5. And Now a Word From the Sponsor

Make sure you <u>really</u> understand the specifications and the acceptance criteria.

Untold amounts of money and time have been squandered, and competently staffed companies have actually gone out of business, because of someone's failure to adequately heed the foregoing enjoiner.

A technical specification is written by the customer. It is a legal document. A technical proposal is written by the vendor. It can become a legal document if, at the customer's discretion, its wording should supersede that of the original specification. Nevertheless, many proposals are written in such a way that they are virtual time bombs or, in a more modern context, computer viruses. Documents of even deadlier potential are acceptance criteria, the list of tests defined by the customer that must be successfully performed before the product can be accepted and its vendor paid. The source of many of the misunderstandings created by these documents can be summed up in just three words: redundancy, ambiguity, and jargon—not enough of the first and too much of the second and third (which are often closely related).

Redundancy in documentation, as well as fault-tolerant electronic systems (transmitters included), is almost always a good thing. In fact, there is well-known rule in verbal communication that states you must say everything three times: tell the listener what you are going to say; say it; and then tell the listener what you just said. The written form of communication differs from the spoken in that a reader can read something as many times as necessary, though a listener may only hear it once. Redundancy in a written document is most effective if the same information is conveyed with different phraseology in different parts of the text, *but with the same meaning each time.* (Never underestimate the interpretive capability of the reader!)

The overarching villain in the failed specification or proposal is Ambiguity. Generally, a proposal is thought to have failed if it fails to win the job. Far more devastating, however, is the ambiguously worded proposal that wins the job by promising something the vendor never intended to deliver. A fine example of an ambiguously worded technical requirement is the following specification:

The transmitter shall be capable of operating at any frequency between 400 MHz and 500 MHz.

It looks innocuous and informative enough, doesn't it? But it isn't. Why? Because the successful bidder built a transmitter that worked at *only* 435 MHz,

which is certainly in the specified frequency range. However, what the user *really* wanted was one that would work at *all* frequencies between 400 and 500 MHz. But that was not what he literally asked for. The specification should have read: "The transmitter shall be capable of working at *all* frequencies between 400 MHz and 500 MHz."

Redundancy could have ameliorated, if not entirely eliminated, the ambiguity. If, for instance, the acceptance criteria called for testing the transmitter with input frequencies of 400, 425, 450, 475, and 500 MHz, the vendor would at least have had a clue that the earlier requirement had been poorly stated.

Another classic, but more subtle, ambiguity often encountered in technical requirements takes this form:

The hum, noise, and distortion products shall be greater than 60 dB below the carrier.

Although at first glance this specification may seem common and direct enough, it actually belongs in the Ambiguity Hall of Fame because it contains several of them. First, does it mean that each of the components—hum, noise, and distortion—must meet the specification individually or when combined (in some unspecified fashion)? Second, because hum, noise, and distortion are commonly assumed to be bad things, a sophisticated reader would assume that what was wanted was for these to constitute a signal level that is smaller than one that is 60 dB below the carrier. In other words, "greater" should apply to the number 60. But look again. That is not what has been asked for. Literally, what has been asked for is that hum, noise, and distortion—in some combination or individually—should constitute signal levels that are greater than one that is 60 dB below the carrier. Maybe they should be 50 dB below the carrier, or 25 dB—anything greater than a level 60 dB below the carrier. If confronted with this ambiguity, the engineer/author might well say, "But everyone who reads it will know what I really wanted." More often than not, this will be true. But this can only makes matters worse.

Now we enter into the Kingdom of Jargon. A jargon word is a common word that has been given a special meaning in certain situations or a word that is unique to a particular field or activity. In this case, the author not only took unwarranted advantage of special-purpose words—hum, noise, distortion, and decibel—but entire expressions by assuming the reader would understand the specification's intent by understanding the jargon words. Unfortunately, in this case the jargon words were used in a sentence whose structural logic was not without ambiguity. This sentence would completely lose a reader who was ignorant in electronics jargon. Readers who did know the lingo, however, might well jump to the wrong conclusion and yet be absolutely sure they understood the requirement precisely because it was written in the insider's language, which they thought they knew. A specification or proposal is no place for jargon.

An especially egregious example of jargon at work is the use, or more correctly the misuse, of the word "triaxial." This is a genuine word. Webster

defines it as "having or involving three axes." For high-voltage, high-current interconnections, high-power transmitters commonly use specially built coaxial cables that have a single center conductor that carries the high voltage and two concentric outer conductors that are insulated from each other. The inner conductor is the insulated low-voltage return path for the high-voltage circuit, and the outer conductor is customarily connected to the grounded equipment enclosures at both ends in order to extend the overall Faraday enclosure. Because there are three concentric conductors, this type of cable is all often called a "triaxial" cable, although it has but one axis that is shared by all three conductors. That is why this cable should correctly be called "coaxial," because the prefix "co-" really means "with," "together," or "joint," not "two" or "dual."

To most engineers, this argument would sound like quibbling. "Everybody knows what I really mean," they would say. But does everybody? If engineers write in a specification that they want equipment interconnected by means of a "triaxial" high-voltage cable, how can they possibly be sure that no one will misinterpret their requirement when what they want is *literally* different from what they asked for? Redundancy will help. Or so will a drawing. If engineers draw a picture of the cross section of the cable, they are more likely to get what they want regardless of what they called it.

Writing a specification or proposal is difficult, but so is reading and interpreting one. Before passing a specifications or proposals on to the reader, authors should check them again to make sure that what they actually wrote was what they actually meant. After reading specifications or proposals, readers should check them again to make sure they didn't unwittingly leap to a false conclusion.