

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

PROCEDURE FOR REPLACING ELECTRON TUBES IN
ARMY SIGNAL EQUIPMENT

Headquarters, Department of the Army, Washington 25, D. C.
19 September 1962

1. Purpose. Studies of maintenance procedures employed in the replacement of electron tubes have shown that more than one-third of all electron tubes have been discarded erroneously as "faulty." The purpose of this technical bulletin is to outline procedures that will help to prevent or to reduce this waste of material by establishing a uniform guide for checking and replacing all electron tubes used in Army signal equipment.

2. Procedure. a. Inspect all cables and connections and check the general condition of the equipment before any electron tubes are removed.

b. After this general inspection, localize the trouble to a particular unit or section of the equipment.

c. If a tube tester is available, remove each tube from the set and test it individually. Do not substitute new tubes unnecessarily; replace only those tubes that are proved to be defective (par. 3).

d. If a tube tester is not available, check the tubes by substitution. Proceed as follows:

- (1) Remove the suspected tubes one at a time and substitute a new tube for the tube removed. Note the socket in which each tube that is removed was installed originally. Check the operation of the equipment after each substitution. When the equipment becomes operative, discard the last tube removed before the equipment became operative and leave the substitute tube installed in its place.

Note. Some circuits, oscillator circuits, for example, may function with one tube and not with another, although both tubes are new. If possible, retain any tube that is replaced until its usefulness is checked with suitable test equipment

- (2) Remove the other substitute tubes one at a time and reinsert the original tubes in the sockets they occupied originally. Check the operation of the equipment after each original tube is reinstalled. If the equipment fails to operate when any original tube is reinserted, discard this tube and reinstall the substitute tube. Continue to reinsert the original tubes until they all are reinstalled or have been proved unsatisfactory. DO NOT LEAVE A NEW TUBE IN A SOCKET IF THE EQUIPMENT OPERATES SATISFACTORILY WITH THE ORIGINAL TUBE.

e. If only a limited number of spare tubes is available, proceed as follows:

- (1) Substitute one new tube for one original tube. If the equipment does not operate, remove the new tube and reinsert the original tube. Continue this removal-replacement procedure with each original tube until the equipment operates satisfactorily.

*This bulletin supersedes TB SIG 312, 30 April 1957.

- (2) When no spare tubes are available for troubleshooting, sometimes it is possible to remove a tube from some other section of the equipment without affecting the operation of the section being checked. In such cases, use this tube as a substitute spare tube to troubleshoot the defective section as described in (1) above.

Note. If, after a short time, a replacement tube shows the same deficiencies that were shown by the tube it replaced, check the adjustment and the condition of component parts of the tube circuit; in the case of a radio transmitter, check for proper tuning. Unless checks of this type are performed, tube replacement will effect only a temporary repair and more serious difficulty may result.

f. If tube substitution does not correct the trouble, be sure to reinsert all the original tubes in their original socket, exactly as they were received, before the equipment is sent for higher echelon repair.

3. General instruction. a. Discard tubes according to the following instructions:

- (1) *Gas tubes.* Discard only when use in an equipment under operating conditions proves the tube to be defective. Under no circumstances should a gas tube be discarded solely on the basis of a test with a standard tube tester.
- (2) *Other tubes.* Discard only when proved defective by valid test in a tube tester or in use in an equipment under conditions that prove the tube to be defective.

- (3) *All tubes.* Discard all tubes when it is obvious upon visual examination that the tube has been damaged; when the gas envelope has been broken; or when a connecting prong or lead has been broken.

b. Do NOT discard tubes -

- (1) Merely on the basis that the tubes have been used for a certain length of time. Satisfactory performance in a circuit is the final criterion that determines the usefulness of a tube.
- (2) When the tube tester indicates that the tube falls *on* or slightly above the minimum acceptability value. It must be recognized that a certain percentage of new tubes fall near the low end of the acceptability range of the tube specification and, therefore, start their operational life at a value fairly close to the "retention limit," as shown by the tube tester. To avoid waste, it should be noted that these tubes may provide satisfactory performance throughout a long period of operational life, even at this "near limit" value.

c. Miniature tubes require special care when they are withdrawn from the sockets. Pull the tube *straight* out. DO NOT rock or rotate the top of a miniature tube when removing the tube. The external pin and the wire lead that are sealed in the glass base of the tube are made of two different metals butt-welded together where the pin appears to enter the glass. Rocking or rotating the tube tends to break this weld or to cause resistance or *intermittent joint* to develop.

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USAR: None.

For explanation of abbreviations used, see AR 320-50.

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