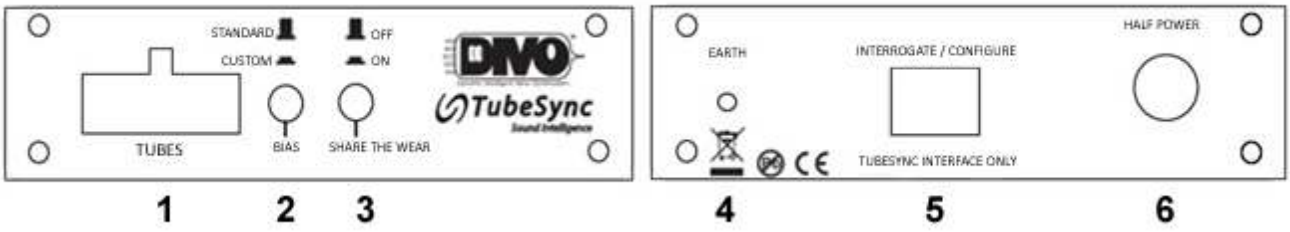
Valve fault indicators.
LEDs flash during power up.
Individual LEDs illuminate to a corresponding valve failure.
For 100W heads (4 valves) all four LEDs are operational.
For 50W heads LEDs 2&3 are in operation.

Mechanical Information

Size 160mm X 100mm X 30mm

Approx Weight 470g

Panel Features & Functions



1. Valve Power Connector

12 way power connector used for connecting the OV4 module to the power valves.

2. Bias Setting

Selects the bias of the amplifier. There are two modes, 'custom' and 'standard'. In standard mode the bias level of the amplifier is set to 35mA. The custom bias setting can be configured by authorised personnel. The default factory settings for this mode are : 35mA , if the OV4 does not detect an audio signal, after 2 minutes the bias level drops to 20mA to preserve the life of the valves. As soon as audio is detected the bias level instantaneously reverts back to 35mA.

3. Share The Wear

Share the wear feature :
On : Valves alternate between pairs when in half power mode.
Off : Valves 2 & 3 are always selected when in half power.
This feature can be used to 'share the wear' between valves during half power operation or used to toggle or select a particular pair of valves during half power operation.

4. Earth

Earth connection point from the OV4 case to the amplifier earth. (usually the chassis).

5. Computer Interface

RJ45 connector interface for custom configuration and diagnostics. *This is for authorised personnel only.*

6. Half Power Input

Half power input : compatible with Orange DIVO footswitches. For use with 100W (four valve) amplifiers. When operated, a pair of valves can be switched out so the amplifier can run at half power. This feature can be operated with 'share the wear' ON or OFF.

IMPORTANT. If the amp is going to be used regularly or 'driven 'hard' in 'two valve' mode, the speaker outputs should be correctly matched to the amplifier. e.g. if you are using an 8 ohm speaker change to 4 ohms or if you are using a 16 ohm speaker change to 8 ohms.

Functionality Quick Reference Guide

OV4 Quick Reference Guide To Functionality		
Condition (when OV4 is fitted)	**OV4 LEDs**	**Description**
Amplifier power up	LEDs flash	Calibration period
Amplifier standby switch ON	No LEDs illuminated	No auto biasing
Amplifier standby switch OFF	No LEDs illuminated	Auto biasing will take place when no audio is present
OV4 - Share the wear ON	No LEDs illuminated	Valves will alternate between pairs during half power mode
OV4 - Share the wear OFF	No LEDs illuminated	Valves 2+3 are always selected during half power mode
Valve goes faulty (100 W mode)	Appropriate fault LED will illuminate	The offending valve will be disconnected. The opposite pair of valves are selected. The amp runs at half power
Valve goes faulty (half power mode)	Appropriate fault LED will illuminate	The opposite pair of valves are selected
Valve is removed or goes open circuit.	Appropriate fault LED will illuminate	In this condition it takes approximately 1 minute for the fault LED to illuminate
OV4 - Standard bias mode ON	No LEDs illuminated	35mA bias always
OV4 - Custom bias mode ON	No LEDs illuminated	Custom bias. The bias will drop to 20mA after two minutes if no audio is seen

DIVO OV4 Operation

At power-on the OV4 performs a self calibration routine (indicated by the fault indicator LEDs flashing). This prevents damage to valves due to a process know as ‘cathode stripping’ The OV4 also checks for faulty valves during this period, under these circumstances, the fault indication and handling system will be instigated.

After calibration, a check is performed to see if the ‘standby’ switch is open or closed. In the event that the switch is open, the system does not attempt to re-bias the amp and will restore the last known working value of grid bias voltage for the amplifier. It will not re-bias the amplifier until the first ‘silent’ period, when corrective biasing will take place.

There are two bias settings on the OV4, standard and custom. The default factory settings are :
Standard: 35mA (no drop back bias feature)
Custom: 35mA with a drop back to 20mA when no audio has been detected for 2 minutes.
Custom values may be changed by an authorised Orange service point.

The OV4 has two biasing modes during normal operation, namely, when audio is present, i.e., when the amp is being ‘played’; the second is when no audio is present for example, during an interval period. When the OV4 detects that the amp has not been played for a preset time, it automatically switches between the two biasing modes, for example, to drop back to a lower bias setting when it is not being played, thereby reducing power consumption, heat generation and extending valve life, whilst eliminating the possibility of valve cathode poisoning.

The currents are continuously measured and ‘micro’ adjustments made if necessary to this value, every time there is no audio signal present for longer than approximately 2 seconds. This ensures an almost perfect balance even when valves are hot / leaky etc.

During non-audio periods, if a current higher than the maximum threshold value is detected in any valve, it will be switched out of circuit and the appropriate LED will be lit to indicate the faulty valve; a fault condition will also be logged against the appropriate valve.

If a fault condition occurs on a 4 valve amp, one of the other valves on ‘the other side’ of the push-pull quartet will also be switched out automatically in order to balance the amplifier. Automatic re-biasing will take place on the remaining pair of valves. The amp will now run at approximately half-power so that the performance can be continued without interruption (albeit at a lower power). If a footswitch is connected the on-board LED will indicate that a fault condition has occurred and the amp is running in ‘limp-home’ mode. The fault LED should then be consulted to determine the faulty valve.

If a faulty valve is detected when audio is present, the OV4 will determine whether the condition is normal due to the amplifier being driven hard with audio or whether a real fault condition is present. In this way, protection is given without the risk of false tripping.

DIVO OV4 Operation ... Continued

The power to the amplifier must be re-cycled in order to reset the fault condition. The OV4 will then treat the valve as normal again and monitor it for a fault condition once again; **however, it is strongly advised that the faulty valve is replaced before recycling the power to the amplifier for several reasons:**

A faulty valve sometimes does not exhibit any obvious fault until it is hot or under stress (when driven hard during a performance), so allowing it to cool can result in it apparently operating normally, however it is likely to fail at some point in the near future, probably during a performance.

A second reason is that a valve which is ‘leaky’ or ‘gassy’ may exhibit a slow ‘thermal runaway’ condition which will be detected and isolated by the OV4. However, if ignored, this can lead to the development of other much more severe faults such as internal arcing to the heater (which has earth leakage, so by-passes the cathode current detection circuitry), resulting in damage to other components including the output transformer.

One major benefit of the OV4 is that it allows the use of unmatched valves (including even mixed valves types such as EL34, 6L6, KT66, etc.), therefore only the faulty valve needs be replaced instead of the usual need to change a quartet when one valve becomes faulty.

If a valve is replaced but the new valve still indicates a fault, then the amp should be immediately returned to a qualified amp technician for investigation as this indicates that another serious and potentially damaging fault could be present with other components in the amp.

If a valve is completely ‘worn out’, missing or the heater is open circuit, this will also be indicated as a fault condition on the LED panel. Note the open circuit detection feature is disabled for approximately 1 minute after power on calibration routine, to prevent false tripping due to slow warm up times of certain types of valve.

The OV4 has a provision to connect a footswitch in order to deliberately switch between ‘pairs’ of valves in a 4 valve amp. This facility gives the ability to for example use a ‘pair’ of 6L6s’ and a ‘pair’ of EL34’s and switch between them using the foot switch. The valves could even be biased to different currents, if desired, by an authorised Orange service point, giving the ultimate in customisation!

Connecting a footswitch to the OV4 gives the possibility of running the amp permanently in ‘two valve’ mode, reducing its power output for smaller halls etc.

IMPORTANT

It is advised however that if the amp is going to be used regularly or ‘driven ‘hard’ in ‘two valve’ mode the speaker should be correctly matched to the amplifier. The easiest way to achieve this is for example: if you are using an 8 ohm speaker change to 4 ohms or if you are using a 16 ohm speaker change to 8 ohms.

DIVO OV4 Operation ... Continued

The footswitch can be operated with the ‘share the wear’ ON or OFF.

Footswitch operation with ‘share the wear’ ON - When this mode is selected, a ‘share the wear’ feature is instigated which ensures that each time the amp is powered up, or indeed, each time the two valve mode is selected, the opposite pair of valves will be used, thus ‘sharing the wear’ between the valves.

Footswitch operation with ‘share the wear’ OFF - When this mode is selected and the footswitch operated valves 2 and 3 will always be selected. In this case for example an amp could run with 6L6’s in positions 2 and 3 and two EL34’s in positions 1 and 4. The amp would use a combination of the valves at 100w and then use the 6L6’s at 50W when the footswitch is selected.

If an OV4 compatible footswitch is used for switching into the half power mode an LED indicates which pair of valves is selected. For example if the footswitch is operated with ‘share the wear’ ON, the user can clearly see what valves are selected and toggle between the inner and outer pairs of valves.

Note : If a valve goes faulty whilst in half power mode, the other ‘good’ pair of valves will be selected.

OV4 compatible footswitch modes of operation :

LED Status	Valve Status
No LED illuminated	All valves are selected
LED slow flash	Valves 1 & 4 are selected
LED fast flash	Valves 2 & 3 are selected
LED illuminated no flash	Valve fault indication

Footswitch Cable

A 1/4" jack to jack TRS cable is required.

Enjoy your OV4, we hope it serves you well for many years to come!