

# TV Service—and the Ladies

By  
HAL ROSEN



*Most technician dealings—confusing, amusing, or both—are with members of the fair sex.*

**EDITOR'S NOTE:** *The TV set owner can be more of a service problem than the receiver itself. More often than not, the set owner to be dealt with is that strange and wonderful creature, the American Housewife, with her unsophisticated view of electronics. However, as these amusing and instructive histories show, dealing with her can be more rewarding than vexing. All you need is the right attitude.*

IT MAY be trite to say so, but the TV technician's lot is not always a happy one. His work is the outgrowth of trouble. People no more enjoy calling him than they enjoy calling the doctor. With television now regarded as a necessity rather than a luxury, the man who services the sets has become a sort of evil that must be accepted—graciously or not.

Aware of this virtually automatic hostility, technicians could easily degenerate into a group of neurotics with persecution complexes, if they let themselves. Luckily, most are sensible enough to find comic relief instead of anguish in some of their encounters with the public. The public, of course, generally means the lady of the house. With this happy breed, our shop has had its share of dealings worth cherishing and repeating.

Recently our service manager got an urgent call from a customer who reported that her TV set had "just exploded." Could someone come over as quickly as possible? Until his arrival, she and her children were taking refuge in a neighbor's house. The service manager assured her that, if the picture tube had indeed let go, nothing more would happen, but he sent a man over quickly anyhow.

When Les (the lucky man in question) arrived, he found a group of curious women and children in front of the place. The lady of the house

greeted him with, "Thank goodness you've come; we were afraid to go back in."

Saying, "Just relax, Mrs. Armstrong; we'll take care of it," he picked up his caddy and bravely threaded his way through the cluster of onlookers and into the house.

A 17-inch *Admiral* table model stood quietly in one corner, with a basin placed under it to catch the stuff that had dripped from the cabinet. Les removed the back and turned the set on. The low-voltage rectifier (Fig. 1) didn't light, so he tried a new 5U4 and turned the set on again. Its plates began to glow cherry red quickly, so he turned the set off right away.

Measuring from pin No. 8, the cathode, to ground with his ohmmeter, he read zero ohms. With the meter still connected, he pulled out the plug from the speaker field coil. The pointer swung up to an infinite reading. This might have suggested a short somewhere in the set beyond the first filter capacitor. In that case, however, he would certainly have read the resistance of the field coil, instead of zero, when the speaker plug was in. The likeliest culprit, then, was  $C_{501}$ , the 80- $\mu$ fd. filter capacitor—and he was right on the nose this time.

Events now fell into place. When an electrolytic shorts, there is often a loud noise like that of a firecracker going off. The dripping from the bottom of the set wasn't hard to understand either. Les put in a replacement, got the set working, and then called a very upset Mrs. Armstrong back into her house: "It's all right now, ma'am; and I must say that you're a very brave woman. In spite of the crisis, you had enough presence of mind to pull the

plug out of the wall and shove the basin under the set to protect your carpeting. Not many ladies could do that."

She blushed prettily and paid without a whimper.

On another occasion Eddie, the "comedian" of our service department, answered an unusual phone call. The woman claimed that "something seems to be sucking the power from the set." After noting a few seconds of silence from the other end, she inquired "Hello, are you still there?" Eddie took the phone from his ear, glanced at it curiously for a second, shrugged his shoulders, and replied, "Yes, I'm still here, we'll send a man over shortly."

He turned to the service manager. "Hey, Fred; ever hear of an electronic leech?" "Can't say I have," Fred replied, "Why?" "Lady here says something is sucking the power from her set. What else could it be?" "Well suppose you just go over and find out what else it could be," Fred laughed, "and none of your sarcasm in front of the customer either." Eddie winked as he walked out to the truck.

When he arrived at the lady's house, she repeated her interpretation of the symptoms and added that "it took a while for them to show up, so you better sit down and have a cup of coffee while you wait for it to happen." Eddie was about to decline but, since she had spoken more in the tone of command than suggestion, he turned the set on and meekly sat down. Ten minutes and three-quarters of a cup later, the picture began to bloom, slowly growing larger and dimmer. As he turned up the brightness control, the picture disappeared completely.

He opened the high-voltage cage and

replaced the 1B3 rectifier (Fig. 2). In a few moments the picture bloomed again. Eddie re-inserted the old rectifier and darkened the room to check for possible arcing. He discovered a slight, bluish light in the center of the 2-meg-ohm resistor,  $R_{105}$ , and knew he'd found the trouble. Eddie explained what had happened as clearly as he could and recommended that  $R_{100}$  be changed as well. The lady agreed and he replaced both resistors.

After waiting a reasonable amount of time, the set having held up, he prepared to leave. "Well, here they are," Eddie said, handing the resistors to the customer, "They won't trouble you any more." "Hmph," she snorted, "you wouldn't think a little thing like that could just suck all the power out of a television set." "No you wouldn't," Eddie wisely agreed. Chuckling to himself, he walked out to his truck.

Then there was the case of the "Rock-and-Roll Parakeet." Les, who ran the call, was quite shaken by the experience.

The lady of the house greeted him at the door. "You'll have to hurry. Pete is watching his favorite program and every so often the picture goes off and he becomes very upset." "Pete?" Les inquired. "Yes; my parakeet," she replied, "He loves to watch that program where the teen-agers dance to rock-and-roll records; it's his favorite show."

Les glanced around the room and caught sight of Pete standing in the middle of a plastic tablecloth, which was spread out on the floor directly in front of the TV set. The bird had its attention focused on the wildly gyrating boys and girls pictured on the screen and didn't notice Les until he gingerly swung the set away from the wall. At once Pete set up a series of piercing chirps, fixing Les with a beady eye. The technician, never having been a bird fancier, grinned apologetically

and removed the back. As the sound from the set disappeared, the chirping increased in frequency and volume and Pete began stalking angrily up and down the tablecloth. Les quickly jammed his cheater cord in and swung the set around until it was once more in line with the bird's vision. As the sound and picture returned, the noise and the pacing ceased and Pete settled down to watching his program, glancing at Les suspiciously out of the corner of his eye.

Beginning to perspire, Les took a deep breath and began tapping tubes to see if he could cause the picture to disappear. A few seconds later he discovered the filament in the neck of the picture tube was growing dimmer. As it went out completely—and the picture with it—the awful din started again in front of the set. With a groan, Les quickly twisted the cap at the base of the CRT until the filaments lit up again. He stood there holding it until the bird quieted down. Then, muttering to himself, "Well; it's gotta be done," he took a deep breath, removed the interlock and pulled the cap off the neck of the picture tube.

This was too much for Pete, who took to the air and, as he flew in great circles around the room, pecked at Les' hair and ears each time he went by. The bewildered technician slumped down in back of the TV set, waving his arms to ward off the attacks.

The lady of the house, hearing the commotion, came running in from the kitchen. Taking the situation in at a glance, she cooed, "Ah, has that mean old man taken away baby's picture again?" She then held up one finger, on which Pete quickly perched. With a look of disdain at the cowering technician, she placed Pete in his cage and set it in front of the receiver.

Les slowly crawled out from in back of the set and took out his soldering gun. Studiously ignoring Pete, he proceeded to apply heat to pins 1 and 12, the filament connections of the picture tube. When he turned the set on again, the picture stayed on. He explained to

the customer what he had done and informed her that, if the same thing happened again, he'd probably have to install a new picture tube. Then he packed up his gear and prepared to leave. As he passed Pete's cage (Les insists) the bird scooped up a beakful of birdseed and, with a Bronx cheer, blew it in the technician's direction. "Same to you, you little monster," Les muttered under his breath as he hastened out the door.

Eddie once got a complaint that a set was "giving off gas." "I could have toppled over when she told me that," Eddie informed the service manager. "I was tempted to tell her to toss it over her shoulder and try burping it. Well, I guess I better go over and see if I can stop the leak."

(Continued on page 123)

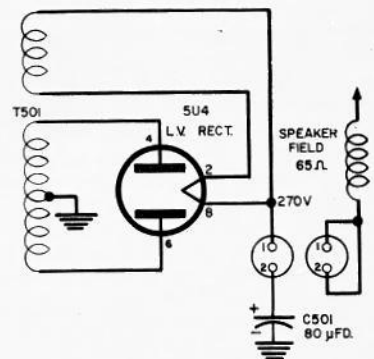
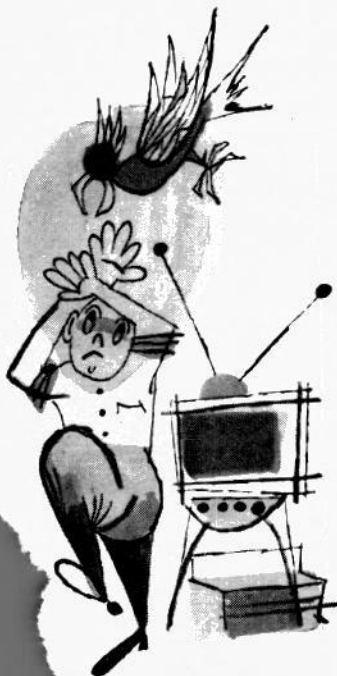
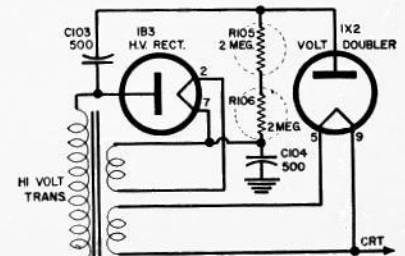


Fig. 1. Cause of this 5U4's demise was easier to understand than the set owner.

Fig. 2. Arcing, not an electron leech, "sucked power" from this h.v. circuit.



## TV Service and the Ladies

(Continued from page 45)

As Eddie entered the house, he paused, sniffed, and said, "Hmm; smells like somebody left the peanut butter jar open." The lady smiled. "Yes, it's a terrible odor, isn't it? I thought it was giving off gas or something." "Well," Eddie replied, "there's no gas in a TV set as there is in a refrigerator. Anytime you smell something unusual, just pull the plug and call for service. It's usually a short."

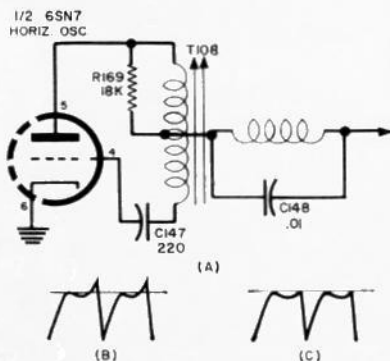
Eddie, having recognized the odor, pulled the chassis and set it up on his dropcloth. He turned the set on and examined the selenium rectifiers. Immediately, there was a soft crackling sound and a more pungent odor than just "peanut butter." He pulled the plug and installed a new pair of rectifiers.

When he turned the set on again, the customer remarked, "My, look how bright the picture is now; and it's full on both sides too. We haven't had it that good for a long time." "Yes, those are two of the symptoms caused by defective rectifiers," Eddie replied. "Actually, you should call us as soon as they start. In this case, you might have avoided the—uh—gas. Incidentally," he went on, "that odor will probably linger for a while, but it's not coming from the set any more. Airing out the room might help." She thanked him and he left.

The call we enjoyed the most involved Eddie and an elderly, white-haired lady who discussed television in technical terms. When she suggested, on the phone, that he bring along an oscilloscope as her set needed horizontal alignment, Eddie was only mildly surprised. He was quite accustomed to hearing female customers use terms normally reserved for technicians. They pick up a word here and there and, whenever they think it fits, they use it. However, to be on the safe side, he took along his portable scope.

The TV receiver was all set up when he arrived. It had been swung away from the wall, the back was removed, and a portable work light was in position to illuminate the chassis. Eddie raised his eyebrows and looked around

**Fig. 3. The female owner knew all about this horizontal oscillator.**



or the man of the house but, seeing one, went ahead and turned the set on. The picture came in normal and the lady who had greeted him at the door said, in a pleasant voice, "it will be all right for a short while, Sonny, when it begins spiking." Eddie looked at her quizzically. "Spiking?" "Yes, that's right," she replied sweetly. Eddie hugged and turned his attention to the set, a vertical-chassis *Crosley*.

In a few minutes the picture began pulling to one side. Then a series of bright flashes covered it, taking the outline of a Christmas tree. Eddie turned to the customer, who was watching intently. "It's spiking," he said quietly. "Yes it is," she returned. Eddie stared at her questioningly for a second. As she offered no further comment, he started to remove the knobs and chassis bolts. After setting the receiver up on his dropcloth, he plugged it and his oscilloscope in and waited a few minutes for the two to warm up.

While waiting, he glanced at the customer several times. She returned his stares with a pleasant smile, swaying slowly back and forth in her rocking chair. Eddie tried to force his attention back to the set's horizontal oscillator (Fig. 3A). He turned the horizontal lock trimmer completely clockwise, then backed it off a half turn. He placed a 10- $\mu$ fd. capacitor in series with the hot lead of the scope and clipped it at the junction of  $C_{118}$  and  $R_{100}$ . Since the resultant waveform was distorted (Fig. 3B), he prepared to adjust the coil slug with his alignment tool.

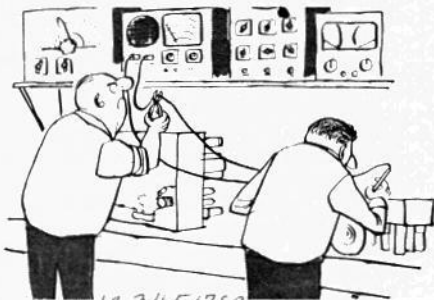
The customer leaned forward in her rocker, looked at the green trace on the scope, and remarked, "My, those peaks are out of line, aren't they?" Eddie nodded his head in a daze and adjusted

until the two peaks of the waveform were "in line" (Fig. 3C). Then he removed the scope connection and checked the horizontal-hold control. He noted that the picture would lose horizontal sync only at the extreme ends of the control's range. Satisfied, he installed the chassis, made a few vertical adjustments, and wrote up his bill. The lady paid him and thanked him for the prompt service.

As he started to leave, he could contain himself no longer. He turned to her and said, "Madam, I give up. Tell me, how do you know so much about television?" "Oh, I fool all the service people," she smiled brightly. "You see, my grandson is a technician too. He's in the Navy now and can't take care of my TV. I was always interested in electrical things and when he was home, working on different sets, he would explain what he was doing while I watched. Why I've seen this horizontal trouble many times. If I had the right equipment, perhaps I could have aligned it myself." Eddie scratched his head and grinned. "I bet you could at that." She held the door open for him.

Still shaking his head, he went down the steps, muttering to himself, "A grandma TV technician. If that ain't the end!"

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# UNUSUAL OCCURRENCES



More evidence that anything can happen in TV servicing, and often does!

## GROUND WAVES

While making a routine service call for a TV service company I encountered a ghost that wasn't a ghost.

Two receivers were connected to the same antenna through a commercial isolation unit. One of the sets, in the first floor living room, showed clear ghost-free pictures on each of Philadelphia's three channels—3, 6, and 10.

The other set, in the basement playroom, was ghosting pretty badly on channel 3.

The customer told me I was the fifth man sent from the company on this trouble. I had had no advance information of any unusual problem connected with this call. Originally, the customer informed me, the sets had been connected directly to the transmission line. On the fourth call, the isolation unit had been installed, without good results.

The idea of if trouble occurred to me. Close examination of the picture showed a *trailing* ghost, not a *leading* one. Temporarily, at least, I ruled this possibility out.

I began to disconnect the isolation box to try direct connection for observation of any difference in results. With the antenna disconnected, a clear ghost-free channel 3 presented itself!

The answer was then suddenly obvious. The channel 3 transmitter was only a couple miles distant at most. The ground wave, entering the basement but not the first floor above, was being picked up by the 2 or 3 feet of lead-in between set and isolation box. The signal coming in from the antenna was the ghost!

Shielded lead from set to box provided the answer. A switch to disconnect the antenna for channel 3

operation would have also served.—  
H. R. Holtz

## NO BRIGHTNESS

I was asked to check a new Admiral chassis 21F1 for no brightness. I tried the 1B3 and found I could draw a small arc from the plate cap, indicating oscillation in the horizontal section. I changed the 6BQ6, 6W4, 6SN7 horizontal oscillator and sync inverter, and the 6AL5 sync discharge tube. There was no improvement.

I removed the chassis and measured the high voltage—6,000 on the second anode. I measured the voltages on the horizontal tubes and found that they were not as high as they should have been. The oscilloscope indicated nearly perfect waveforms. I removed the high-voltage cage, checked and replaced the high-voltage capacitor, the yoke, and high-voltage transformer. I made continuity checks of the width and linearity coils, and checked and substituted in frustration for every component in the horizontal section—all to no avail.

I switched my attack to the if section and to my surprise I got no video signal from the 6AC7 plate. I tried the age tube and again found irregularities in the scope waveform and pin voltages. These irregularities led me back to the width coil. I had no width coil to substitute so I disconnected one of its leads—behold brightness! The width coil was the culprit. A new coil was substituted and everything was fine.—William L. Fields

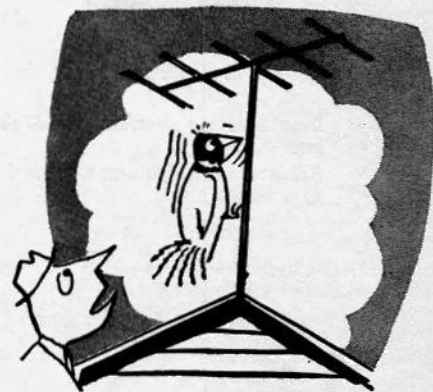
## UNUSUAL RINGING

The exasperated wife of a well-known local doctor called me in to check her television set, recently installed by

another service technician. She told me that he had given up, frankly telling her his experience didn't cover the sort of trouble she was having.

It seems her TV set rang like a telephone early every morning. At first they had thought that it was the phone. But every time they answered it, sleepily, no one was on the line. Since theirs was a new house, she thought that the carpenters might have nailed a phone up in the wall in back of the TV set. The doctor noticed it was not his phone ringing, it must be another, somewhere in his TV set. Checking the set, I found no phone and no phone line other than his regular phone drop that came into his house.

The set was a Zenith and the manufacturer had installed no bells on that particular model. The chassis checked out perfectly, the set operated very well. The investigation extended over a week since the only time the set would ring was in the very early morning around daybreak, and I usually didn't get up that early. Peculiarly enough, the set was never on at the time it rang. In desperation, I set up a watch during the early morning hours to pinpoint the source of the sound. When it finally appeared it seemed to come from the set. But on closer investigation it seemed to emanate from the wall directly in back of the set. The rings were of odd length and short duration. Since we didn't want to tear out the doctor's new wall, we went outdoors to check the other side. It was then that the apparent source of the sound shifted upward, but the only unusual aspect of the antenna installation was a bird sitting on the antenna arms.



Had we been qualified bird watchers, we would probably immediately have noticed that he was a male woodpecker, hammering away on the aluminum. The din was terrific! The antenna was a ground installation with a V bracket mounted against the house approximately at the location of the TV set on the other side of the wall. The bird had either been trying to impress his ladylove with the racket or just plain didn't know any better. The doctor's wife reported that he got discouraged in another week and that the antenna seems to perform just as well with the holes in it.—Philip Whitney

## UNUSUAL OSCILLOSCOPE PATTERN

I have often thought of trying to feed in television sweep voltages at the horizontal and vertical input terminals and a video signal at the intensity control of my oscilloscope to see if I could produce a television picture. Like most technicians I do not have much time for such experimenting and I never have actually tried to see if it would work. Until this week the only television pictures I had seen were properly confined to a TV screen and my scope produced only useful waveshape or crazy-quilt designs.

This week, however, using the scope to trouble-shoot an Emerson model 700 TV set for loss of sync and having just made a connection at the grid of the horizontal control tube, I looked back at my scope to make the switch from 60 to 15,750 cycles. I saw a green "Liberace" grinning at me from the screen!

After pinching myself, checking to see that it was not a reflection from the TV screen and calling my partner to convince me that I was not seeing things, I found I very definitely had an excellent TV picture on my oscilloscope. Incidentally, the picture on the television set was rolling while that on the scope was locked in perfectly. The scope picture was in positive phase, had good detail, plenty of contrast and fairly good linearity. The scope horizontal sweep corresponded to the picture vertical sweep so the picture was on its side.

I called several other shops in town, but none of them had ever run into such a thing. In fact, some of the technicians were so surprised that they came over to see it for themselves. The thing that mystified us all was the apparent modulation of the scope beam when the only input to the scope was at the vertical terminals through an ordinary frequency-compensated probe.

Studying and checking of the schematic and waveshapes showed how the picture got on the scope, and how it surely must be possible to get the same results using any scope and any television set having the pulse-width (Synchroguide) type of horizontal afc and a slightly weak sync circuit. I figured it out this way:

At the grid of the horizontal control tube two voltages are combined, a sawtooth waveshape coupled from the horizontal discharge network and a horizontal sync pulse from the sync separator stage. In this particular set, some of the video signal was riding through the sync stages with the sync pulses. This video signal, compressed, appeared to contain the complete picture signal from light to dark. Since the sync pulses at this point combine with and ride on the peak of the sawtooth, the video information was located on the slope of the sawtooth. At a scope sweep frequency of 15,750 cycles, this

video appeared as a ripple or ragged edge on the sawtooth. When the scope sweep was changed to 60 cycles however, the sawteeth appeared as vertical lines (of a raster). The video signal between the sync pulses then added to or subtracted from the speed of the vertical sweep on the oscilloscope and effectively "speed-modulated" the beam trace to produce the intensity variations of the picture.

I was a little skeptical that repairing the set might cause me to lose my scope picture. However, after completing the repair I found that it did not. I believe that this portion of the video signal riding through the sync stages is common in many television sets, and since it is too low to disturb the operation of the sweep oscillators, it may even be allowable in the design of some sets. Certainly it could occur due to changes in component values or aging of tubes in the clipper and sync amplifier stages. After realizing how common the possibility of obtaining a television picture on a scope screen could be, I wonder why I have never heard or read of it before.

The experience of finding a picture on my oscilloscope screen was exciting and naturally I wanted to impress my wife with my discovery. After looking calmly at the green picture for a few minutes she really dampened my enthusiasm: "It's a pretty good picture all right, but where's the sound?"—L. H. Wilson

## THERMAL CUTOUT

One of the most unusual service experiences I ever had was with a G-E model 12C105 TV receiver. This set, like many G-E's, has a thermal cutout in the power circuit that feeds the series filaments.

My first call found the set dead. I took off the back, plugged in my "cheater," and allowed the set to warm up. Everything acted normal and, thinking this might be one of those pesky intermittents, I performed the usual tube banging, made some voltage measurements, and replaced a doubtful 6BG6. I told the owner to let it play as long as it would and to call me when it quit.

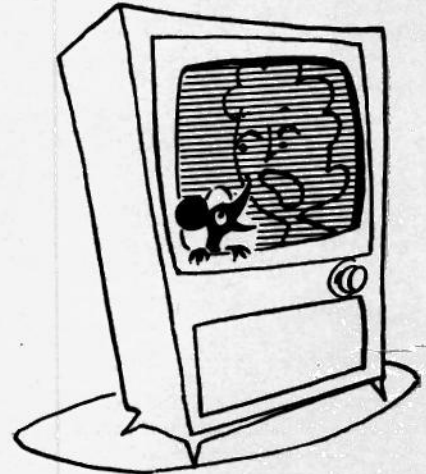
The call came about 10 days later. This time I took the chassis to the shop and put a Variac on it to raise the line voltage until something popped. Something did pop, but was the last thing I suspected. The interlock ac input socket arced over and the thermal cutout opened. After letting it cool, I again applied about 117 volts—another arcover and cutout. Replacement of the ac input interlock socket cured this trouble.—D. L. Weaver

## MICE IN TV SETS

Mice and small rats can find their way into, and make their homes in, some of the strangest places. For instance, the inside of a television

receiver. Whenever small openings can be found leading into the underside of a chassis, they prefer to make this their habitat, rather than upon the slightly cooler topside. Occasionally, I imagine, some are electrocuted or shocked, but the vast majority seem to be right at home among the jumble of wires and components.

When called upon to service defective receivers that show evidence of these small rodents, such as small pieces of paper, rags, and other foreign materials, you will find that they usually do not respond to standard home-call procedures and have to be taken to the shop.



I have found that much time can be saved in servicing these sets by following this set of rules:

1. Clean set thoroughly of all foreign materials, with a small brush or damp cloth.
2. Check all fuses in the set.
3. Make a careful visual inspection of all the less-rigid noninsulated wires to see if they have been moved, possibly causing a short circuit.
4. Check all insulated wires for chewed-through insulation.
5. Most important, make a continuity check of all inductances wound with very small wire, such as peaking, width, linearity, and horizontal oscillator coils.

Normally, these checks will give you the key to the problem, if caused by these pests.

Unnecessary callbacks can be reduced by closing all ports of entry. Seal all small openings with tape, mesh wire, or wire-cloth. But make sure that plenty of air can circulate in and about the set. Determine how the rodents entered the room. Sometimes moving the set to another location or by moving adjacent objects away from the set, will cut off the path of entry.

Similar difficulties will sometimes be caused by members of the insect family. Again the same rules apply. Just use a finer screening.

And most important, after the set has been returned, *do not—under any circumstances—tell the owner that she had mice in her TV set!*—William Shope

END

## TV

# Oddities

By JOHN D. BURKE

TV REPAIR is a crazy business. I pity the students in trade schools who, like one promising young man I know, have only the faintest conception of what lies ahead.

I. Just yesterday the owner of a good-sized and successful shop asked me to take a set off his hands. The problem: They had installed a high-voltage doubling circuit in the set, and now they couldn't get enough width.

What was wrong? I chanced to look at the yoke, while carrying the set to my car. It was a 50-degree yoke!

No cause for boasting on my part—no cause for embarrassment on his. It happens to the best of mechanics.

II. Some people in high places in our trade, or in proximity to it, speak boastfully of being able to find what's wrong with any set, in a matter of minutes.

I will contest that with anyone. Now and then a set will stand you on your head. Just finished one like that last night.

A case of not enough high voltage. Got about 3,000. A Motorola TS 118A. Take a look at that set's diagram. Note all the possibilities for high-voltage trouble.

Note also the fact that they use an *odd value*, and *odd voltage* capacitor (180  $\mu\text{f}$  at 3,000 volts) across the damper tube.

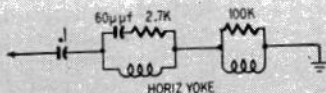


Fig. 1—A shorted 100,000-ohm resistor across one section of the horizontal yoke winding was responsible for loss of high voltage in a Motorola TS 118A.

Convinced that the capacitor was at fault (got some voltage rise with other values of capacitance) I wasted several hours going to Motorola N.Y. to get one. (Nothing like it to be had at local distributors.)

Still—I was not too surprised when the new capacitor failed to help. Sweat—test—sweat—test. (And curse!)

Now—for those of you who do not earn your living in this trade—I want to emphasize that the trouble in that set—when I finally found it—was something that *no instrument* could have revealed.

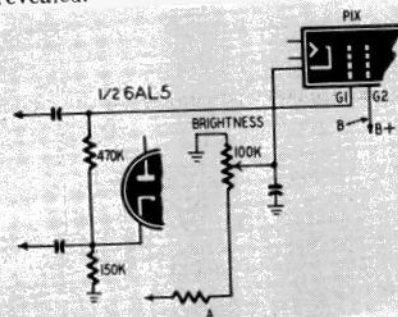


Fig. 2—This works despite a high-resistance short between G1 and G2.

I'll give you a diagram (Fig. 1) to look at. (The editor will like that!)

That 100,000-ohm resistor was the culprit. When I took the focus coil off, and tested with the scope at the junction of the two coils, the pattern looked normal. Long afterward I came back again—after getting an apparently correct resistance reading across the yoke, and hunting all over the place for the cause of the trouble, including the substitution of another high-voltage transformer. This time I started to open up

Some real backbreakers  
—plus a few tricks for  
keeping your customers  
happy—and keeping them

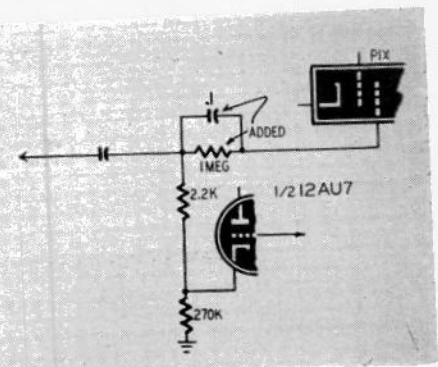


Fig. 3—A temporary remedy for heater-cathode leakage in a TV picture tube.

one end of that resistor. The resistor broke! It had heated, fused, and dropped down to some value low enough to spoil the circuit's normal impedance; yet not low enough to show on the ohmmeter on a test across the coil.

Trouble in high-voltage (and in B-voltage, too) often arises in the yoke. But, the yoke is often one of the most inaccessible parts of a TV set.

III. One of my customers now operates his set in the following manner, according to instructions I gave him:

He turns the set on, lets it warm up. Then he gently taps on the base of his picture tube. After a few minutes of tapping, he chances to strike the tube just right. The cathode tab circuit fuses, and the picture tube lights up normally.

Next time he lets the set cool off, he goes through the same procedure to get it going again. Thus he is getting use out of a 14-month-old 16-inch tube.

IV. Three of my other customers are getting use out of defective picture tubes which have high-resistance internal shorts.

Such shorts spoil the normal biasing arrangement—but by revising the circuits I was able in each case to extend the useful life of the tubes. Well over a year already in two cases.

One of the sets had a high-resistance short between grids 1 and 2 of the picture tube. Result—picture much too bright. The set is a Crosley 9-419M. Fig. 2 shows the changes made. The resistor at A was 220,000 ohms. I reduced it to 100,000 to raise the cathode potential. Reduced the B-voltage to grid 2 (point B) to bring brightness down further. Result—good contrast!

The other two sets were both high-resistance grid-cathode shorts in Meck MM614C's. The shorts spoiled sync take-off by cutting out the d.c. restorer tube. The solution in Fig. 3 leaves some effect of d.c. restoration. That in Fig. 4 eliminates d.c. restorer action, but customer is satisfied.

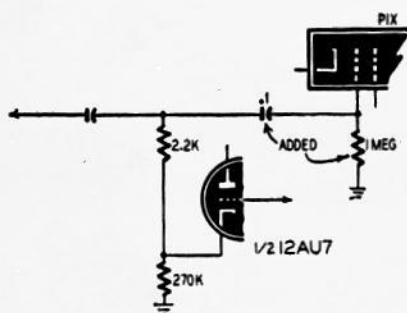


Fig. 4—Another method of overcoming the effects of a high-resistance short between heater and cathode in the picture tube by eliminating d.c. restoration.

V. Saw an article in another magazine for a rather elaborate tester one could build to test high-voltage transformers.

Here (Fig. 5) is my rough-and-ready method, which works well.

First familiarize yourself with the length and snap of the normal arc which can be drawn from various types, and voltage ratings of flyback transformers. Not the d.c. only, but the a.c. (I use the arc to a well-insulated-handle socket wrench or screwdriver, held in my hand.)

Now connect the transformer to be tested to a TV set in such a way that only the *essential* connections are made. That is, to B plus or to B plus plus, and to the plate of the horizontal output tube. Make sure your damper tube is going to receive its voltage.

Disregard width and linearity connections. In some transformers you can leave off the sweep coil connections—in others they are necessary. Study the situation. In any case, it's *not necessary* to convert the a.c. to d.c.—You need not connect it up to a rectifier tube.

Nice thing about this, I find, is *also* that you can tuck in a new transformer *without* having to do any soldering. If the new transformer is not needed—it can be returned for credit!

(Double-ended clips are very handy for such jobs and many others.)

VI. A job which stood me on my head:

A service call. No d.c. high voltage, and at the same time plenty of a.c. arc on the cap of the 1B3. Naturally, I

replaced the 1B3. Got a faint picture, similar to low-emission picture tube. However, I checked for high-voltage d.c. again.

It was still very low! So I tried another 1B3. No luck. Took the set to my shop.

Some hours, and many curses later, I finally realized what was wrong. Apparently, when the set was built they were fresh out of proper sockets for their 1B3's.

So they used one of those rectifier tube sockets which have pin connections only for pins 2, 4, 6 and 8.

Need I tell you that the 1B3 uses 2 and 7 for filament?

Knowing what they had done, they must have put a jumper on the tube they used, between pins 7 and 8.

That set was a booby trap, waiting for some unsuspecting repairman. Can you top that?

VII. It is about time for someone to say, "No!" to the indiscriminate use of plastics.

One such is the generally adopted new type of i.f. transformer, with fixed parallel trimmers molded in the base.

They short-circuit! And are devils to repair.

One of my customers now operates his TV set with a shield missing from a sound i.f. transformer. I took it off, the only way I could clear a short through the plastic base to ground.

True, one can always replace defective transformers (if and when the substitute is available). But it is not good to be left wondering whether—and when—the replacement, or some other similarly constructed transformer in the set, is also going to short.

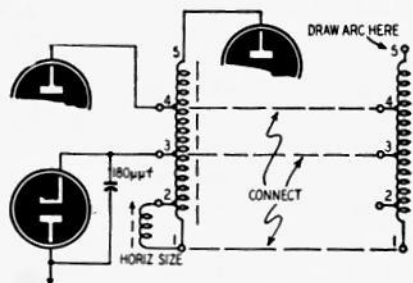


Fig. 5—Flyback substitution test setup.

VIII. My own set is a Philco 48-1000 which I converted to 14 inches.

When I bought the set second-hand, I found that the tuner was defective. Several contact springs were broken. The repair? I soldered in new springs made out of a certain type of women's hair curlers of good spring steel.

The resultant circuits had more inductance and capacitance than the original, creating greatest difficulty in the oscillator. So I moved oscillator segments—used channel 13's for channel 11, 11's for 9, etc. The set works well, except that I don't get 13. However, 13 is weak in my neighborhood anyway.

I also eliminated the automatic frequency control circuit—put in manual fine tuning based on a 1-meg control which varies oscillator grid bias. It works well.

END





# Art's TV Shop

By Art Margolis

## THE CASE OF THE BOOBY-TRAPPED TUBE

**S**EEMS like you got a bad batch of tubes there, Art," burly detective sergeant Haines smiled in a cool fashion.

"It's not indicated, Joe," I grinned back.

"That's the third bad 6GH8 old boy," he returned with some of the smile gone.

"Let's review it," I answered, trying to be patient.

He began, "I brought in all the tubes from my TV and tested them," he waved a finger at the self-service tube tester. "The 6GH8 was bad. You sold me a new one."

"Right you are," I nodded, "I made sure you tested the new one before taking it home, right?"

He sighed, "Yeh, but the new one didn't work, so I brought it back. It tested bad then."

"I gave you another new one, that you also tested before you took it home," I answered, trying to keep smiling.

He gave a long sigh a second time, "That one didn't work either." He held the tube up. "It tests bad too."

I pointed at our Service Charge List. "Joe I'll tell you what. Bring in the TV. If there is nothing wrong but a tube, I'll pay you the service charge. If there is trouble, then you pay for the job."

He smiled. "Be back in a while," and he strode out to his unmarked patrol car.

I took the three 6GH8's—his original and the two new ones I sold him—and tested them carefully. All three had the same problem. The pentode section of the triode-pentode was dead.

I pulled out Joe Haines's file card. He owned an Emerson 29P03 color TV. He had described the symptom of the trouble, the first time he was in. The color-killer control was inoperative and rainbows were going through the picture instead of the colors locking into place. I pulled the schematic

for the TV and looked over the circuit.

The tube in question had the triode section doing color-killer work, while the pentode part was the burst amplifier. The burst amplifier was connected into the color killer. If the burst amplifier was defective, it could ruin the performance of the color killer.

As I mused, Joe walked back into the store and gingerly placed the 19-inch color TV on the service counter.

I set it in place, removed the back and plugged it in. I took a new 6GH8 off the shelf and tested it in the tube tester. Both the triode and pentode sections showed Good.

Joe was watching closely. He didn't say a word, so I remained silent. I plugged the new, known good 6GH8 into its socket and turned the TV on. I could see the face in the counter mirror.

The audio blasted forth and a bright picture pushed its way satisfactorily across the screen. The colors came in momentarily but then began rotating down through the picture. The flesh tones changed continually from green through normal through purple. A clear case of colors out of sync. The color burst-oscillator circuits were indicated as being in trouble.

I looked at the burst amplifier I had just installed. It seemed normal. I watched it. Then it began. One of the black plates was turning pinkish. I pulled the plug. That is not permissi-

ble. A plate in a tube should never run hot enough to glow. If it does, it is drawing more plate current than it is rated for and will burn up quickly.

Now what could be causing this 6GH8 to be drawing too much current? There are three immediate possibilities (Fig. 1). One, B-plus could have bled through to a control grid from the preceding plate. When that happens, the valve action of the tube causes too much current to pass the control grid vicinity. Instead of a normal negative bias, the control grid is positive, exercising no control. The tube runs wide open.

A second possibility is loss of cathode positive bias. When the cathode loses bias, the control grid-cathode voltage difference acts as if a positive voltage were on the grid, as in the number one possibility. Here again the tube runs wide open and passes more current than the plate can absorb.

The third reason could be too much positive attraction voltage on the plate. Should plate voltage go more positive, it affords a stronger attraction to the cathode current, and plate current rating could be exceeded.

I looked at the schematic and zeroed in on the pentode part of the 6GH8. Joe watched over my shoulder. The plate and screen were supposed to have plus 250 volts on them. The control grid is at zero volts, while the cathode has plus 25 volts. The plus 25 on the cathode effectively gives a minus 25 volts bias on the control grid. This high negative bias allows little current to flow. Surely not enough to make the plate glow.

I plugged in the TV, grabbed the probe of my voltmeter and began reading voltages (Fig. 2).

Pin 3 the screen grid had plus 250 as prescribed. Pin 6 the plate was about 175 volts, somewhat low. Pin 2 the control grid had the zero voltage shown on the schematic. Pin 7 the cathode was wrong! It had plus 2 volts

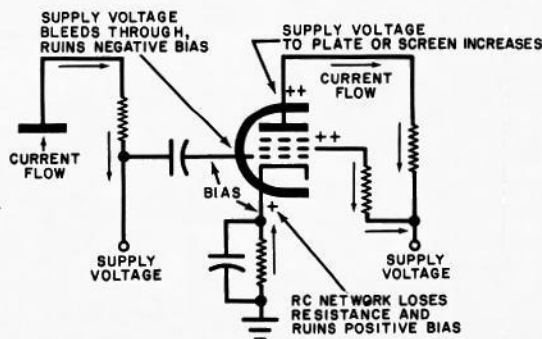
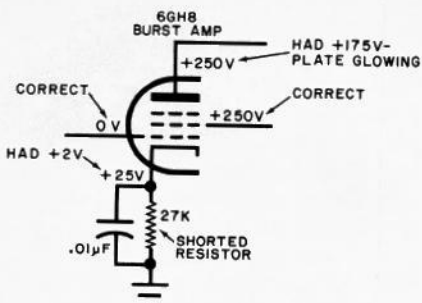


Fig. 1. Three possible reasons for excessive plate current are shown.



*Fig. 2. Voltage readings showed a shorted resistor.*

instead of plus 25, which is required

In the cathode was a small RC network consisting of a 0.01- $\mu$ F capacitor and a 27,000-ohm resistor in parallel to ground. They both looked good.

I turned off the TV and took a resistance reading from pin 7 to ground. Aha, it was under a hundred ohms. There was not enough bias resistance to develop the plus 25 volts between ground zero and pin 7. The hundred ohms only developed about 2 volts. Either the capacitor or the resistor had shorted down to the low ohmage.

I unsoldered one end of the capacitor. Joe was now watching carefully. I measured the capacitor. It had infinite resistance. It wasn't shorted, it was good. I disconnected one end of the resistor and took a resistance reading. That was it! Instead of 27,000, it read under a hundred ohms.

I turned to Joe with the little colored carbon body between my fingers, "Here's the trouble, a shorted resistor." Then I took a new one out of the drawer and soldered it in.

The TV was turned on and the newest 6GH8 plugged in. I watched the plates carefully. They stayed black, no glow.

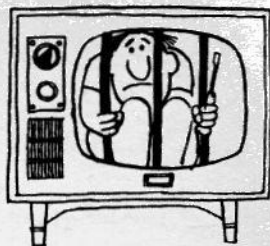
I tried the color-killer control. It was now working properly. A good picture showed with all the colors locked into place.

I laid the box of the last 6GH8 I used alongside his other three. He looked at them all ruefully, then put both his elbows on the counter and cupped his chin in his open palms. He smiled coolly, "Seems like you got a bad batch of tubes there, Art."

I took a deep breath and said, "Joe - - -"

He laughed, "Don't get up-tight there old boy, it's a bad batch, but it was a booby trap in my TV that did it. I could have been buying tubes forever if you didn't catch it. Pretty tricky."♦

# BEWARE OF YOUR OWN TV REPAIR TRAPS



*Go ahead. Do it yourself. But read this first.*

**By ART MARGOLIS** AT the front of my TV repair shop is a tube tester and a display of replacement parts. Together, they lead to many a successful do-it-yourself repair. But others end up on our service bench in sad disarray. For, hidden in the complex route from diagnosis to repair, booby traps await the unwary home handyman.

While all kinds of bizarre electronic tragedies happen to the fearless, little can hurt the careful. A few professional tips can help you bypass the ambushes with techniques that are mostly common sense. Let me tell you about some case histories that exemplify what I mean.

## Two for the Tester

One evening two people were taking turns at the tube tester when a gentleman brought in a 19-in. portable TV. As he lifted the TV onto the service counter he glanced at the brunette at the tester. She was about to press the button.

"That's a bad one," he snapped and pointed to the lit neon that indicated a shorted tube.

She looked up, startled, then smiled. Taking the tube out of the tester, she handed it to me. It was a 6BQ7. Meanwhile, the tall young fellow opened his paper bag and began testing tubes. As I was writing up the bill for the brunette's new 6BQ7 she started to put it in her handbag.

"Hold on, honey," said the man with the portable. He took the tube from her hand and shouldered the young fellow away from the tester. "Always test a new tube. Some of them are bad." Her 6BQ7 wasn't, though. She smiled, paid me and left.

I started to take the back off the man's portable but he was watching the younger fellow at the tester. Presently the young man was at the counter asking for a 6EA8 and a 6CE5. I gave him a 6U8 and a 6BC5 as re-

placements and the young man proceeded to put all the tubes back in the bag.

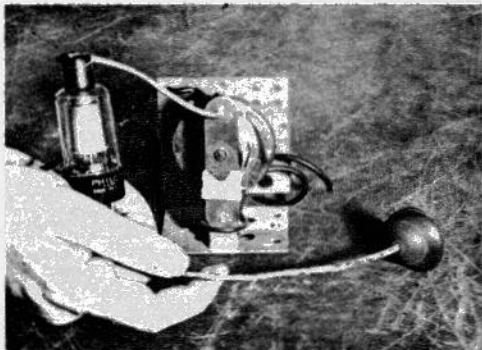
"Don't put those bad ones in your bag," snapped the older man. He grabbed the two bad tubes and tossed them into the trash can. "They'll get back in your set if you don't heave them. Also, you'd better make a note that the 6EA8 goes in the 6U8 socket and the 6BC5 in the 6CE5 socket. You'll get them mixed up otherwise."

In spite of the way it was said, this obviously was good advice. The young fellow made a face but did as he was told.

## The Hotter Heater

"I know, the 1B3 is bad again," moaned the gentleman, turning his attention to the portable. "I changed five of them in the last few months." There was high voltage at the cap of the 1B3 rectifier but none going into the picture tube.

"Looks like you've been booby trapped," I said, breaking the news as tactfully as I could. "Your set takes a 3A3 high-voltage rectifier, not a 1B3. Even though the two tubes look exactly alike your 3-V heater



1B3 and 3A3 high-voltage tubes look exactly alike, often are mistaken for each other.

# BEWARE OF YOUR OWN TV REPAIR TRAPS

voltage will keep on opening up the 1¼-V heater of a 1B3."

## The Inexact Replacement

Harry Townsend owns a hi-fi store and is an expert in his own right.

"Strange thing," he said, trying to cover his embarrassment at having to go to anyone else for electronic service help. "The picture on this set won't hold still. It rolls sporadically."

"He adjusted the vertical height and linearity until the picture had shrunk about 2 in. from the top and bottom of the tube. "Now it will hold," said Harry, adding sheepishly that he had worked on it the day before. "When I turned it on there was no picture—just a white line across the screen. I found the vertical output transformer had an open winding so I put in a new transformer and it's been rolling ever since."

"How had the vertical hold been before it went off?"

"Perfect!"

"First thing I always do when I cure a trouble and discover a new one is double check any part I replaced."

"Way ahead of you," he sighed.

"Once I determine the part is good I check its value to be sure it's the right part."

"Did that too, Art. In fact, I didn't even use a universal replacement. I called the distributor for the exact factory part."

Fortunately, he had the old output transformer with him. It was marked 104102-4. The number on the one inside the set was 104102. Not *quite* the same. I looked up the universal replacement number and tacked one into the circuit. Now the picture filled the screen. I tried the vertical hold. It was locking solid.

"The replacement transformer didn't quite match the impedance of the yoke," I said. "It's like a mismatch in the output of an audio circuit—you get lowered output. If you try to compensate by turning up the controls, the way you did with the linearity and height, you get distortion—in this case a loss of vertical hold."

I could see he was burning. I reached for

a record changer I had been having trouble with. "Harry, I'm stuck on this bomb. The reject doesn't always work. I wonder . . ."

## Color Un-Coded

"That yoke you sold me—it's not the trouble," said a pathetic voice on the phone one day. I could hear his wife cluck-clucking in the background and I knew it must be Mat Harrison. They had been in earlier in the day and she was dead set against his trying to fix the TV.

His trouble was a classic case. "The picture comes on but it is shrunk in on all four sides,"



Reversing the leads of the deflection yoke results in reversed deflection of electron beam. Universal replacement yokes can't match color coding of all yokes they replace. You must peel off cover to match lead wires.



he had said. "And the picture is shaped like a keystone."

I explained that he probably had a bad deflection yoke. The yoke has four sections. The two vertical sections spread the picture out from top to bottom. The two horizontal sections spread the picture from side to side. Whenever one of the windings shorts, it's respective picture area shrinks. This causes the keystone-shaped picture. So I sold him a universal replacement yoke.

"The picture is not shrunk any more," he moaned. "It's worse. It's upside down and backward."

"Your yoke is okay," I told him. "You just have it wired wrong."

"Impossible," he said emphatically, "I matched the colors wire for wire."

"Sorry about that, chief, but the colors don't match. A universal replacement is made for a hundred different TVs. You'll have to peel the cover off the old yoke, make a sketch of which wires are coming from which connections and match the new yoke to the old." He had been trying so hard to touch all bases in replacing the yoke that he had not stopped to consider what might go wrong.

### Gently Does It

A similar case showed up one Sunday morning. The girl from my answering service sounded rattled when she told me that someone's TV set had exploded.

It turned out to be a finicky accountant who loves to save money by doing everything himself. He's great at following instructions to the letter. He had been in the shop on Saturday to get a 24-in. picture tube. My advice that, for replacement purposes, a rebuilt tube was the best buy fell on deaf ears. But when I offered tips on installation of the tube he made notes of everything.

As I took the replacement out of the box for him I pointed to the plastic cap on the CRT neck. "On your old tube you'll find a little metal strap that connects two pins. Be sure to take it off the old tube and put it on this one. Without it your picture will be blurred."

Next I pointed to the yellow band on the CRT neck with the lettering DO NOT USE ION TRAP. "This new tube has a straight electron gun instead of a bent one like your old tube. You won't need the ion trap. It's the ring with the small magnet around the neck of the old tube. Leave it off. The main

tube is aluminized so the ions won't burn up the screen."

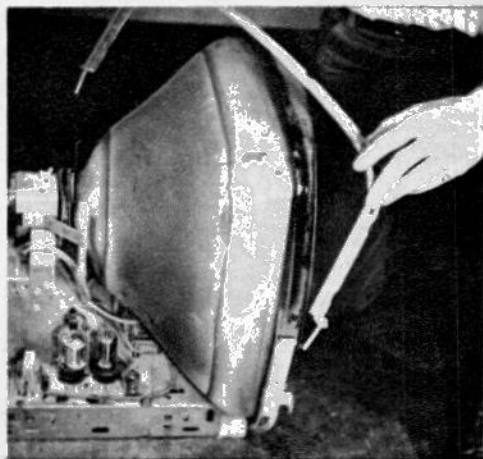
The last advice I had given him was, "As you take the old tube out make a note of every move you make. Then retrace your exact steps as you install the new tube."

"Don't you worry about that," he snorted.

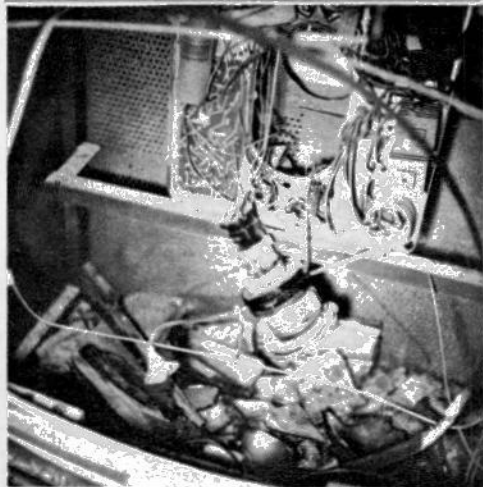
As I walked into his living room I found glass all over the floor. The trail of glass led to the TV which looked sad with its face blown out.

"I made sure I got that strap back on exactly like it came off," said the accountant.

*[Continued on page 116]*



CRT circumference varies from tube to tube. Metal strap should be tightened only until it is snug around replacement, regardless of position on old tube. Tighten it too far and you will be in for some serious trouble.



*Continued from page 105*

"even though the last turn or two was tough going. But I know the nut ended up in the same location on the bolt. I could tell by the rust marks."

There was no sense in telling him that no two picture tubes are exactly the same size and that each needs a fit that is snug but never tight—he probably won't be changing any more tubes.

### Turn of the Screw

Mr. Myer is a nice old gent who makes his living by manufacturing kitchen gadgets. The last time I had a service call from him he told me, "I must 'fess up, Art. The set was good 'till I got ahold of it."

I turned on his TV. Light and background noise came on. There was some semblance of audio and video but they showed up on the wrong channels with very severe interference.

"What did you do?"

"He removed the channel selector and fine tuning knob and pointed into the hole they had been covering. "I tried to adjust those little screws for best sound and picture. But something went wrong."

The oscillator slug adjustments in most TVs are readily available. They move sound and picture settings to the center of the fine tuning range so you can switch from channel to channel without bothering with the fine tuner.

Some sets have all the channels hooked together while others (like Mr. Myer's) have individual adjustments for each channel. When they are hooked together you have to adjust only two screws—one for channels in

the high band (7 through 13) and another for the low band (2 through 6). You must know which type you are working on before making the adjustment.

In any case the adjustments should be made with a non-metallic alignment tool. If you use a screw driver with a metal blade it acts as though it, too, was a slug as long as it is in the coil. You have to pull it out of the coil to check every adjustment you make.

If they are tuned too far the slugs can fall out—there are no stops in some tuners. When that happens you lose your range altogether. That's what had happened to Mr. Myer's TV.

I began removing his front-end's oscillator strips one by one, gingerly holding the coil and removing the slug. Then I reinserted the slug into the front of each strip and adjusted them.

And while I was at it I decided to clean all the contacts on each strip. Very often the accumulation of dirt on the contacts can cause intermittent reception, or none at all, when you switch channels. Also, I got up into the front-end to clean the fingers which touch the contacts. They, too, get dirty and are a frequent cause of a missing picture when you switch to another channel. Best thing to clean the contact with is an aerosol spray cleaner.

Mr. Myer had been watching me closely, muttering, "There must be an easier way."

A few weeks later he sent me a small package. It contained a gadget that looked like a long, thin screw driver with an adjustment to rotate the center of the blade. Inserted in the slot of a screw it can be made to grip the sides of the slot so that you can reach into a tuner coil and retrieve the slug. Mr. Myer had found that easier way. —