If LETRASET or similar graphic aids are used, check to see how many typewriter spaces each such symbol occupies.)

The form has 50 cells per line. If one uses 8½-inch width paper, a typewriter with elite type, and left and right margins of 1⅜-inches, there are 69 spaces per line. We are sure that authors and typists are sufficiently ingenious to adapt the form to accommodate mathematical expressions occupying more than 50 spaces.

Some examples follow (see Fig. 2), the typed versions being taken from the handwritten copy on the form.

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REFERENCES

[1] D. G. Stewart, " A guide to the typing of mathematical notation," The RAND Corp., Santa Monica, Calif., Rept. P-3090, November 1964.
[2] "The preparation and typing of mathematical manuscripts," Bell Telephone Labs., Inc., unpublished memorandum, 1963.
[3] A. R. Stafford and B. J. Culpapper, *The Science-Engineering Secretary*. Englewood Cliffs, N.J.: Prentice-Hall, 1963.

The Value of Questions from the Nonspecialist Reviewer

***Abstract*—Someone not a specialist, but technically competent, can often function more usefully as a reviewer than the expert who perhaps cannot recognize commonplace sources of error.**

Writers of technical articles are frequently warned that they must neither write over readers' heads nor oversimplify, a difficult course to steer. One way of testing for its achievement is to submit a paper to a reviewer who is technically competent, but not a specialist in the subject dealt with in the paper. This procedure, of course, is helpful only if the reviewer does not hesitate, because of his unfamiliarity with the subject, to question anything he does not understand.

An actual case may better illustrate the value of this questioning attitude when the nonspecialist reviewer brings it to bear on concepts which may seem understandable to an insider. As Chairman of JEDEC JS-7 Committee on Definitions and Type Designations, I acted as an administrator rather than as an expert on the highly technical definitions under scrutiny. I nevertheless undertook (with some trepidation) to question well-established terms in U.S. and international usage in the semiconductor industry, with surprising results. For example, "transient thermal impedance" was defined with no corresponding definition of "thermal impedance," a situation analogous to defining a tall man without first defining a man. Some considerable correspondence among the experts then established that the idea of "impedance" in a thermal context might not be strictly accurate, and "transient thermal resistance" was suggested. Further investigation, however, showed that Fourier's analysis was based on heat flow, and "thermal impedance" is correct.

Another term questioned was "virtual junction temperatures". Because "virtual" means "being so in effect or essence though not in actual fact or name," I asked what it was if not the actual temperature. I found that it was not always possible to measure the exact temperature at the junction and therefore suggested that an explanation of the term be appended: instead, the term is being eliminated in favor of "junction temperature" alone, with a footnote to the effect that the approximate temperature is used when the true temperature cannot be obtained.

From these examples one can see that the initiated sometimes cannot see the forest for the trees, and cannot recognize that there is need for care in examining even generally used and accepted terms. The nonspecialist may be better fitted for the latter than the specialist.

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Speed Reading Versus Speed Writing

***Abstract*—The current popularity of reading-improvement courses should not allow them to replace writing-improvement courses in college curricula (or anywhere else, for that matter). The writer who can pace his exposition to the optimum for his material and his readers will save time not just for one person, but perhaps for thousands, so that there is no question on which end of the reading–writing process emphasis ought to be placed.**

Underwood's paper[1] confirms by objective analysis what many of us in the publications field have believed intuitively: that "speed reading" has been over-recommended as an aid to the harassed scientist or business administrator who is unable to cope with his mountain of required reading. Underwood finds varying degrees of comprehension are required, and he feels that the relation of reading speed to these has not been scientifically evaluated. It is unfortunate that the promotion, gimmicks, and time could not have been devoted to the improvement of writing instead. It would be tragic, however, with the intense competition for time in the college curriculum and after-hours training courses, if promotion of speed-reading courses resulted in the decline of writing-improvement courses.

If we assume that an engineering education screens out those who mouth every word in a text, and that graduates can read at a rate of 250 or 300 words per minute, then the kind and quality of the material read become significant in the speed of understanding. Kapp,[2] speaks of "imaginative" (nontechnical) writing, which gives us a better insight into that which we already know, contrasted with "functional" (technical) writing, intended to convey new information. Perhaps we can recognize what we already know faster if we comprehend the symbolism more quickly. But quite a different process is involved in reading technical information. Time must be taken for new concepts to penetrate. Some readers must translate a scientific paper almost word-for-word, while consulting dictionaries, textbooks, and bibliographical references.

If reading material were to be classified into three categories of major interest, these might be denoted *entertaining, informative,* and *educational*. The style of entertaining writing determines the speed at which it should be read. The author seeks to control the reader's pace (and his mood) by his choice of phrases, sentence structure, and professional techniques. Such writing is no more a sequence of words each of which stands on its own definition than music is a series of symbols specifying certain acoustic frequencies. To race through every paragraph at top speed would be equivalent to opening Beethoven's Fifth Symphony *allegro vivace,* omitting the rests between the famous quadruplets.

Informative writing presents facts within a framework with which the reader is familiar, with the intent of providing informa-

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[1] W. J. Underwood, "A critique of reading improvement training," *IEEE Trans. Engineering Writing and Speech*, vol. EWS-10, pp. 52–56, December 1967.

[2] R. O. Kapp, *The Presentation of Technical Material*. London: Constable and Co., 1964.

tion for eventual decisions by the reader (or to permit him to relay selected information to a decision maker). It is in this category, where to a trained individual the speed of mental assimilation is limited only by the rate of symbol recognition, that a higher reading rate may prove advantageous. During such reading, emotional reaction should be negligible, and other distracting or retarding influences (such as thinking) can be delayed until the reading itself has been completed.

Educational writing involves the presentation of new concepts, and the rate of mental assimilation depends upon how well the author explains his subject in terms the reader already knows. Except for highly specialized groups of readers, the rate of mental assimilation at best is considerably lower than the rate of symbol recognition. It is in this category that improvement in writing techniques is a more immediate need than improvement in reading speed.

Speed reading may some day be valuable for this category if technical authors achieve greater proficiency in "speed writing": writing consisting of words and analogies reasonably familiar to the reader; writing that is coherent, contains transition elements, and is organized in a logical sequence. The technical literature is not overburdened with writing of this quality, and even with well-written papers, as their technical level is raised, the ease of comprehension to large readership groups is diminished. Speed writing, then, also must be writing at as low a technical level as will benefit the optimum readership. A good engineer incorporates a "factor of ignorance" (sometimes called "safety factor") in his equipment design to accommodate additional use or loading which cannot be precisely anticipated. A good technical author should write with a similar factor in mind—to accommodate not only his co-workers in the field but also other readers who subscribed to the journal to learn what is new in fields somewhat separated or even quite remote from their own.

Speed writing becomes a tradeoff between the author's time (or his technical editor's) and the reader's. Since the circulation of most technical journals is numbered in the thousands, it hardly seems necessary to state in which direction the greatest benefit lies. While the technical author is not entering a popularity contest, he should remember that only the magician acquires status and prestige by mystifying his audience.

These remarks are not intended to imply that improvement in the rate of reading may not be helpful for all reading categories for some people. But in the field of technical literature, we should look to improved quality of writing as the more immediate aid to rapid comprehension.

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