# Inside Watford Valves

Derek Rocco runs Watford Valves in the UK. *Ben Bartlett* pays him a visit...

WHEN YOU BUY A matched set of output valves for your amp you naturally expect them to be tested. In most cases output valves are subjected to tests to ascertain the current draw and heater continuity. These tests give a quick idea of whether a valve will 'work' in a guitar amp or not, but they are a long way from ideal.

The kind of punishment a valve gets put through in a real guitar amp being played loudly is a lot like the gruelling training undergone by the world's toughest troops. Using this analogy, the majority of valve testers put their output valves through a day's gentle march in the army cadets. Watford Valves, however, with the aid of its custom-built test rigs, puts the valves under 'real working' conditions which is the equivalent of a hellish week with the US Navy Seals.

## Custom-built rigs

"These custom-built test rigs set Watford Valves apart from other dealers," says Rocco. "They allow custom selection to guarantee that the valves are less likely to fail when the going gets tough." Two of the most common machines that are used for testing valves were made by AVO (which stands for amps, volts and ohms). The most common tester, which was used by most valve suppliers in the sixties, was the AVO Mark IV. This machine can perform many functions on a single valve. It was designed for service stations to check whether a valve had the correct conformity to the manufacturer's specification. This enabled valve distributors to 'match' valves on the current that it

Valves at ease after Rocco's rigorous testing

"I could've sworn that that one just moved." Tireless Rocco keeps watch

was drawing on the tester and so was born the phrase 'matching'. In the seventies, AVO launched the VCM-163 which was the first machine to allow the output of a valve to be measured accurately, along with the current draw.

It's clear that although these testers can prepare our troupes for battle, they will not prepare them for the conditions that the road will throw at them: SAS style-training will be needed. Watford Valves identified this problem at the beginning of the nineties.

The company was originally set-up to provide local groups with a reliable source of valves, but it became clear that specialist equipment was needed which was not available commercially. Watford Valves then embarked, with military precision, on a research and development programme which, by listening to some of the most-respected technicians in the industry, has resulted in what they believe is the most advanced test-centre for valve evaluation.

## On with the tests...

The first rig Rocco shows to me is the 'high plate volt rig' which was designed around Marshall and Fender amplifiers. This rig is a working amplifier which resembles a serious assault course and one which all Harma valves, Watford's own brand, have to pass. This unit tests all output valves from 6V6GT to KT88 and applies to an EL34, for example, 500V plate and screen.

## Regular supply

The second test-rig takes the range of the first rig a stage further with the inclusion of digital meters and a signal generator. Here I see why it is so important to regulate the mains supply – these digital meters are so accurate that a change in the supply can change a valve's reading drastically. The principle here is simple: there is no point learning to fire a pistol and then being expected to use a semi-automatic. So, each valve has to be tested under real working conditions to measure not only the current drawn but also the output of the valves.

"This is vital," explains Rocco. "Valves with the same current draw will have different outputs; if the valves have different outputs then they can sound odd and dramatically affect the sound and balance of the amp, therefore all output valves are matched on current draw and output/gain." These rigs have bias setting which are the same as 'Boogie, Fender and Marshall,

Watford Valves was set up to help local groups. It soon found there was a high demand for its specialist equipment

This procedure sorts the chaff from the wheat – any weakness or short circuits will cause the valve to fail.

The valves are also tested here for cathode heater insulation. The heater inside is a bit like a miniature electric-bar fire which gets the cathode or negative plate up to operating temperatures. If the insulation of this component is poor the valve will hum – unfortunately, it'll be humming a different tune from the one you want to play! This tester also has a microphonic test for output valves which was designed around a Fender Twin, as this is one of the many tests that the AVO simply cannot do.

Although our American chums call valves vacuum tubes, the vacuum isn't always as perfect as it could be. If the valve is 'gassy' – it has too much air inside – the life and the gain of the valve are significantly reduced, thus resulting in poor sound. Watford Valves prefers not to use Chinese-made valves, believing that a lot of them suffer from a gas problem and that they have a high failure-rate.

thus insuring more meaningful readings, unlike the AVO testers.

## Brian May

Rocco now informs us that the prototype rigs have been developed into two modular blocks which handle 30 valves-per-block, each valve individually tested for all the above parameters. In any army, some troops need to be sent for special application training and in this case it does not get any tougher than the way in which Brian May, for example, drives his valves in his AC-30. So

Solitary scrutiny on this test rig equals top quality tone and performance

what hellish device has Watford Valves come up with to drag those screaming EL84s and make them come of age?

"Conventual testing was simply not enough, we had to replicate what was actually happening in Brian's amp"explains Rocco. "He simply runs his valves so hard that they are at the point of destruction – this contributes to his famous trademark sound. The test rig had to be designed to replicate sustained notes, single runs and power chords. This was a mammoth task and we needed the best, so in came Dave Petersen the country's leading Vox expert."

Enter the 'full drive burst tester', the Hammer house of horror to all little EL84s. The tester is a 10 valve AC 30 with a signal generator providing the most destructive May-type signal. A timer is included which alters the signal from shorts bursts to long sustaining notes. This is the only tester of its type in the world and was designed and built in good old Blighty. Only the strongest survive and while Watford Valve's goal of supplying the most reliable valves for Vox amps has been achieved, the failure rate is high – as the EL84 'graveyard' proves.

Well done my pretties, you've passed the test

## Mission time

Finally, we come to a totally unique tester. This drive testing rig puts the small ECC83/ 12AX7 through a real-life mission. The ECC83/12AX7 is the most commonly used preamp valve and unfortunately is the most variable. The tester runs the valves under the same conditions they would meet in your amp. The valves are firstly tested for hum and electrode noise – any faults here and the valve is given it's marching orders.

They are then tested for microphony. Now, microphony is not just reserved for guitar pickups, your valves can start howling too so the valves are linked to an amplifier and speaker and are checked to see whether they would be good in a guitar amp. The valves are then tested for the balance between the triodes. Most preamp valves are made up of two separate halves which function best when they have the same value in terms of gain and output.

Once the chosen few have come this far then the final test comes into play, the drive test. This test measures the actual amplification of the valve with the guitar signal driven into it. Each half of the valve is given a three digit code. The valves at the higher end of the scale will break into distortion a lot faster and provide you with more gain; lower values mean that the valves will stay cleaner as they are harder to distort.

Next time you need to re-valve your amp, think on. Are those new shiny bottles up to your demands?

The unique drive testing rig puts the kit through a real-life mission


(Left) A Variac regulates the mains supply; (right) quality valves of yesteryear