

Important issues with key parts

Please read this fully!

Provided in this document contains technical descriptions of key parts which you need to understand before you make a final decision as to the purchase or service of a tube tester!

There are two critical classes of parts which can not be fully evaluated due to the technical nature of these parts. These two groups are **all meters and all transformers**. A full detailed evaluation of these two part categories as to their reliability, suitability, or stability for continued use in any tube tester is just not possible. I will explain this below!

General statement of fact:

These devices **transformers and meters** were manufactured 30 to 70 years ago, or more when the tester was originally new! The materials used in the manufacturing of these devices used many forms of organic materials in their construction. In addition the manufacturing process in producing the basic raw materials and in the final assembly process of putting the them together all combined to create a device that can and does age in unknown and unexpected ways. The original devices were never evaluated for M.T.B.F or Mean Time Before Failure data. The original manufacturer of the device and the tube tester manufacture did not provide electrical testing specifications for these device as to each possible failure type, or operational acceptability over time. Most manufactures did not provide any specifications as to acceptable tolerances as to the acceptability of these parts in their product materials supplied to the use or within the testers operational manual. The result of this creates a situation where only some basic measurements can be taken which will only provide some limited technical specifications but these tests can not establish the reliability, full degree of usable suitability, stability or effectiveness of full original use as was provided when the item and product was brand new!

TRANSFORMERS:

There are no practical test methods to evaluate the condition of a transformer, or to establish its degree of usable suitability, reliability, stability, effectiveness, **or usable life** of the part, or winding within the device. It is normal for transformers to deteriorate at various rates over time and use, miss use, or abuse, each of these will also have an effect on its deterioration by speeding up the deterioration to one degree, or another.

I can not and will not provide any recommendation as to condition, or fitness for use, or possible life expectancy of any transformer. I will only provide actual test results at no load and under the test load of the 6L6 tube and/or the tube used by the original manufacturer in the test and calibration process. If your tester had original specifications listed **with acceptable tolerances form nominal values** in its operating manual I will provide comparison test results of these specification tolerances as stated in its documentation, to the actual values measured at the time of the estimate. I will be happy to answer any questions about the transformer from a known actual factual bases as it is at the time I do the basic tests. If a transformer is clearly defective it will be so identified.

IMPORTANT NOTE: If your tester is a Military model I-177A/B, TV-2, TV-3, TV-4, TV-7, TV-10, AN/USM 118A/B the possibility of a new transformer or an add on one is not available at this time. I have not been able to locate any transformer company willing to build a new transformer for any of these models due to tight specifications and the required special housing design for the mounting of the transformer, all these are sealed transformers.

METERS:

A mechanical meter has many specifications some electrical and some mechanical. Only some of the actual electrical specifications can be evaluated directly without opening the meter up. These are the terminal resistance, track-ability, and the full scale current value. Mechanically only pointer balance can be reasonably evaluated. This information only provides a small amount of the meters measurement accuracy. It provides no information as to reliability, full degree of usable suitability, stability or its effectiveness. Meters can fail, or exhibit many various types of error in their measurement taking process. Most can not be identified, evaluated, or observed easily, or without opening the meter up and doing much more evasive evaluations. Such evaluations can be more negative towards advancing an earlier failure than may have otherwise occurred! Opening up a meter should only be done if it otherwise is not usable, or if the customer is willing to accept the risk that opening it up and performing any tests, or service may result in the meters total failure and making it un-usable requiring a all new meter!

I can not and will not provide any recommendation as to the overall condition, reliability, fitness for use, or possible life expectancy of any meter. I will only provide a statement of "within usable measurement range" (WUMR), which will only be based on terminal resistance and full scale current reading values. Meters will not be evaluated beyond this level. If a meter has a clear defect it will so be identified!

Please take into full consideration the information provided when determining if you wish to service or purchase any tube tester. I can not accept any responsibility as to the full and total condition of either any meter or transformer in any tester. All meters and all transformers with 30 to 70 or more years age will have some issues to some degree or another, many unseen and often unmeasurable and thus the degree of impact on tester accuracy is not fully known under any given specific tube test situation. Only new meters and transformers can such assurances be provided.

Other important information to understand!

Things to understand about your tube tester its technology and realistic expectations of its condition and potential use for your application.

Technology:

Most all tube testers operated using tubes as the active device and the early solid state models used early transistors and FET transistors as well. The reliability of the solid state devices of the time were not anywhere near the current level of solid state device reliability. Tubes did and do drift and get weak so operating values and tester specifications will change as a result. This must be understood as well as the information on the previous page as to the actual condition of the materials used in these testers.

Reality:

Most all testers I see today have some level of operational degradation. Very few testers from the 1930 to 1990 era that I have seen and serviced have meet their original operating specifications under load of power tubes as they had when they were new. The actual test results vary widely. The degree to which any one tester may approach meeting its original operating specifications will depend on all the following, and other unknown factors as well: Actual age from original production date, actual number of operating hours over its life, any operating errors, or abuse it received during its operating history like the meter being pinged to the far right stop and how often, or the transformer being loaded by tubes being tested under continue operation (test) for many hours and how often this occurred. How and under what conditions the tester had been stored over any time period when it was not in use such as the heat, humidity, near or in water (salt or fresh), mold conditions, and how well it had been, or not been maintained during its life as well.

All the above variable conditions will have a direct impact on the current operating condition and the actual specifications the tester can produce at rest (no load) and during actual testing (under load) conditions. 95% or more of these old testers will show differing levels of deterring operating specifications under loads depending on the actual load. In 95% of the cases the manufacture used a 6L6 tube as the tube for both testing and calibration of the tester some used other tubes. I use the 6L6 on all testers in addition to the other tube usually used by the manufacturer (often not a power tube) when evaluating each tester. It is the 6L6 tube that the load test conditions are developed from.

A tube tester can be serviced to a reasonable operating level without the replacement of its power transformers and meters provided they are within usable condition which I refer to as **marginal**. However, how long they will last or remain in usable condition, there is no way to say or predict! So please understand the degree to which any tester can be serviced to, in other words, either to its original, or very close to its original specifications, or to within usable operating specifications will depend on how much you are willing to spend to accomplish such a level of service.

Transformer issues:

The most common indicator of some transformer issues is the heater/filament voltage (6.3 volt) under load at 800 mA to 1 Amp or more of load current. An easily acceptable value would be within +/-5% of the 6.3 voltage. A marginal transformer will supply a reduced value between -5% and -10% from the 6.3 volt level. The industry standard for the typical tube life test is performed at - 10% of the rated nominal heater/filament voltage. Below this value the Gm test result will begin to go down proportionally to the tubes condition and the heater/filament temperature developed by the heater voltage.

One of the design trade offs of the typical service tester includes the application of a line set voltage rheostat that is used to set the tester to a specific AC line set voltage. This series resistance which is in the primary of the power transformer allows for a voltage drop to occur which is reflected in the secondary windings of the transformer even when the transformer is new. This voltage drop is worsened in transformers which have developed internal leakage and core saturation issues. This adds to the voltage losses at under load conditions especially of power tubes.

If your tester is affected by this issue you have some options. 1.) Do nothing about the transformer and accept the test reading, 2.) Use an external variac to set the ac line voltage and accept some improved heater voltages as is. Using a variac to set the AC input voltage to the correct ac value across the transformer will provide some improvement in test results depending on the original error and the corrected error, 3.)

Add a ac volt meter allowing you to monitoring the actual AC voltage applied across the primary of the transformer and keeping it set to its optimum voltage value for the tester you own.

Either option 2 or 3 will often greatly improve the accuracy of the test reading of tube being tested and may even keep the heater/filament voltage within a +/-5% or not to exceed a +/-10% test range. The other options are 4.) To install a new heater transformer for only the tubes you normally test usually 6.3 volt and 12.6 heater/filament type tubes to correct for this group of tubes at a cost of around \$20 to \$55.00 depending on your choice of voltages and currents you want to support, and finally 5.) To replace the power transformer with a new transformer at a typical price of around \$200 to \$250. **This does not apply the any of the military tube testers.**

Other age performance issues:

Switches - Many of the old testers have a wide range of switch performance. That is some switches rotary or push wear down and some just need a good cleaning! However, cleaning does not always solve switch problems especially push switches. A switch can seem good for some time frame and then be bad quite quickly. This is just a reality of the beast due to age and usage! Switches can sometimes be fixed depending on the type of switch and the type of defect.

Ferrite beads - Many older testers were not originally designed to test high gain (High Gm value) tubes. These testers but when the newer high gain tubes became available the testes could test the tubes but required some circuit changes to accurately test these tubes. However, many never were upgraded. The upgrades were most often the addition of ferrite beads to suppress/kill parasitic/oscillations which caused the tester to give the wrong Gm test result. If your estimate states the lack of Ferrite beads you may want to consider the installation of these beads at least on the 9 pin tube socket as this is the one that is most often used today for these type tubes like the 6DJ8, ECC88, or 12BY7A or similar tubes. Please let me know if you want me to add these to your tester. Not all testers need this if you will not be testing the High gain tubes.

Bobbin Resistors - These are wire wound resistors that were wound to a specific resistance value required for the circuit. These were often not standard values at the time. Many of the standard resistor and capacitor values used then are much different now. Only bad bobbin resistors will be replaced, unless you are willing to pay the cost in labor and modern resistors to replace all of them. **If you wish to replace them all, request a special estimate for doing this.** These resistors are subject to random failure due to age, or other physical stresses related issues to the resistor. While under refurbishment service they will all be checked only the bad or out of tolerances ones will be replaced! It can be costly to replace them all and often requires a special circuit board be used to mount them on and additional wiring to re-connect them to the circuits. I have not developed a standard method for all the makes and model tube testers.

Tube sockets - The typical defect is that they become either badly tarnished or corroded or the contacts become loose. Often you may see a white powder on them or on other metal parts. This powder is often **Cadmium** and is a hazardous material. I do not recommend you try to clean up this white powder without an appropriate respirator, eye protection, and gloves as well. I normally only replace tube sockets that can not be effectively cleaned and tightened up, or are clearly bad/worn out. A new socket can go bad quickly if you wiggle the tube out rather than pul it straight up and out. I will normally tighten up the socket, if you would rather have a new socket installed tell me Now! Tube sockets are mechanical devises and will wear. Also it is not always possible to replace a socket with an original type so sometimes holes will have to be drilled in the chassis to mount a new tube socket. Good quality tube testers used high quality tube sockets which were more rugged than the typical radio/TV/appliance or lower cost/quality tube tester type socket, and these type sockets are no longer made. Tube In addition some sockets will have to mount on top of the chassis and others will have to mount under the chassis. **If any of these are a problem for you, please tell me before the repairs are performed!**

Wiring - Many of the older testers have cloth covered wires, or early rubber/plastic covered wires. These cables often have or will deteriorate and may require replacement. Full replacement is not practical and only the worse wires causing, or which may clearly cause a problem "as best as I can identify" will be replaced, but not all of them will be replaced!

Other Electrical Parts:

Resistors: There are several types of resistors used it vintage testers. The most problematic types are higher carbon types, metal types, bobbin wire wound types, and wire wound power types with taps. The values standards are different today from those when these testers were made. Under refurbishing service I always replace the problematic types.

Capacitors: Here to we have the same situation as with resistors. Some types are very unreliable and others are still ok for continued use, depending on type and construction material. Under refurbishing service I always replace the problematic types.

Summary:

There are many other types of parts used in these testers, but these are the most common ones that may require special efforts to replace with the correct values and types which often can take time to either obtain, make, or modify to keep the same values and/or replace with an acceptable part!

If you have any questions on any of these issues as they relate to your tester please let me know! Thank you and best regards,

Roger Kennedy