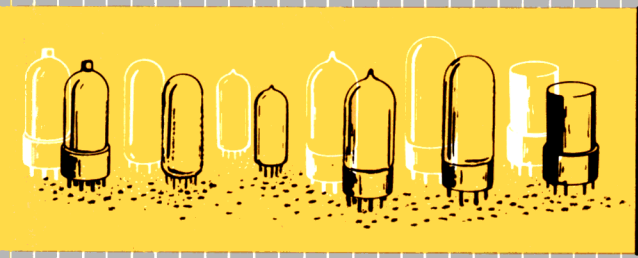
getting the most out of

VACUUM TUBES

by Robert B. Tomer



Types and causes of tube failures, what to expect from tubes, testing methods, and all about tube maintenance programs.

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getting the most out of VACUUM TUBES

by Robert B. Tomer

Vacuum Tubes—The Important 4/5ths of Electronic Circuits

Over 80% of all electronic equipment defects result, directly or indirectly, from tube failures. Why do tubes fail? What can be done to prevent them from failing before their time? How can you determine whether a tube is good or bad, or how well and how long it will work in a given circuit? Should tubes be replaced periodically, whether they've failed or not . . . or should they be tested every so often, and replaced if indications show them to be below par? This book supplies the answers to these profound questions . . . plus many, many more.

Like Watching a Play From Backstage

Author "Bud" Tomer, an international authority on tubes, is well-known for his candid "Tech Tip" bulletins and his slide-film presentations to service, military and engineering groups. Within these covers you'll find a virtual encyclopedia on vacuum tubes—yet the author has not delved into mathematical details that would be of interest to only a few tube engineers. Everything is focused toward the interest of those who *use* tubes—either for replacement purposes or in original equipment designs.

In his refreshing, down-to-earth style, Mr. Tomer sheds a bright light on such areas as, "Why so many tube types?" "What About Tube Testers?" etc.

(*continued on back flap*)

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GETTING THE MOST OUT OF VACUUM TUBES

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PREFACE

The purpose of this book is not to add another volume to the many excellent ones available on what makes the vacuum tube work. Rather, it is intended to shed light on the almost completely neglected subject of why these versatile devices sometimes do not work.

Informed scientists and engineers have frequently stated that the life of a vacuum tube in normal service should exceed 5,000 or even 10,000 hours. The fact that some of them do not last this long is well known. The question then is, "Why do they so often give less than their predicted or possible potential?"

J. M. Bridges, Director of Electronics, Office of the Assistant Secretary of Defense, speaking before the RETMA (now EIA) "Symposium on Reliable Applications of Vacuum Tubes" at the University of Pennsylvania in May 1956, said: "It has been demonstrated by service tests that the average number of tube failures per operating hour in two equipments of equal complexity, having approximately the same tube complement, can differ by as much as a factor of ten, due entirely to differences in the thoroughness and completeness of engineering design."

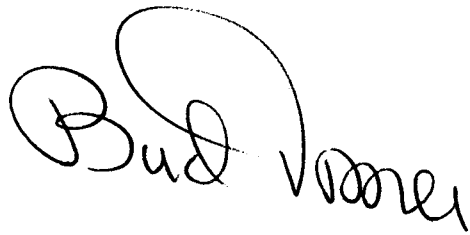
If the failure rate of tubes in military equipment can vary as much as ten to one because of circuit design alone, what influence do maintenance practices have on over-all reliability and failure rates? For an answer to this, we refer to Aeronautical Radio's General Report, Number Two, on "Electronic Reliability in Military Applications," July 1957, which states: "All available evidence indicates that this factor—the influence of maintenance personnel —is one of the dominant causes of unreliability in military equipments." Later in this same report we read, "The conclusion was reached that about one out of every three tubes removed from military equipment was a 'good tube.' "

What can we deduce from all this? It appears possible that more effective maintenance practices can in some

instances, reduce over-all tube failure rates by as much as 90%. Extensive military records, covering thousands of tubes in all types of electronic apparatus all over the world, have shown that these results are entirely possible.

It is for the purpose of pointing out those engineering practices leading to premature tube failures, and those maintenance practices contributing to additional failures, that this book is written. I hope that, as a result of this knowledge, those responsible for the maintenance and servicing of home entertainment, business, industrial, and military equipment will gain a new appreciation of vacuum tubes, so they can obtain greater satisfaction from them in the future.

May, 1960



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