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THE COMMERCIAL INSTRUCTION MANUAL FOR ELECTRONIC INSTRUMENTS

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This paper is about instruction manuals, a subject about which very little has been written. We are not wanting for literature on technical writing; individuals, professional societies, schools, and companies have contributed their ideas about what makes good and bad technical writing. But the instruction manual, which becomes more vital as man's machines become more complex, has apparently remained a matter of private concern to each manufacturer, with no evidence of any exchange about what makes a good instruction book.

THE INFLUENCE OF "MIL SPECS"

There is one seemingly enormous exception to what I have just said about the lack of writing on the subject of instruction manuals; that is the staggering number of military specifications, which not only prescribe the structure of instruction manuals, but which offer different directives for instruction manuals on airborne communications equipment, ground communications equipment, vehicular communications equipment, etc. The military, as usual, is nothing if not thorough in the matter of specifications. Now, military instruction manuals are outside the scope of this talk; obviously, anything I or anyone could offer on that subject would be superfluous. However, because of the constant influence of the military specifications on almost all technical writing today, I would like to make these two points before I move on: First, the beginning writer or editor of commercial manuals will profit greatly from a study of a few pertinent "Mil Specs." Here is a practical, field-tested way of publishing an instruction manual, and anyone who has written to "Mil Specs" will certainly want to apply some of their precepts to commercial manuals. The second point is that the military specification does not really give criteria for a good instruction book, but only for an acceptable book. And here, I'm afraid, is where instruction manuals in general have come out the loser. An instruction manual is required as part of a government contract, and the manual must be accepted by the government agency involved. Acceptance is the password, and many technical publications firms guarantee acceptance as a matter of course. Acceptance means adherence to the specifications, which are necessarily minimum requirements, for it is more important, from a military standpoint, that all books be passable than that some be outstanding. The whole procedure is very proper, but I do wonder if anyone thinks beyond mere acceptance and tries to write a manual better than merely "acceptable"? In short, the military specification has undoubtedly given much to the technical manual art, but in return it has all but obliterated creativity and the freedom of expression so necessary to any writer or editor.

This paper is about the nonmilitary - or commercial - instruction book, and, to bring personal experience to bear, it is about commercial instruction manuals for electronic instruments. I have in mind, as I write, a small company embarking on an instruction manual program without any previous experience. The writer and editor are unfettered by military specifications, and they would like to produce a good instruction manual. I will divide my advice to them into three parts: the writing, the editing, and the publishing of instruction manuals.

WHO WRITES FIRST DRAFT?

An obvious and common question is, "Who should write the instruction manual?" and this question leads us into the matter of placing the instruction manual group within the corporate organization. Some time ago I surveyed sixty manufacturers of electronic instruments to find out what I could about instruction manual methods throughout the industry.[1] Of those who replied, almost two thirds placed their instruction manual groups in the Engineering Department. In most of the other companies, manuals were an activity of the Sales Department. There are excellent grounds for the Engineering approach; the information must originate there, and accuracy demands close cooperation between writer and engineer (if, indeed, they are not the same person). However, the argument for placing the manual group in Sales is also strong. Few companies realize the potential value of an instruction manual as a sales stimulant, both by direct reference to other company products and - most important - by furthering the development of the corporate image. There will be more on this aspect later in this paper.

Whether the instruction manual group (and by that I mean whatever writers, editors, typists, artists, etc, are assigned to instruction manuals) falls under Sales or Engineering on the company organization chart, a certain amount of information about the instrument can come only from the engineer who designed it. According to the survey I mentioned earlier, the design engineer has full responsibility for preparing the first draft of the instruction manual in almost half of the responding companies. In fully one quarter of the companies, the engineer's responsibility did not end with a rough draft, for one out of four of these instrument manufacturers does

[1] F. Van Veen, "Instruction Manual Procedures Survey," *STWE REVIEW*, Vol. 6 No. 2, April 1959

not assign any full-time writing or editing manpower to instruction manuals.

The following is one method of apportioning the responsibilities of authorship. I do not say it is always the best method, but I believe that it makes use of the design engineer's superior knowledge of the instrument and at the same time does not demand of him even a rough draft of the complete instruction manual.

Let's consider the makeup of a typical instruction manual as finally published. There's a title page, a table of contents, instrument specifications, an introduction, sections on theory of operation, installation, operation, service and maintenance, parts list, interior views, and schematic diagrams. There are naturally many variations to this outline, but, largely because of the unifying influence of "Mil Specs" in this country, the main body of the manual usually follows the introduction - theory - operation - service sequence. Asking a design engineer to write even a rough draft of all of these sections seems a great waste of engineering time. He is the expert in matters of theory and operation. The introduction, usually a few paragraphs on description and purpose of the instrument, is somewhat like a new product release, and the design engineer will probably already be on record as to the description and purpose of the instrument. The service section will undoubtedly contain much routine information, perhaps lubrication data, instructions on replacing tubes or components, tables of test voltage and resistances, etc. Some of the routine service information is simply plugged in place by the technical writer or editor. The company service department, in the case of older instruments, or the calibration laboratory, in the case of new instruments, is the logical place to look for service data peculiar to the specific instrument. In this system, the technical editor asks of the design engineer information on the theory and operation of the instrument. I do not mean to suggest that this is a small requirement. Asking for an account of the theory and operation of a complicated instrument is asking for many hours' work. But where else can authoritative information come from, especially in the smaller company? Remember that we relieve the engineer of originating the more routine parts of the manual, not out of compassion, but because we want his manhours directed to better use. But when the engineer sits down and describes the why and how of his instrument, his time is well spent. In the very writing he may encounter problems overlooked in the design of his instrument. And, of course, this is the opportunity for the engineer to express legitimate pride in the instrument he has designed.

EDITORIAL RESPONSIBLITIES

A technical editor, under this system, accumulates information from many parts of the company, orders it according to a preset outline, edits the whole for continuity, and injects a consistency of style. He handles all artwork, asking the engineer for rough sketches as necessary, draws up the parts list, and manages the many details that are part of any editor's work.

The most obvious function of an editor is to mend fractured grammar. This is just the beginning, however, and the editor of an instruction manual will ideally spend less than five percent of his time playing the comma-jockey. This is not because good grammar is unimportant, but because copy-editing (i.e., editing for grammar) should be almost a reflex action to a good technical editor. If an editor spends longer than a minute or two correcting grammatical errors on one typewritten page, there's something wrong with him. If an editor sees a singular that should be a plural, there is no reason for meditation on the subject; the editor's pencil bobs back and forth a few times, and the error is eliminated. A technical editor should know the rules of good grammar just as surely as a cook should know how to peel potatoes.

The editing part of an editor's chores comes not in copy-editing, but in altering the writing style of the authors to suit the audience for whom the manual is intended. First, the editor must decide who that audience is. A common mistake, I think, is to try to make the instruction book all things to all people. One must decide who his typical or average reader will be, and edit from that standpoint.

Whoever the typical reader is, he will appreciate simple, straightforward language. Simple, straightforward language does not necessarily mean short sentences made up of short words. The first criterion in a choice between words must be precision of meaning, never the number of letters in the words. The editor will probably find that the engineer's biggest faults as a writer are his fondness for redundance, his use of empty phrases, and his generally trite use of words, as if he were mischievously intent upon making even the dullest subject duller. If this sounds harsh, it isn't meant to be. Writing style simply reflects reading habits; and engineers devote very little of their total reading time to fiction, poetry, drama, or other forms where they might learn that there is usually more than one way of saying something. But then, we have our friend, the editor, so let's not dwell on the writing insufficiencies of the engineer.

The instruction manual should bear a family resemblance to other manuals published by the same company, both to promote corporate image and to work a large part of the instruction book program into a simple routine. The mechanics of paragraphing, referencing, etc, are very important, and the company should draw up a standard specification for as many of these things as possible. If it seems I am embracing formal specifications now whereas I denounced them earlier, I want to

emphasize that I believe that specifications are indispensable, but that they should be set forth at the company level.

For paragraph numbering, I would recommend the decimal system as practiced in military manuals. No other system permits such easy insertion or deletion of material either in draft stages or in the process of reissuing an existing manual. The prospect of a paragraph numbered "2.1.4.6" may seem ludicrous to some, but I can say of this system only that it works, and works well.

Illustrations may also be numbered within each section, using dashes rather than decimal points for quick recognition. Thus the second figure in Section 3 would be Figure 3-2. I would recommend that the use of Roman numerals be abandoned, except perhaps in appendixes. My admiration for Roman culture knows no bounds, but the fact is that a Roman II in many type faces is indistinguishable from an Arabic eleven.

Incidentally, it should go without saying that one of the editor's final checks before printing should be of all paragraph, figure, and table numbers for correct sequence and cross-referencing.

ILLUSTRATIONS

A picture is not worth a thousand words if it takes the reader longer to get the message than it would have taken him to absorb the same idea in a thousand words of text. There are certain illustrations that are a necessary and important part of any instruction manual for an electronic instrument. First is the schematic diagram of the instrument, probably the most important part of the instruction manual, yet often published as a drafting department hand-me-down that shows little consideration for the reader. I have time here to mention only a few of the hallmarks of a good schematic diagram for instruction manual use.

1. It should be arranged in a logical manner, with input at the left, output at the right, and conspicuous paths for signal and power.
2. It should carry basic component information - the resistance of each resistor, capacitance of each capacitor, current rating of each fuse, transformer voltages, tube types, voltages at key points, etc.
3. It should be drawn with eventual reduction in mind. For instance, a 22 by 34 inch drawing will require at least a 50-percent reduction to fit on a foldout in an 8½ by 11-inch book. Knowing this beforehand, the draftsman can choose his Leroy template so that characters will not fill in and become obscure when the drawing is reduced.
4. Switches should be identified with panel engraving, and not merely as S1, S5, etc.
5. Where possible, the drawing should be segmented, so that various stages or circuits are isolated by a border of empty space. This makes it easy for the editor to mark out certain sections for use throughout the manual.
6. The schematic diagram and complete parts list should be on facing pages, if possible, so that the reader doesn't have to flip back and forth to look up part numbers.
7. The schematic diagram should ideally be placed on the outer folds of a foldout, so that it can be exposed while the book is open to earlier pages. This use of the so-called "apron fold" means extra expense, but the reader will be grateful. The inner or apron fold itself can be used for parts listing.

Other illustrations may include interior views of the instrument, with callouts to identify components. The "exploded view" line drawing, so common in military manuals, is not necessary with most commercial electronic instruments, where replacement problems are usually limited to electrical components. The photograph of the instrument interior will almost always require retouching to highlight components to be identified. I recommend use of the adhesive cellophane leader lines, black, edged with white, to ensure proper identification. These may be affixed to acetate overlays so that the retouched photo will in no way be marred.

An elementary block diagram is almost indispensable, and properly belongs at the beginning of the section on theory or principles of operation. A panel view of the instrument usually appears at the beginning of the instruction manual. This view should be large enough to reveal panel engravings, so that the reader may learn the functions of various switches and connectors even though no instrument is near at hand.

As a final word on illustrations, I would implore that terminology be consistent in pictures and text, that illustrations be placed as near as possible to their text references, and that they be professionally executed. Hand lettering, no matter how neat, looks like hand lettering. With lettering templates so inexpensive, it is hard to explain the use of hand lettering in manuals published by some of the larger manufacturers.

SERVICE AND MAINTENANCE DATA

Most instrument manufacturers probably prefer that customers order common replacement components - everyday resistors, capacitors, etc - from local supply stores, rather than write to the manufacturer. If the parts list in the instruction manual adequately describes the part, most customers will buy a replacement locally. Adequately, for a resistor, usually means resistance, power rating, tolerance, and type (composition, wire-wound, etc). For a capacitor, an adequate description includes capacitance, tolerance, working voltage, and type. The manufacturer's part number should always be included. No matter how strongly the manufacturer may wish to avoid replacing minor components, there is no escaping the duty of every manufacturer to offer replacement for all components, at least of current products. Failure to

live up to this responsibility can quickly make enemies out of customers.

The arrangement of parts lists in most instruction manuals shows again the military influence, and the effect is wholesome, for parts lists need military-type orderliness.

Service and maintenance information must be supplied, but here it is often hard to decide how much is enough. The solution is to rub the lamp and conjure up the "average reader" once again. If he is equipped to perform primary frequency calibration, then primary frequency calibration it shall be. If he has no more than an ordinary communications receiver, the calibration procedure must be on those terms.

The service section should include information on the manufacturer's service warranty, and instructions for returning the instrument or parts for repair.

Tables for test voltages and resistances are sine qua non in most manuals for electronic instruments. It seems a simple matter to tabulate voltages by tube and pin number, but there are pitfalls. All conditions of measurement must be specified, and these normally include switch positions, input voltage and frequency, type of voltmeter used, and reference point for all voltages. The degree of permissible deviation should also be stated.

The introduction to the instruction manual should describe the instrument's purpose and physical characteristics briefly. If we consider that the average reader probably has his new instrument beside him, and is itching to turn knobs and switches (if he hasn't already), it might be a good idea to tell him right away what each control is there for. This information can be condensed into a "Table of Controls and Connectors," and become one more part of the routine. Another topic for the introduction: accessories. The user should be told what things are supplied with the instrument before he throws away the box, and he should be told what accessories he must acquire to use the instrument properly. And, of course, he should be told without delay the power requirements of the instruments, plus any safety considerations he should know before he plugs into the power source.

Artwork, parts lists, service information, introduction - these are properly the work of the editor, who will add them to the engineer's writeup of theory and operating procedure, and edit the whole for grammar, clarity, continuity, and consistency.

All that I have said up to this point concerns making the manual useful to the customer. "What else should a manual do?" you may ask. In reply, I will quote a New York Life Insurance employee directive that says, "Everyone who prepares a communication for the company is a public relations writer." This is most true of instruction manuals, the one sure communication the company has with the man who has just become a customer. The customer will read this communication; he has to. What, then, will the company do with such a captive audience? We spend thousands of dollars for space advertising in trade journals, in the hope that one out of thousands of readers of that journal will pause a few seconds to look at our advertisement. And here, for the asking, is a man of proven value as a customer, his mind wide open to our message. He wants instructions, of course, and will not tolerate an out-and-out sales approach. So we give him instructions, and in so doing we are inevitably going to give him an impression as well. The manual may further an existing impression of the company, or it may destroy an impression; but it will have its effect. (What do you suppose is the impression elicited by hand lettering in a schematic diagram?) To use the jargon of the day, the instruction manual is at work creating corporate image. Of course, the manual can do some direct selling, too, by telling the reader about other company products that would go nicely with the instrument he has acquired. The manual can (and should) list company district sales offices, and can gently point out the instrument's superior design features. These are acceptable practices, although some readers may tune out such overt selling. Most important are the tone of the writing and the over-all quality of the manual. Tone is a difficult matter to pin down. The tone of an ad by Van Cleef and Arpel differs from the tone of an ad by a discount house. It is easy to say that most of us would wish for our company communications a tone that is authoritative but not overbearing, warm but not familiar. Achieving the right measure of warmth in writing is an art, and the editor will either have it or not. If he has it, this talent can be the most valuable asset he has to offer his company. I would like to make one final remark on the subject of tone. I do not believe that an instruction manual can stand a conversational tone. Those who would court the reader with a barrage of second-personal pronouns and folksy contractions ("You can't run the power supply on 50 cycles") will most likely shudder to find that, in cold print, their attempt at amiability looks plain foolish.

If tone cannot be easily regulated, over-all quality can. It is very commendable, from a company viewpoint, to save money in printing. But if the printed book looks like the child of poverty, the economy was misguided. Electronic instruments generally bring a relatively high unit price; there would not seem to be much justification for worrying about the 50-cent printing cost of a manual that is to accompany a $500 instrument.

Corporate image is pretty easy to promote, once the company has decided what the image is to be. Some companies establish four different corporate images: one for stockholders, one for employees, one for vendors, and one for buyers. At any rate, the problem of determining image is not that of the instruction manual. The manual can promote the image by cover design, choice of body

type face, even choice of paper stock, and, again, by the tone of the writing. On the cover, the company identification should be in a style consistent with that used in other company literature. If the company has a slogan, why not display it on the cover as well? The same applies to monograms or other corporate symbols. The ideal instruction-book cover is quickly identified with its publisher.

Any typographer will tell you how every face has its own personality, that this one will stamp you as progressive, that one old-fashioned, etc. The smart editor chooses a conventional type face for maximum readability; anything out of the ordinary will only distract the reader. (Those other type faces in the specimen book are for wedding invitations, jewelry-store advertising, circus posters, etc.)

AFTER THE PRINTING

When the instruction manual is printed, the editor's job is still far from over. The manuals must be distributed, some in answer to requests, some within the company, some to the shipping department to join the subject instruments, and most to a storeroom. Inventory records must be kept for all manuals, so that when a certain predetermined minimum supply is left, the reissue machinery will be set in motion.

Manuals should be distributed in accordance with a carefully considered company policy. The company must decide whether it will give or sell a manual to every person who writes requesting one. Occasionally, some prime contractor may ask for two or three hundred copies of a certain manual. Thus it is best to establish at least a nominal price for all manuals, whether or not the company intends to apply it in all cases.

Customers have a dogged habit of losing instruction manuals, and it will ever be so. If the instrument bobs about in the second-hand market, almost every new owner will request a manual from the manufacturer. All this bears upon the question of estimating the number of manuals to be printed. It is not unusual to find two or three books used per instrument shipped. This is one factor in estimating quantity. The other is the length of time that you want the books to last. The instrument will almost certainly undergo changes, and as the instrument changes, its instruction manual becomes obsolete. Addenda and errata can be printed on small sheets and inserted in the manuals, but this is not a very satisfactory solution. Eventually the manual must be given a thorough going-over and reissued. The company must determine the point at which its manuals become intolerably outdated. Given the desired lifespan of the manual plus the rate of consumption, the editor can estimate the quantity of manuals to be printed. (Of course, the economics of printing will set minimum practical quantities.) During the life of the manual, the editor collects complaints and corrections, and files them in a record copy until they are called forth by the reissue alarm. Reissuing a manual should be a routine procedure, but is nevertheless time-consuming. As a company grows, and new instruments are added faster than old instruments are dropped, the number of manuals "up for reissue" each month steadily increases. At some point it may be helpful to make reissues the primary responsibility of one editor.

When a company stops manufacturing an instrument, it is not automatically divested of all responsibility to the owners of that instrument. It should be able to furnish, for a reasonable period of time after discontinuance, replacement parts and instruction manuals. It should never be necessary to tell a customer that the instructions for his instrument are out of print. A record copy of every manual and a photo-copying machine are all that are needed to ensure continued good will among old customers.

There has been time for only a passing glance at the subject of instruction manuals. One could easily devote a paper of this length exclusively to, say, schematics or parts lists or service data. My approach has been broad in an attempt to touch all bases at least lightly.

Commercial instruction manuals seem to be standing still, as if their publishers either believe that they have found the right formula for a prefect manual, or just do not care. It's a company problem. To many companies, the instruction manual is a necessary evil - something grudgingly supplied as part of a contract. If your company assumes such an attitude, I hope you will tell your management that you are cheating yourselves out of the services of one of the best good-will ambassadors money can buy - a high-quality, useful, attractive instruction manual.

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