ndoor and Built-In Antennas Their Strong and Weak Points

The indoor TV antenna yields only a compromise performance

By IRA KAMEN

JOHN STUART MILL said, "In times of crisis we must avoid both ignorant change and ignorant opposition to change." This statement is wise counsel today both to those selling and installing television receivers and to landlords of multiple dwellings.

The urban television dealer has not been able to realize full sales possibilities because many building owners have refused to permit tenants to erect rooftop antennas. Often, to make his sale, the dealer has installed in apartments TV receivers with indoor antennas, the poor performance of which increased the tenant's resentment against his landlord.

The latter is often justified in refusing his permission, or, as shown in the photo, the roof becomes cluttered with a maze of disfiguring antenna rods, and the landlord becomes liable for public, personal, and property damage.

In addition, random installations of rooftop antennas may result in penalties for violation of local fire, building, and electrical ordinances. There are two main reasons why so many buildings have roofs like the one in the photograph: either the landlord did not want to offend tenants, or he used the permission as a way of persuading them to agree to a rent increase. Some landlords are neither cringing nor greedy, but allow the antennas so that tenants can enjoy television, feeling that the appearance of the roof—never exactly artistic in any case, with clotheslines, water towers, and so on—and the rather remote possibility of damage are subordinate to peaceful relations between landlord and tenant.

On all rooftops overloaded with antennas interference between television receivers may be so bad that on many evenings only two or three of a possible six or seven channels can be used by most tenants. All other channels show r.f. interference as pictured in Fig. 1. The Oscillator Interference Chart shows that when a television receiver is tuned to channel 2, 3, 7, 8 or 9, its oscillator radiates interference on either channel 5, 6, 11, 12, or 13.

The final solution

The permanent solution to the multiple-dwelling problem is a vacuum-tube-type master antenna system such as approved by the engineering committee of Television Broadcasters Association and conforming to RMA specifications. To date, two systems have been tested and approved, one made by RCA and the other by the Intra-Video

Fig. 1—Interference from another set.

Corp. of America. Both these systems suppress oscillator radiation enough to prevent its marring the pictures of other RMA standard receivers connected to the system. Any type of TV receiver may be connected to the system. Neither system is in common use.

Many a dealer is temporarily convinced (against his better judgment) that this or that indoor antenna is the answer, for he knows that a successful indoor antenna would mean greatly increased sales.

Installation companies guaranteeing in the original contract reception for stations not yet on the air should beware of the indoor antenna even though it may operate satisfactorily for channels now in use. Nearly every indoor installation is a costly, time-consuming experiment, and the set user is almost never fully satisfied. There are call-backs and a resultant financial loss every time a new station goes on the air.

There is no such thing as a high-gain indoor antenna. Even an adjustable unit barely approaches the performance of a simple outdoor dipole on the channel to which it is adjusted. Careful comparative tests should be made on all new "sensational" indoor antennas before embarking on a wholesale indoor-antenna program.

The indoor antenna is not practical as a final solution to the problem. TV signals do not pass readily through steel structures and are attenuated by the materials of which houses are built. Such antennas are always a nuisance, whether installed under a rug, in a closet, on a table or simply on top of the receiver.

Indoor antennas usable

There are, however, many locations where indoor antennas can provide a satisfactory *compromise* signal from most stations. The set owner must, however, overlook faults. There is a reduced signal-to-noise ratio and contrast will depend not only on the control, but

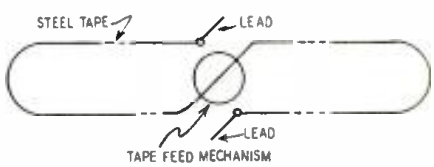


Fig. 2—Slide-Rule is a folded dipole.

on the positions of people and furniture in the room. With an "under-the-rug" antenna, every time someone walks across the room the contrast changes.

The signal quality varies, too, with the season. Window screens and foliage

The Tele-Tone has rotatable V antenna.

affect it during the summer, and during the winter, when the indoor antenna is picking up a reflected signal from a building or a mountain, ice formation on those surfaces may change picture quality and strength.

The only time, in fact, when an indoor antenna works excellently is when it is near a window from which it is possible to see the TV transmitting antenna.

Practical indoor antennas

For portable receivers, the indoor antenna is of course a must. The most practical is the rotating adjustable V which can be turned and the length of which can be adjusted. A typical one is used with the Tele-tone receiver in the photo. While the V antenna was originally a means of minimizing the space needed for a dipole, it definitely has an important advantage. Although TV transmitters send out horizontally polarized waves, reflections produce a signal which has a different angle of polarization from the original. By setting the V at the correct angle the two (direct and reflected) signals of different polarization can be combined in phase and the signal increased.

Many receivers with only average sensitivity may be installed with an indoor antenna yielding a weak signal, if a booster amplifier with a minimum gain of 20 db is connected between antenna and receiver. The booster should not oscillate and should pass the full 6-mc bandwidth required for good reception. Many boosters have such narrow bandwidths that they do not permit the TV receiver to "track" on picture and sound simultaneously. Many oscillate on some channels, mismatch the antenna input, and are unstable.

Another practical indoor antenna is the Radio Craftsmen slide-rule. The length of a folded dipole is adjusted like a steel measuring tape. While the length of this antenna is adjustable, it cannot offer a perfect 300-ohm match except at one adjustment (if at all) for the distance between elements cannot be varied. This distance should vary from 0.54 to 0.145 inch for optimum results from channels 2 to 13. This antenna's shape is not like that of a conventional folded dipole, either, as illustrated in Fig. 2.

Fig. 3 shows a typical under-the-rug antenna with high- and low-band folded dipoles made of ribbon line. Occasionally three or four of these must be installed and a switch provided at the receiver to select the one adjusted for the desired station. In other installations pairs of dipole rods are installed in different sections of an apartment and co-axial cables circuited to a co-ax switch at the receiver. While several indoor antennas and a switch may provide satisfactory reception, it is a rare customer who will accept and pay for such an installation.

It is conceded that a built-in TV indoor antenna (Fig. 4) would be a great stride toward full realization of customer acceptance of television. Capitalizing on this fact, several manufacturers have made judiciously worded claims to having solved this problem. However, as one of these manufacturers stated: "gold is where you find it." Indoor antennas—whether built-in or portable—will pick up television signals only if they are present in the vicinity of the indoor antenna, and the quality of the reception cannot be improved over the quality of the signals received.

Actual tests of built-in antennas indicate early enthusiastic customer reaction in some areas (Brooklyn, Queens, Kings, and Westchester County in New York) where strong TV signals from a majority of nearby TV stations have an unobstructed path to the indoor antenna from one general direction. As

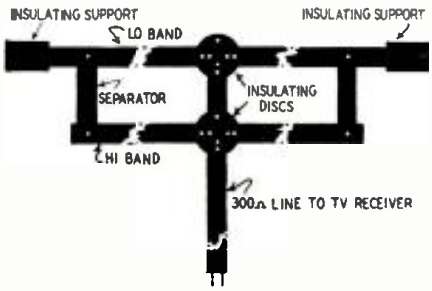


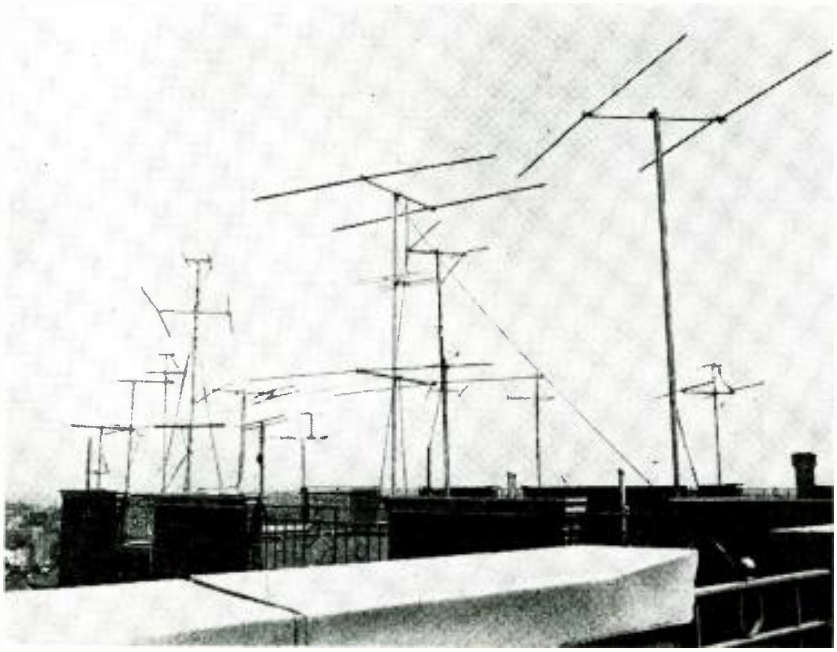
Fig. 3—Under-rug unit of ribbon line.

expected, in Manhattan, dealer and multiple-dwelling reception with built-in antennas has been generally poor. The following disadvantages have been noted by TV dealers:

On stations where signals are weak, the tuning adjustments become complex to the layman. The customer must keep his hands off the top of the cabinet as he tunes the antenna or else he affects the tuning. Metal trays or other large appurtenances cannot be placed on top of the cabinet by the customer.

In first-floor dealer establishments the built-in antenna will work on only one or two stations in one or two locations in the store, which reduces the flexibility of the dealer's sales operation. In many cases the dealer's serviceman must sell the customer on accepting the reception of the built-in antenna or rapidly install an outdoor antenna before the customer rejects the merchandise.

The service technician who has the responsibility of asking the "lady of the house" to relocate the TV receiver with built-in antenna in another section of the room or a different room where the TV receiver will pick up more channels, must have an outstanding sales personality. Many amusing situations have arisen where the receivers with built-in antennas work best in the middle of the living room, in front of a window, and in other loca-



Forest of antennas on apartment roof. Close proximity can cause interference.

tions which the customer usually rejects.

The idea of installing a TV antenna on the power line cord or as a permanent unit in the rear of a console TV set as though it were a built-in radio antenna is impractical. Several manufacturers have spent considerable money and time to prove it. Certainly for apartment-house installations, it is impossible except when the TV receiver is against a favorably placed wall or in front of a window.

The increasing number of TV stations will start the indoor antenna on

Fig. 1—Philco's built-in TV antenna.

the road out except for portable receivers and for those people willing to accept compromise reception.

OSCILLATOR INTERFERENCE CHART*

Receiver tuned to channel	Osc. freq. (mc)	Interference with channel
2 (54–60 mc)	81.25	5 (76–82 mc)
3 (60–66 mc)	87.25	6 (82–88 mc)
7 (174–180 mc)	201.25	11 (198–204 mc)
8 (180–186 mc)	207.25	12 (204–210 mc)
9 (186–192 mc)	213.25	13 (210–216 mc)

*For receivers with 21.25–27.5-mc i.f.

The plight of viewers living in multiple dwellings will be finally relieved when the landlord again faces a buyers' market and realizes that he must give his tenants television outlets just as he provides heating, plumbing, ventilation, and other fundamental services.

Many of our readers will not agree with Mr. Kamen on this controversial subject. For a different view, see Noll and Mandl in last month's issue (page 29)—*Editor.*

TELEOGLERS GET TELESQUAT

TV fans may be getting "telesquat" and "telecrane" spinal ailments, Dr. Martin R. Stone, president of the Chicago Chiropractic Society, said in an interview with a reporter of the *Chicago Daily News.*

Persons who perch themselves precariously on the edge of their spines by sitting in a slumped position are asking for trouble. They are doing the "telesquat."

"They sit on the bottom of their spine and not on their bottom like nature intended. The 'telesquat' can cause a low backache and other physical disturbances," he said.

Sitting in a forward bent position puts a strain on the vertebrae of the neck. This is what Dr. Stone calls "telecrane." This practice can cause severe neckache, headache, and eyestrain.

TV STATION LIST

WE receive occasional reports of television stations 1,000 or more miles away being received clearly on ordinary receivers. Reports of such television dx reception are both valuable and interesting because they indicate the extent of this undesirable long-distance propagation.

Beginning with the next issue, RADIO-ELECTRONICS will publish reports of long-distance TV reception. Readers are invited to notify us of their TV dx experiences in detail, giving the date, time, name, location, and distance of the station, quality of reception, type of receiver and antenna in use, as well as any other pertinent data.

To aid dx'ers, the following complete list of stations gives all necessary logging information.

City	Call	Channel
ALABAMA		
Birmingham	WAFM-TV	13
Birmingham	WBRC-TV	4
CALIFORNIA		
Los Angeles	KECA-TV	7
Los Angeles	KFI-TV	9
Los Angeles	KLAC-TV	13
Los Angeles	KNBH	4
Los Angeles	KTLA	5
Los Angeles	KTSL	2
Los Angeles	KTTV	11
San Diego	KFMB-TV	8
San Francisco	KGO-TV	7
San Francisco	KPIX	5
CONNECTICUT		
New Haven	WNHC-TV	6
DELAWARE		
Wilmington	WDEL-TV	7
DISTRICT OF COLUMBIA		
Washington	WMAL-TV	7
Washington	WNBW	4
Washington	WOIC	9
Washington	WTTG	5
FLORIDA		
Miami	WTVJ	4
GEORGIA		
Atlanta	WAGA-TV	5
Atlanta	WSB-TV	8
ILLINOIS		
Chicago	WBKB	4
Chicago	WENR-TV	7
Chicago	WGN-TV	9
Chicago	WNBQ	5
INDIANA		
Indianapolis	WFBM-TV	6
KENTUCKY		
Louisville	WAVE-TV	5
LOUISIANA		
New Orleans	WDSU-TV	6
MARYLAND		
Baltimore	WAAM	13
Baltimore	WMAR-TV	2
Baltimore	WBAL-TV	11
MASSACHUSETTS		
Boston	WBZ-TV	4
Boston	WNAC-TV	7
MICHIGAN		
Detroit	WJBK-TV	2
Detroit	WWJ-TV	4
Detroit	WXYZ-TV	7
Grand Rapids	WLAV-TV	7
MINNESOTA		
Minneapolis	KSTP-TV	5
Minneapolis	WTCN-TV	4
MISSOURI		
St. Louis	KSD-TV	5
NEBRASKA		
Omaha	KMTV	3
Omaha	WOW-TV	6
NEW JERSEY		
Newark	WATV	13
NEW MEXICO		
Albuquerque	KOB-TV	4
NEW YORK		
Buffalo	WBEN-TV	4
New York City	WABD	5
New York City	WCBS-TV	2
New York City	WJZ-TV	7
New York City	WNBT	4
New York City	WOR-TV	9
New York City	WPIX	11
Rochester	WHAM-TV	6
Schenectady	WRGB	4
Syracuse	WHEN	8
NORTH CAROLINA		
Charlotte	WBTV	3
OHIO		
Cincinnati	WCPO-TV	6
Cincinnati	WKRC-TV	11
Cincinnati	WLWT	4
Cleveland	WEWS	5
Cleveland	WNBK	4
Columbus	WLWC	3
Columbus	WTVN	6
Dayton	WHIO-TV	13
Dayton	WLWD	5
Toledo	WSPD-TV	13
OKLAHOMA		
Oklahoma City	WKY-TV	4
PENNSYLVANIA		
Erie	WICU	12
Lancaster	WGAL-TV	4
Philadelphia	WCAU-TV	10
Philadelphia	WFIL-TV	6
Philadelphia	WPTZ	3
Pittsburgh	WDTV	3
RHODE ISLAND		
Providence	WJAR-TV	11
TENNESSEE		
Memphis	WMCT	4
TEXAS		
Fort Worth	WBAP-TV	5
Houston	KLEE-TV	3
UTAH		
Salt Lake City	KDYL-TV	4
Salt Lake City	KSL-TV	5
VIRGINIA		
Richmond	WTVR	6
WASHINGTON		
Seattle	KRSC-TV	5
WISCONSIN		
Milwaukee	WTMJ-TV	3

Television Channel Frequencies

Channel Number	Frequency (mc)
2	54-60
3	60-66
4	66-72
5	76-82
6	82-88
7	174-180
8	180-186
9	186-192
10	192-198
11	198-204
12	204-210
13	210-216

The following stations, not on the air when the above list was made up, are expected to open on the dates indicated below.

City	Call	Channel	Probable starting date
Kansas City, Mo.	WDAF-TV	4	10/16/49
Greensboro, N. C.	WFMY-TV	2	9/22/49
Columbus, Ohio	WBNS-TV	10	10/1/49
Johnstown, Pa.	WJAC-TV	13	9/15/49
Dallas, Tex.	KBTV	8	9/17/49
Jacksonville, Fla.	WMBR-TV	4	10/16/49