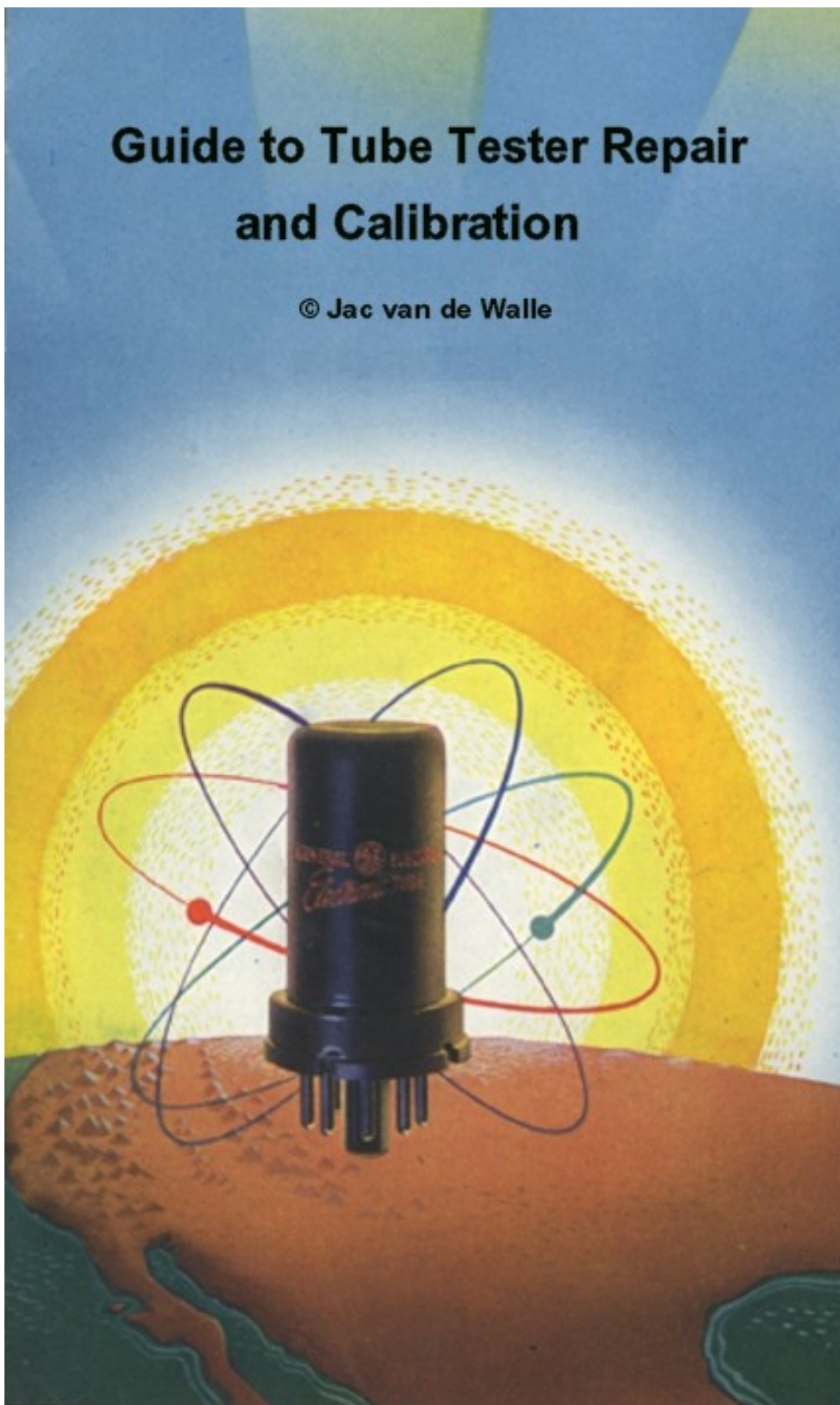


# Guide to Tube Tester Repair and Calibration

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# GUIDE TO TUBE TESTER REPAIR AND CALIBRATION

- INSTRUCTIONS, HINTS AND INFORMATION –  
Jac van de Walle

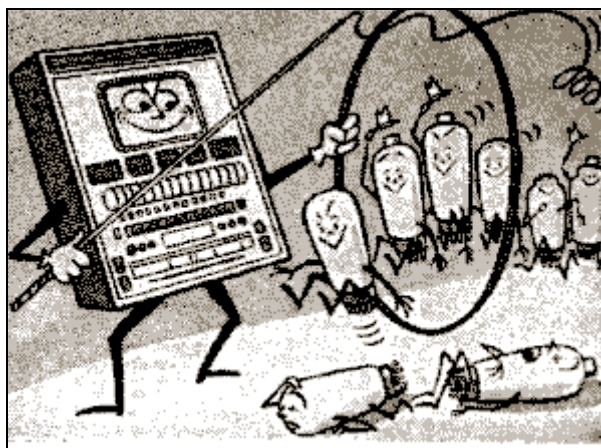
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*All information here is to the best of our knowledge, but we take no reliability for any of the procedures or information. Even so, there may be errors in the document. So just regard all of this an opinion only.*

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## 1. Introduction

This manual can be used together with the set of calibration tubes we sell, but also it can be used by itself, and holds a lot of specific and general information about tube tester repair, maintenance, calibration, and buying advise. For 50 years, tube testers have been the number one piece of equipment of every repair man. They were build in many versions, serving different purposes. The finest testers will provides several tube parameters, measured under realistic conditions, referred in this manual as “Class-A” products. Such testers have the size and weight of a suitcase, are slow and difficult to operate. The medium class category would give an indication about the tube’s condition under more (or less) useful conditions, referred to here as “Class- B” testers. The lowest category, “Class-C”, was the most used. These would give an indication on red-green scale panel meter, not telling what this measurement is doing, and for this reason will not work without mistakes. It can not be explained here in detail how all tube testers work, but many examples will be given. We need to be aware today, most testers are now in bad condition. All possible problems and defects will be found, so normal service (as in the service manual) can not be done, and general overhaul needs to be done first. The main target here is, to create awareness of what needs to be done, before a tester can be in daily use again.

In the end, we all expect some kind of performance of the instrument, even when it is 50 years old. In the world of electrical instruments, there are a few options to ensure long time precision. Ideally, the instrument needs no attention at all. Such instruments are self-calibrating at power on, or they are constructed in such a way that precision is resulting from internal references, which do not change their value. With tube testers, as far as I know, they all need attention after some time. The Class-C testers often referred to as “tube checkers” stay good for many years, and while using such, you may get an idea about it’s usefulness. Meaning, you will probably sell it and get yourself a Class-B tester for series work, or a Class-A tester for analytic work. When working with Class-B testers, you may verify the good functioning of the tester, by comparing it’s results with tubes of known values. This method is called verification. So when you have a tube that you know is extensively used, a test result like “100% lifetime” would be definitely wrong. Class-A testers are supposed to give verify precisely known data of a the device under test. The best is, to compare this with tubes that you know this data of. When the result is identical, very likely the instrument has nothing wrong with it. Some manufacturer allow this verification method to replace calibration even. Meaning, you can skip calibration, if the verification is good. Other manufacturers do not allow this. Keep in mind, there are two kind of manuals for most testers: The user manual and the service manual. So, if your tester requires to do something to the internal settings for calibrating, this will be explained in the service manual, and not in the user manual. Also existant, but never seen by myself are the factory setting manuals, that will tell the workers how to do those “one time

only” settings, like the arm calibration of the Hickok Bias potentiometers, by just bending it with a plier the right way.

Note, the calibration manual (service manual) is a special document, which manufacturers normally did not provide to the end user, or not provided at all. Unfortunately even today, people that do have the old calibration manuals, try to hide those, to sell copies on Ebay. As far as possible, we provide this for free at [www.jacmusic.com](http://www.jacmusic.com).

## 2. Various types of tube testers

Some tube testers, also referred to as tube checkers, only tell if a tube is broken or not. All tubes are tested in a diode circuit, loading the rectified voltage with a variable resistor. The filament voltage is often lower, to make old tubes appear less good, fulfilling the expectation of the owner. For most of them, the practical value is absolutely zero. So called “good” tubes can have shorts and leakage still, and the only thing you know for sure if a tube is bad. However, a bad tube you would recognize yourself as well, since it doesn’t work in your amplifier. So the usual misunderstanding is, you have working tubes, and such a tester will tell you how good they still are. This is definitely not so. You must see these testers differently. Suppose you have a non-working TV, with 30 or more tubes inside, and you only want to know which of those is causing the problem, and most of the case it’s a broken heater anyway. Such a “Class-C” tester is ideal for that job, and using a “Class-A” parametric tester for this would drive you crazy, with all the settings and test results. Today, with tube TV’s being 50 years old, the defect can have 1000 reasons, but in the days when the TV was new, the defect was practically always a tube, and often it was a broken heater. In 95% of the cases these tube checkers would do this job, and in the old days many technical enthusiasts would even own one, just because it’s handy to test a set of radio or tv tubes. However for testing tubes of HiFi Equipment, when it is basically working, this tester will tell you nothing you didn’t already know. Mainly you recognise these testers by the row of knobs, and small size.



**TC-2 Tube checker. Japan**

From the TC-2 and it’s species, very many are made. They appear often for sale in very nice condition. Sold on Ebay for crazy prices, by optical appearance only. Collector’s value is each persons personal choice, but practical use for Hifi purposes is not possible.



**Superior Instruments TV11**

This is the only exception in this category, I ever came across. Though really very old, the Superior Instruments TV10 and TV11 are reasonable testers. The calibration instruction of the TV11 which is in the internet, can be used for TV10 as well. The TV10 has a tube inside, and at least some components. The TV11 has a solid state rectifier. They are able indeed to pick out potentially weak tubes.

Recommended product, but don’t pay too much for it. You should replace each and every electronic part inside, and calibrate it with a know-to-be-good, and known-to-be-weak tube. In the end, a difference should be indicated.

### 2.1. AC testers without much electronics inside. Class-A or Class-B