

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

