MAC'S SERVICE SHOP

LIGHTNING DAMAGE INSURANCE JOBS

By John T. Frye, W9EGV

"IT'S TIME we furthered your education by discussing lightning-damage insurance jobs that come into the shop," Mac announced to Barney his assistant, during their afternon Coke-break.

"A man can't even enjoy a Coke around here without having it laced with knowledge," the red-headed youth grumbled, "but go ahead—if you must."

"That's what I like: an enthusiastic listener," Mac said, lighting his pipe. "There are three entities involved in this kind of a job, and each must be considered: the owner of the damaged electronic equipment, his insurance company, and the service shop called upon to assess the nature and extent of the damage and possibly to repair it. Let's run quickly through the chronology of such a job; then we'll go back and discuss interesting features.

"First, an insured who thinks lightning has damaged his radio, TV, hi-fi, amateur station, CB transceiver, etc., should *promptly* report this to his insurance agent, who will instruct him to get an estimate of the damage from an established service shop. (That doesn't mean the insured's brother-in-law who tinkers around with electronics in his spare time!) At the shop, a technician carefully examines the equipment to see if the set failure was caused by lightning, the extent of the damage, and the probable cost of repairing the set. This information is relayed to the insurance agent, directly or through the owner, and the agent calls an adjuster to look at the set. It may be a few days before the adjuster calls at the shop; but when he does, he will want the technician to show him hard evidence that lightning did the damage; so all such evidence should be carefully preserved for his inspection.

"The adjuster reports to the insurance company, which, based on his recommendation, either (1) denies all responsibility due to a lack of evidence that the failure was caused by lightning, (2) authorizes a repair of the set, or (3) because the cost of repair is prohibitive, makes some cash or replacement arrangement with the insured. The company pays for the estimate in the last two cases; the customer pays in the first. At any rate, the bill is made out in triplicate: one for the customer, one for the insurance company, and one for our files. The customer pays us, and we give him two receipted copies of the bill. He turns one over to the insurance company, and they send him a check."

"Why might a person think lightning had damaged his equipment?"

"Such circumstantial evidence can vary all the way from a coincidence in which the set would not operate immediately after a heavy thunderstorm to much stronger evidence in which a ball of fire comes out of the TV set at the same time there is a snap of lightning from a nearby stroke, followed by smoke curling out the rear of the cabinet."

"That last reminds me of Thoreau's remark: 'Some circumstantial evidence is pretty strong, like finding a trout in the milk.' How does lightning usually reach the equipment?"

"In the case of a receiver attached to an outside antenna, the stroke or induced voltage surge can come in on the feedline, but more often it enters via the power line. A bolt doesn't have to strike the line for this to occur. All it has to do is strike in the vicinity. After all, the current of lightning strikes has been estimated to be as high as 200,000 amperes, with 15,000 to 20,000 amperes being an average value; and the voltages producing the strike are estimated to be as high as 100,000,000 volts. Lasting only microseconds, such a strike produces a tremendous field that induces a voltage surge on the primary of a power line that can leap across to a transformer secondary and enter the house through the ac wiring. This surge can easily bridge open switch contacts of a radio or TV receiver. Most people don't understand this.

"What kind of damage does lightning do?"

"Mark Twain remarked that one thing you could lie about and get away with was to tell something you heard a parrot say. Lightning stories are like that. No one can *prove* you're lying. I've seen lightning strike a horizontal antenna and reduce it to a line of little copper beads in the grass below. When a conductor carries a heavy current, forces are developed by the accompanying magnetic field that tend to crush the conductor. This is called the 'pinch' effect. Another time I saw a rubber-covered copper wire that had been hit by lightning and reduced to a rubber tube with no wire inside at all. Stranger still, the rubber insulation seemed to be intact and hardly scorched. More common effects include the fragmentation of line bypass capacitors, melted power switch contacts, fused conductors on pc boards, vacuum tube envelopes shattered,

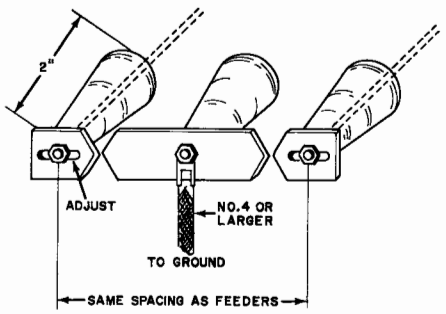

Fig. 1. A spark gap arrestor to protect ham antenna is easily made.

ruptured filter capacitors, shorted windings in power transformers, antenna input coils of radios and TV sets badly charred, flash burns on the chassis in the vicinity of line cord tie-points or the power switch, and tubes with burned out filaments. These are some of the things the adjuster will expect to see."

"I imagine the action the insurance company takes depends a lot on the policy the owner has."

"Right. The usual home owner's policy comes in a variety of types, including various deductible amounts with matching premiums. Naturally, the higher the deductible the lower the premium. TV, amateur, and CB antennas, rotators, and towers are not ordinarily covered by policies that are written to cover the house, garage, and household goods. Even then, with

such a policy, TV sets, radios, and hi-fi's are only covered for their actual cash value. The guy who has never read his policy carefully may be very chagrined to discover the total loss of his beloved but ten-year-old hi-fi does not entitle him to a brand-new stereo system at the expense of the insurance company. He may do well to recover the cost of a new stereo cartridge.

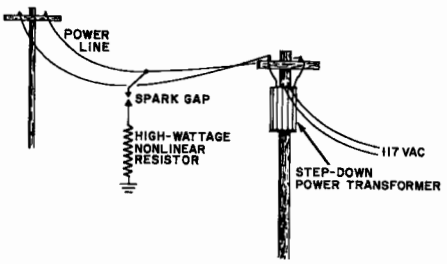

Fig. 2. In power-line arrestor, current is reduced by resistor.

"But there's another way to go. If he has ham, CB, or hi-fi equipment worth $500 or more, he can insure it for full replacement value with a separate policy usually labeled a 'personal line floater' or an 'inland marine floater.' Then, if his equipment is destroyed, the company will pay enough to buy a new system comparable to the one he had before. Such policies cost from 80¢ to better than $2 per $100 of declared value per year, depending on the individual company and the item insured. Jewelry, cameras, tools, service instruments, and similar equipment in the home can be insured with these policies."

"Seems to me the technician is pretty important in this operation."

That he is. Actually I do many insurance jobs here without ever seeing an adjuster. Local agents know me, and they also know the average adjuster is unqualified to assess damage to sophisticated electronic equipment. They're content to use my report as the basis for settling the claim. I'm sure this arrangement prevails in many other communities, and it puts a lot of responsibility on the technician, especially when the equipment belongs to a long-standing customer who feels 'taking' an insurance company isn't really stealing. When one of these starts hinting he wants me to declare his equipment a total loss when it isn't, or to say the damage was caused by lighning when there's no evidence to support this, I suggest that he take his set to another shop because I intend to call things exactly as I see them. Invariably, he then backs off."

"What do you think is the best insurance policy?"

"That's easy: prevention. You rarely recover your entire loss through insurance; so the best thing to do is try to protect your equipment from lightning damage. You could, of course, follow the practice observed in the old French provinces and keep some wood from a lightning-struck tree under your bed, secure in the belief you're fully protected because 'lightning never strikes twice in the same place'; but I'd suggest you employ more scientific methods. Start by making sure your house wiring is properly grounded and protected against overloads with fuses or circuit breakers. Install U.L.-approved arrestors on all TV lead-ins, antenna rotator control wires, and coax feed lines. Ground metal towers or metal masts mounted on poles or other wooden supports. Make a *good* common ground. If you don't know how—most people don't—order "Lightning Protection Code 1968," NFPA No. 78, from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210, for a postpaid price of $1.37."

"How do lightning arrestors work?"

"There are many types, but all are intended to do one job: carry a heavy surge of lightning-induced current in a conductor safely to ground, while leaving that conductor virtually disconnected from ground at all other times. Let me sketch a couple of common types. Shown in Fig. 1 is a homemade spark gap arrestor for use on the open-wire feeders of a ham antenna. Gaps are spaced just wide enough not to arc with full power from the transmitter, but voltage from a nearby discharge will start the arc that carries the heavy current safely to ground. When the surge subsides, the arc stops.

"Things are different when the conductor normally carries heavy current and high voltage, as does a power line primary. Once the arc is started by lightning, the follow-current from the generator would keep it going until the arc electrodes were melted. The arrangement in Fig. 2 prevents this. The nonlinear thyrite resistor has a resistance which decreases exponentially with increasing current. When carrying the heavy discharge current, it is a virtual shortcircuit; but with the lower follow-current, the resistance increases until the voltage drop across it is sufficient to stop the arc. Various resistance and gap types of lightning arrestors are manufactured for use with telephone lines, coaxial cable, twin-lead, etc.

"But remember I said most damage from lightning occurs when a surge comes in on the house wiring. That's why I think it is an excellent idea to install a secondary service lightning arrestor, such as G.E. Model 9L15CCB007, called a Home Lightning Protector, right at the service entrance. Otherwise, pull the plugs on all electronic equipment when you're going to be gone for several days or when you're home and a thunderstorm is building."

"Do you think a high antenna tower invites lightning damage to the home?"

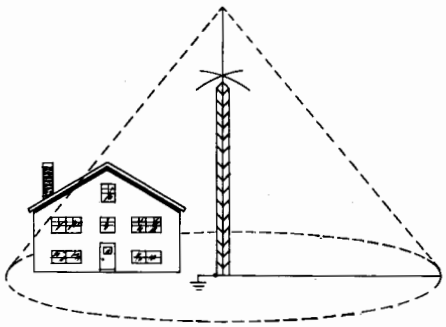

Fig. 3. A metal antenna tower, properly grounded, provides a cone of protection for the house.

"Quite to the contrary, if the tower is metal and properly grounded or has the metal mast properly grounded, it actually provides a cone of protection as shown in Fig. 3. Note that the apex of the cone is at the top of the grounded antenna, and the radius of the base is equal to the height of the tower. A direct strike of lightning to any object inside this cone is very unlikely."

"All right, let's recapitulate: quiz your insurance agent and read your policy carefully to see exactly what kind of protection you have for your electronic equipment. To protect that equipment, use lightning arrestors on all leads entering the house, including the power leads. Make good grounds and bond them together. Pull plugs during storms or when you're going to be away from home, and don't try to con the service technician into helping you defraud the insurance company. If he goes along with that, he'll cheat you, too!" ◈