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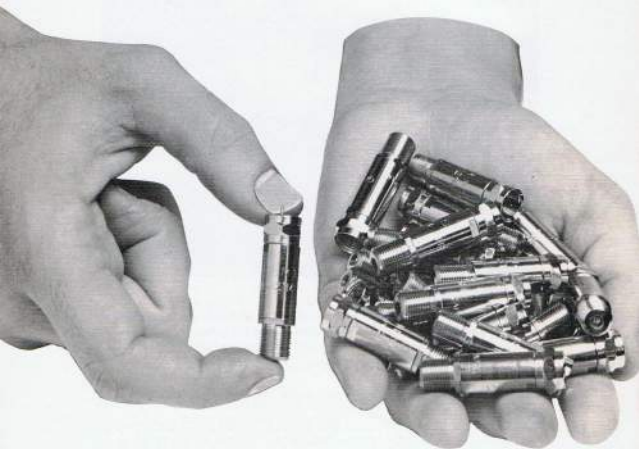
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**MAR.  
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**VOLUME 2  
NUMBER 3**

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#### **A Pox On Your House**

**PROPOUND** — Oregon Antenna Receiving System Operator Chuck Kee of Redmond offers this "guest editorial" that places the blame where he believes it fits.....6

#### **Freeze Is An Ugly Word**

**INFAMOUS CHILL OF '48** — Just when television was moving pretty good, the FCC stepped in and shut it down. For nearly four years America waited ... and waited ... and waited.....10

#### **Color It Dumb**

**CBS-COLOR THAT DID NOT FLY** — Compounding the freeze of new station grants was a two year FCC study of color. It went all the way to the Supreme Court!.....26

#### **Maybe The Freeze Wasn't So Bad!**

**THE UHF FIASCO** — Never has a federal agency taken so few steps, more slowly, to correct a problem it created.....39

#### **Where Our Roots Are**

**HOW TV CAME TO PANTHER VALLEY** — Meanwhile, community antenna systems were developing, as this March, 1951 article originally appearing in **Radio-TV News** reports. This was 24 years ago; it is amazing how little has really changed!.....52

#### **Meanwhile — Back in 1975**

**ECONOMY (do it yourself) DEMOD/MODULATOR** — Steve Richey explains how easy it is to demodulate a signal, and put it back on a new channel, for about \$15!.....59

**CATA-torial (Kyle D. Moore, President)**.....4  
**CATA ASSOCIATE MEMBER ROSTER**.....63

#### **OUR COVER**

Plainly, the FCC has cost the American viewing public millions of mis-spent dollars in two decades. CATV has been a pawn in the hands of the FCC, and the FCC apparently marches to the network's drummer. Part One of a two-part report.



## IT SEEMED LIKE A GOOD IDEA

At the close of World War II, Sylvania Electric Products conducted a marketing study, to assist in that corporation's decision "should it go into commercial manufacture and distribution of television receivers?" The war-time economy, where this nation first proved it had the aptitude to turn out very large quantities of identical devices in a very short time, was about to run down. Sylvania, like many other large war-time suppliers, was looking for something to boom. **Television seemed like a good prospect.**

Sylvania broke its study down into people who would instantly buy a television receiver, those who would one day, those who would buy only if the price came down (and program quantity went up), and finally, those who would never buy (they said). The study indicated that 75% of the American public would never buy television receivers. Still, 25% amounted to many millions of receivers, and Sylvania, like numerous others, **decided to give television a chance.**

In 1946 television was just awakening from a long war-time sleep. The receiver industry would build 6,000 receivers in 1946, and the American public would purchase 5,000 of these. Nationwide, there were six—or seven, depending upon whom you believe—stations transmitting at the time.

The FCC had authorized commercial television in 1941, although television has roots back into the 20's. An experimental station in Los Angeles, operated by the Don Lee Radio Network began telecasting 1½ hours a day in 1931 on what was to become television channel 1 (later deleted in favor of two-way radio). The "broadcasting standards" inaugurated by Don Lee Broadcasting in the early 1930's were not substantially different from those finally accepted by the Commission in 1939 and authorized commercially in 1941.

Of course the war shot down the advancement of commercial television in 1941, but by the end of the war, six (or seven) stations were actively broadcasting to a handful of do-it-yourself electronic nuts who had assembled receivers in basement workshops.

With this issue of CATJ, we attempt to trace the badly tattered course of federal regula-

tion as it applied to the dawning years of the television industry. This report, in the best of tradition of old-time radio serials, will be continued (to completion) in the next (April) issue of CATJ. In this issue, we trace the uncertain path of a federal government wrestling with some of the most immense pressures that industry can bring to bear. We will witness indecision, deliberate attempts to suppress or conceal vital evidence, overt attempts at bribery and perhaps blackmail. As Edward R. Murrow used to pan into the black and white cameras, "**You Are There**" as we trace through trade press reports, thousands of personal interviews and re-interviews, official FCC and Congress reports, the tangled web of intrigue created by the growth of television in this country.

The decisions (and lack of decisions) of the FCC and Congress in the critical period 1948-1956 are clearly the basis for the tangled mess the present FCC finds itself in, **vis-a-vis CATV**. Your interest in the present state of CATV will, we feel, be greatly enhanced by an **understanding** of this critical-to-television period, 1948-56.

This issue draws few conclusions about our present problems; it seeks only to point out historically where we were headed (and how we traveled) from the days of "**Television Comes To Panther Valley**" (see Page 52) to the present. In next month's CATJ (April), we will take an equally hard look at the era 1961-1974. There will be particular emphasis on the period 1963-64 (NCTA Research Council), 1966-69, and 1972-73; short moments in history when CATV assumed a prostrate position as various federal broadcast authorities and groups marched the Russian Army (barefoot) over our torso.

Throughout this scenario, CATV (and our system subscribers) has been attacked again and again by a street gang of do-gooder regulators hell bent on creating a show for their benefactors: the adversary broadcasters. Now through the pages of CATJ, we intend to hold court, submit our preliminary evidence, and petition the U.S. Congress for a trial. Let's see if this government of the people, by the people, and for the people still really does work!

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# PROFOUND

## "A GUEST EDITORIAL"

Chuck Kee  
Key TV, Inc.  
Redmond, Oregon

A wise CATV person recently said, "When you fight, you get what you did not expect to get; when you do not fight, you get what the other side wants you to have." The CATV industry has for ten years now been getting what the other side has wanted us to have, and it is time to turn the tables and become a vocal, monolithic in our views, bunch of hell-raising, Bible-quoting antagonists.

We must come out of our shells. For too many years we have tended to our antennas and cables, tweaked upon our amplifiers, and cast the riches of television into our communities. We have followed false prophets, and they have lead us to the very brink of extinction.

There are those who proclaim that the Community Antenna Television Industry is dead and waiting only for the formal burial ceremony. Those who proclaim this are either fair weather friends, or broadcasters who would rather see us dead than alive and hope that by forecasting our early demise, they will hasten the day when we are in truth dead. We are not dead, but we are an industry of walking wounded.

Our wounds have been inflicted by a federal bureaucracy dedicated to the false myth that we are a danger to the established order. We first encountered this bureaucracy in battle upon the windy snow-clad peaks of Carter Mountain. In a see-saw battle we advanced, and then we fell back and were defeated. We murmured through our ranks, "We may have lost a battle, but we will win the war." Alas, we underestimated the enemy, and, while we talked of preparing for another major battle and rallied our troops accordingly, the enemy prepared for subterfuge and legal maneuvers we were ill prepared to encounter. While we waited for a frontal attack, the enemy infiltrated our ranks, turned brother against brother, and refused to meet us in an open field of combat.

In the ensuing years, we have lost encounter upon encounter, often without even the recognition that we had met the enemy and lost. We have lost the advantage of mounting an offensive, and we have sprayed our am-

munition ineffectively in defensive actions that we have lost, time and time again.

Well, I say that enough is enough! The time has come for all of us, community antenna operator, broadband communications operator, supplier to our needs, franchising municipalities, and most of all...our subscribers, to become the most hostile, fire-breathing, unhappy, and just plain mad bunch of people who have ever inherited the face of this great nation!

The enemy has inundated us with paperwork, forms, letters of inquiry, notices, and requirements totally unnecessary. We can fight that battle; we can inundate them back. Every operator, every system employee, every municipality must immediately proceed to write letter upon letter upon letter to each and every person whom we identify as "an enemy" of CATV. It is not enough to write letters; the letters must show hostility, anger, and the basic truths with which we are all familiar.

Most important of all, when we read in the trade press, or hear generally that such and such, or so and so, has said something we find disagreeable, we must initiate letters and telegrams upon our own. We must go far beyond waiting for someone to "ask us what we think". We need to tell these people who would state untruths about us, or propose unrealistic endeavors for our future, that we disagree, that we disagree violently, and that we are mad and angry. We must allow no one who would continue the erosion of our simple, basic industry and service to escape our wrath. A seemingly semi-innocent off-hand remark by an FCC official that all CATV measurements will be changed from dbmv to picowatts should draw from each and every system operator an unsolicited letter of protest, an angry, mad, monolithic letter that puts the official on notice that we won't buy that one!

Stand up and be counted. Get off your VOM and trade your SLM for pen and paper at least one hour every day. Set out to write no less than one hostile, angry letter each day. Let's start inflicting some wounds on the other side!



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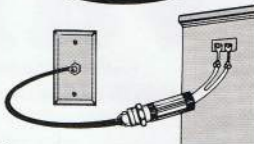


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# A SPECIAL MESSAGE FOR OUR "SPECIAL" READERS THIS MONTH!



More than 4,000 extra copies of this issue of CATJ are being circulated to members of Congress, regulatory agencies, state officials in all fifty states, city fathers regulating CATV, and non-subscribing portions of the CATV industry. This is your first introduction to CATJ and we hope you find it interesting.

You probably will NOT want to subscribe to CATJ. Normally, our pages are filled with circuit diagrams, and heavy technical language "discussions" of our industry's technical aspects. But these are **NOT NORMAL TIMES**. The CATV industry is threatened with total extinction. We are being regulated right out of the cable business and 10,000,000 American homes face the prospect of darkened TV screens. This issue of CATJ begins a two-part series on the tragic history of CATV regulation at the Federal level. This series concludes next month. Extra copies of this special report (as long as the supply lasts) and a **guaranteed copy of Part Two** in April are available if you return the card below.

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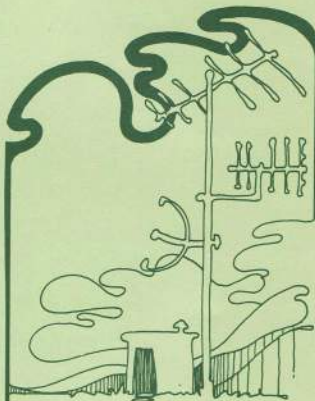
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YES — we know . . . this is not exactly the **regular format** for CATJ. Don't worry — the change in emphasis is only **temporary**. This is a one-shot effort lasting the months of March and April.

ACTUALLY — you should find the history of early day television fascinating. Keep this copy around, and then when you want to impress somebody, quote FCC Chairman Wayne Coy in 1949 when he said, "We have to remember that people live between big cities, and they want television reception. Rural people are important people too!"

JUST TO KEEP THE FAITH — we have not **completely** ignored your technical information needs this month. See Page 59 for a very neat economy demod/modulator you can build for just a few bucks. **Keep the faith . . . we won't let you down in May when we return to normal times!**



---

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# THE INFAMOUS TELEVISION ALLOCATIONS FREEZE OF 1948

## Freeze

The budget of the Federal Communications Commission in 1949 was approximately 8 million dollars. By mid 1949 the American public had invested approximately 500,000 million dollars in television receivers and another 50 million dollars in antennas and accessories to receive television. Television broadcast stations had invested up to 100 million dollars in their facilities, and another 25 million dollars in various support services (Bell microwave, etc.). *The whole scheme ground to a screaming halt on September 30th in 1948 when the FCC, with all of their 8 million dollars annual budget, called a halt to the granting of new television station application processing.*

The freeze was going to last "just a few months". Then it was going to last "a year... no more". Later it would last "no more than two years". Before it was all over, it lasted nearly four years, a period during which no new television stations were authorized in the United States, *and a period during which television, for 107 established VHF stations, became very, very profitable.*

There were television stations in 63 market areas when all of the pre-freeze stations finally got on the air. They broke down, as shown in Table 1, to cities which primarily had one outlet each, although a few had two and a handful enjoyed three outlets with

New York City and Los Angeles having 7 stations each.

The reason for the freeze was simple and straight forward. When the United States returned to peacetime at the close of World War II, the television broadcast standards established in 1939 and 1940 called for 19 VHF-only TV channels. They were spaced 6 channels in what is now low band (channel 1 existed at that time, but was subsequently removed from TV service), and 13 in what is now high band plus what we generously call in CATV "super band". However, during the war time era, the military found out that the pre-World War II VHF frequencies from 30 to 300 MHz were *not the use-less frequencies* they assumed them to be prior to the war. In fact, the VHF frequencies pressed into wartime service turned out to be the *best all around frequencies* for the military. So they came back from the war and immediately set out to capture for their own use as many of the VHF frequencies as they could. In their frequency battle, they won the top 6 VHF TV channels (14-19); this left television with 13 VHF channels. Then the two-way communications people made a passionate plea to have channel 1 removed to their domain, and they won (for which we *should*, as TV users, be eternally grateful because it turned out that old channel 1 was susceptible to long range world-wide short-wave-

**TABLE ONE**  
**CITIES WITH TELEVISION**

Birmingham	2 stations	Buffalo	1 station
Phoenix	1 station	New York	6 stations
Los Angeles	7 stations	Rochester	1 station
San Diego	1 station	Schenectady	1 station
San Francisco	3 stations	Syracuse	2 stations
New Haven	1 station	Utica	1 station
Wilmington	1 station	Charlotte	1 station
Washington	4 stations	Greensboro	1 station
Jacksonville	1 station	Cincinnati	3 stations
Miami	1 station	Cleveland	3 stations
Atlanta	2 stations	Columbus	3 stations
Chicago	4 stations	Dayton	2 stations
Rock Island	1 station	Toledo	1 station
Bloomington	1 station	Oklahoma City	1 station
		Tulsa	1 station
Indianapolis	1 station	Erie	1 station
Ames	1 station	Johnstown	1 station
Davenport	1 station	Lancaster	1 station
Louisville	2 stations	Philadelphia	3 stations
New Orleans	1 station	Pittsburgh	1 station
Baltimore	3 stations	Providence	1 station
Boston	2 stations	Memphis	1 station
Detroit	3 stations	Nashville	1 station
Grand Rapids	1 station	Dallas (Ft. Worth)	2 stations
Kalamazoo	1 station	Ft. Worth (Dallas)	1 station
Lansing	1 station	Houston	1 station
Minneapolis	2 stations	San Antonio	2 stations
Kansas City	1 station	Salt Lake City	2 stations
St. Louis	1 station	Norfolk	1 station
Omaha	2 stations	Richmond	1 station
Newark (N.Y.C.)	1 station	Seattle	1 station
Albuquerque	1 station	Huntington	1 station
Binghampton	1 station	Milwaukee	1 station

like propagation a high percentage of the time, which would have rendered it useless for TV service).

This left the television world with 12 VHF channels. But no one, in 1946, showed much concern because after all in 1946 there were only 6 (or 7, depending upon whom you talk to) television stations on the air in the whole United States, and they *all* operated on channels 2-6. None had yet ventured to the "high band" channels of 7-13, and most experts felt that as expensive as television was going to be (for transmission and receiving) a nationwide grid of stations operating on the 12 VHF

channels would provide *all of the service that anybody could ever want.*

With that in mind, the FCC settled down to process applications for new television stations in late 1946. There were 5,000 television receivers in use in the whole United States at the end of 1946.

Now about all the FCC did in 1946 when it established an "allocations program" was eliminate the channels television lost (channels 1, 14-19) in the post war trades, and, utilizing 1936-1939 developed data (mostly from RCA tests in that era), begin assigning stations to channels in the remaining VHF



**DIAGRAM 1**

channel range. RCA had found in the 30's that regular television coverage for stations might extend as far as 55-60 miles. This was based upon 50 kilowatt transmitter power levels and 1,000 foot (above average terrain) antennas. So the Commission, rather arbitrarily as it turned out, chose the distance of 150 miles to keep stations operating on the same channel separated. Unfortunately for the whole United States, even this separation between stations on the same channel was not respected totally. If you will look at Diagram 1, you will see how the Commission chose to allocate (i.e. approve) operation by 6 stations on VHF channel 4 prior to the 1949 freeze. Most of these stations were 150 miles (more or less) from the nearest other same channel station, but channel 4 Lancaster, Pennsylvania, was much less than 150 miles from Washington; in fact it was not even 100 miles away. Nor was it quite 150 miles from New York City.

So Lancaster and Washington both had channel 4 stations, and it turned out that from Lancaster to Baltimore was only 53 miles and Baltimore to

Washington a scant 40 miles or so. The end result was that people living north of Washington, up to and beyond Baltimore, had almost constant interference on Washington's channel 4 from Lancaster channel 4. *It was an idiotic mistake in channel assignments, and for it the whole United States would pay the supreme price: a freeze in 1948.*

When the weather conditions turned warm, Lancaster's signal was so strong in areas south of Baltimore that people right in Washington, D.C. sometimes noticed the interference on channel 4. Naturally they complained to the FCC, and some of those complaining were senators and the like. Very quickly those complaints landed on the front desk of the FCC Chairman, Wayne Coy.

The senators and congressmen complaining suspected the worst. It appeared to them that *if this type of condition existed nationwide*, the television boom everyone expected would die before it started. "Nobody wants to watch television with lines running all through the screen," they complained. In those days Lancaster was considered pretty provincial and the audacity of a small town television station "way up in Lancaster" interfering with the new television reception of Senator this or Representative that was more than Washington could bear.

In actuality, the Lancaster-Washington-Norfolk triangle was probably the worst such situation in the whole country. *No where else*, with the limited number of television stations on the air at that time, did problems of such magnitude exist.

So the FCC, faced with the irate complaints of senators, congressmen, and the mayor of Baltimore decided it had better find out *what the problem was*. A wise soul at the FCC suggested that until the problem was identified, no new TV grants should be made, and his suggestion was bought in toto.

## MAJOR CONTRIBUTOR TO FREEZE

WGAL-TV Lancaster probably only wished to provide television reception to the folks of Southeastern Pennsylvania, but an FCC allocations boo-boo placed them on a channel shared by nearby Washington's WNBW and New York's WNBC. The result was disastrous interference, and a shut down of new TV expansion in the United States.



Now this kind of problem was quite new to the FCC. Yes, there had been a period prior to 1927 when the whole nation was up in arms over the uncontrolled radio broadcasters who seemed to *assign themselves frequencies*, and move frequency from day to day as the stations around them moved. But that had been dealt with quite nicely by the Federal Radio Commission after 1927 when all stations were "assigned frequencies" on which to operate. In 1948, the FCC assigned the frequencies in question, and other than the Lancaster-Washington-Norfolk triangle, the rest of the nation was not (yet) *really* in bad shape. Ninety percent of the Commission's instant problems *could have been* eliminated by making a simple channel change for Lancaster. Right then, on the spot: Lancaster ended up on channel 8 anyhow *after* the freeze. But no, the FCC left Lancaster on channel 4 and the senators and representatives and mayors who were buying new sets every day continued to experience interference on their Washington reception on channel 4 for years and years and years. It is not hard to envision the kind of animosity that developed towards the FCC in those years; not only had this federal agency shut off television for their constituents in Colorado or Oregon or wherever, but they were the cause of the interference on Washington's WNBW, right there in the suburbs of Washington! On the surface it is difficult to fathom how the FCC could let the situation drag out even one week, not to speak of four years.

The allocations shuffle should have taken a few months, perhaps six at most, even with bureaucrats handling the problem. The problem was simple enough: create a new table of assignments so that stations would operate without interference to one another's service areas. But *the issue was enlarged* even before it got into the allocations shuffle.

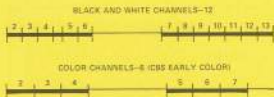
Along came color, and it presented unique problems. First of all color *did not fit* nicely into the then (and now) standard 6 MHz wide channels. The only demonstrated color system of that era, by CBS, required a 12 MHz wide channel. In effect, if a color station were to set up in Washington, it would operate over *two* channels, such as 3 and 4, *at one time*. This bothered the Commission because if *this* was the way color was going to be, then *somehow* the allocations table would have to find room for the twice-as-wide-as-black-and-white colorcasts.

Diagram 2 illustrates the problem.

Color is the subject of a complete separate report in this issue of CATJ, and except for an occasional reference to it in this report on the freeze, it won't be covered in detail here. See Pages 26 to 38 for the full story.

OK - *so color was an unknown*. It might require a whole new allocations scheme. At least that is the way it looked in 1948 when the freeze began. However, by 1949, the color question was pretty much solved as far as making it fit into a standard 6 MHz wide channel was concerned. Technically, by 1949 *it presented no problems* to





**DIAGRAM 2**

the allocations table that would be established for normal black and white operation. But the Commission would *fail to announce that fact* until 1951, allowing the senators and others on their backs to continue to believe for several more years that color was "one of the problems" effecting the release of the freeze.

Then came the UHF problem. Somewhere along about in the winter of 1949 a belief developed that the 12 VHF channels then available to television were *not adequate* to cover the nation. It turned out this was a perfectly valid assumption. Diagram 3 shows the coverage of the United States which was available with only 12 VHF channels to allocate nationwide. The white areas represent coverage areas for stations granted permission to broadcast before the freeze came along; the gray areas represent new, unused (at that time) allocations *using the 12 VHF channels only*. The dark areas are regions where *no television reception* could be expected, if the nation *only* had the 12 VHF channels with which to work. Clearly, something had to be done to bring television to all of those "black areas".

#### THE ALLOCATIONS ROOT

Had the FCC gone about **their** allocations business in an orderly fashion during the 1949-52 period, the whole complexion of CATV today would have been dramatically different. CATV exists today because in 1975, some 23 years after the "freeze lifted", **more than 22 million U.S. homes are still not reached by the basic three network service.**

In 1949 at the National Association of Broadcasters Annual Convention, FCC Chairman Wayne Coy sprang the news:

"...before many months there will be ultra high allocations which will open up a new frontier of the spectrum. It will be possible, given imaginative leadership, to take television service to all America..."

And to put down fears that the new UHF channels would not obsolete the millions of receivers already in the hands of the public, Coy said:

"...present television sets on the market will continue to obtain service from existing VHF channels; wherever a television signal is available from a VHF transmitter, the existing receivers will continue to render fine service for many years to come."

Dr. Thomas J. Goldsmith, Director of Research for DuMont Labs, reported at the same NAB meeting:

"When the UHF channels become available, the public will be able to buy at a modest price converters which will bring the additional channels to their receivers."

With the cat out of the bag that UHF was coming, one prospective operator wasted no time asking for *special* permission to set up shop there. The operator of WNOW in York, Pa., petitioned the Commission to allow them to put a station on the air in the UHF range *"to allow tests of the true stature of this new frequency range"*. Attorney Jack C. McKenna, representing WNOW, asked that a plan immediately allocating 6 UHF channels *in 30 cities then without adequate television reception* be approved so that (1) these cities could have television, and (2) the FCC could gain much needed test information about the potential of UHF and the problems which were sure to show up. The plan did *not* fly, but years later hundreds of new UHF broadcasters *would wish that it had*.

In the summer of 1949 RCA put an experimental station on the air in Bridgeport, Connecticut, on what is today channel 23. The station operated





WITH VHF CHANNELS ONLY—The VHF stations on the air when the freeze was initiated (white circles indicate coverage), when added to the VHF channels proposed (grey circles) still resulted in large regions unserved by television signal contours.

with what would today be considered very low power (15 kilowatts), and relayed through a microwave feed the programs of WNBC New York City to the Bridgeport area. RCA would later invite all comers to the Bridgeport tests to make possible the development of UHF receiving antennas, UHF converters, tuners and the like. Of course in the process of running the tests, RCA gained valuable first hand knowledge that would apply to the later manufacture of television transmitters for UHF.

With the UHF question under study, the Chairman of the Commission wasted no time sowing seeds of encouragement to the disgruntled, freeze-bound, industry:

"Within the next few years, there will be close to 1,000 television stations reaching a large percentage of the population of this country. In that same period this country will have 25,000,000 television receivers."

Of course the business of predictions was risky. *Today* there are *not yet* 1,000 television stations yet on the air; however, in early November of 1953,

the 25,000,000th television receiver would be bought by the public.

It might be well, while we have the Commission temporarily off the hook in mid-1949, to review some of the basic blunders of 1945-46 which the Commission was still trying to live with in 1949. The broadcasters of that era, already on the air telecasting, *were not above* applying subtle pressures on the Commission. As we shall see separately, their's had become a *very high* return kind of business, and they wanted to protect their new found gold mines. They were not above *spending* a few bucks to do so.

In 1945, the assignment table allocated television stations (i.e. channels) to the 158 largest trade areas in the United States. Little or no thought was given to the efficient use of these channels; they were merely scattered about where they "might do the most good". When the Commission faced up to the error of its ways in 1948-49, one option it felt it did *not have* was to make any of the then existing stations uncomfortable. So a few would be

## THESE WERE THE PIONEERS



WRGB-4 Schenectady,  
Nov. '39 (now ch. 6)



WBKB-4 Chicago, Aug. '40  
(now WBBM-2)



WCBS-2 New York, July '41

asked to move up a channel or down a channel, and a few *might* even be asked to move from low band to high band (i.e. from one of the 2-6 channels to one of the 7-13 channels). But overall, the plan was to disturb the existing situation only a little bit, and *none* would eventually move to UHF.

In effect, if you left all of the 107 then operating or authorized stations in place, or moved them about only slightly, you did not have a completely new slate with which to work. In fact, as the VHF and UHF allocation table developed, it became increasingly clear that *as long as the original 107 stations stayed put*, or nearly so, there were many fewer *clean* options available to you. And, in the end, the allocations table developed *would not be a new program*, it would be an old one with appendages tacked onto it.

Some industry experts saw *through* the obvious difficulties the Commission was having with making a new plan

meld in around the existing status quo, and they offered alternate suggestions. One of these was offered by Dr. Thomas T. Goldsmith, Jr., Director of Research for DuMont Labs. The DuMont plan started out with the premise that *VHF would be utilized for the largest cities*; the exact number where it would be utilized was open at the beginning of their study; they merely *ignored* the existing 107 stations that the FCC kept stumbling over and started with a clean slate. Using mileage separations between co-channel and adjacent channel assignments, which would seem adequate today, DuMont developed a plan which would allocate *4 VHF stations* (i.e. channels) *to each of the 140 largest trading areas* in the country; and then, utilizing a popular 48 channel UHF capacity (it, of course, subsequently became 70 UHF channels), DuMont illustrated how the UHF channels could be assigned for those markets that re-



WNBT-4 New York, July '41



WENR-7 Chicago, Oct. '43  
(now WLS-7)



WABD-5 New York, May '44  
(now WNEW-5)

## PIONEER'S PIONEER

Don Lee Broadcasting, operator of a radio network in the West, actually began daily transmissions (1½ hours each) in mid-1931 using a frequency assignment equivalent to the old TV channel 1. A very innovative outfit, KTSN, produced many hours per day of remote telecasts throughout the Los Angeles basin in the late 40's using a 16 foot parabolic dish antenna atop their Mt. Wilson site (which they developed for television) to pick up early Rose Bowl Parade coverage shortly after World War II. KTSN was sold in 1950 to CBS, and operates today as KNXT.



quired more than 4 local outlets (i.e. New York, Chicago, Los Angeles, San Francisco, etc.); plus the UHF channels would be assigned to rural areas or markets smaller than the top 140 trading areas. The DuMont plan made excellent sense, *which is probably why it was disregarded.*

It is only fair to point out that at that time DuMont was in the television network business. CBS and NBC were the big networks, with firmly entrenched network affiliates across the country. DuMont was operating with a handful of affiliates (less than 10 full time at the peak) and ABC was just barely operating at all. DuMont believed that the largest possible number of trade areas should have *equal exposure to all of the network services* (i.e. one each ABC, CBS, DuMont, NBC outlet). Many years later when ABC was crippled by lack of national exposure and the FCC moved VHF assignments around one last time, DuMont's 1949 thesis would be proven correct. But for DuMont that would be too late; the network folded up in 1955.

Many years beyond our present time frame in this report, in early 1954, Dr. Allen B. DuMont would appear before the FCC and make a statement that rang altogether too true. He said (in early 1954):

"The 1948 freeze reserved for two networks (CBS and NBC) the almost exclusive right to broadcast in all but 12 of the 63 market-trade areas with television at that

time. Because of this situation, the other two networks (ABC, DuMont) did not have and have not had more than a ghost of an opportunity to get their programs into markets so necessary, if high quality programs are to be produced and attract advertisers from whom revenues and profits must come. If prompt action had been taken to establish a new allocation table and the UHF channels opened up when there were less than a million operating television receivers (only 975,000 receivers were in use at the end of 1948, the year the freeze began), there would not have been the suppression of the 'courage and daring' of the two smaller networks."

The network affiliation problem worked then pretty much the way it does today. If you are the only station in a market, you carry programs from any network you wish when you wish. And you mix them up, carrying only the top shows from each network. This of course cuts way down on the exposure of the *full* network schedule of programs in any market *with only one station*. If there were two stations in the market, the usual practice was for each to almost-full-time affiliate with one of the two larger networks (i.e. CBS or NBC then), and then fill in your schedule with a few of the top rated shows from the other network(s) (ABC, DuMont then), which is exactly what your *other local competitor* was doing also. *Only 12 markets* had three or more stations on the air after the freeze hit, so ABC and DuMont network programs were limited to full time showing in at most 12 (and usual-



WITH UHF CHANNELS ONLY—substantially larger regions (than VHF only) would be covered, provided ALL communities allocated channels were to place those channels on the air.

ly many less) markets. On the other hand, CBS or NBC programs were often seen for the full schedule in 40-50 markets. Given this uneven national audience distribution (i.e. CBS and NBC had the most affiliates, so they got the most advertising dollars), the situation went from bad to worse for DuMont and ABC. CBS grabbed up the likes of Sullivan while NBC signed multi-million dollar contracts with Milton Berle for the Texaco Star Theatre. DuMont ended up with lectures on pottery making. Success begot success, and DuMont and ABC headed for oblivion. The more money CBS and NBC made, the bigger the talent names they could attract. The more big talent they bought, the wider the gap between DuMont/ABC and CBS/NBC.

While we are still dealing with the 1949 period, the special detailing of the problems of networks *not named CBS or NBC* in those days would not be complete without an attempt at explaining why ABC did not go down the

drain when DuMont did. ABC was in worse shape, financially, than DuMont. Edward Noble acquired the ABC radio network in 1943. He would say later, in early 1952, that at no time since the acquisition of the network by himself in 1943 had the company paid a dividend, or had he drawn a salary. He would further state that any earnings the company had were always plowed back into the company.

In early 1953 the FCC approved the outright acquisition through stock control of the ABC operation by Paramount of motion picture fame. The purchase of ABC (which then owned and operated 6 AM, 6 FM and 5 TV stations) was largely a speculative one for Paramount. By coincidence, it cleared the necessary FCC approval at about the time that the freeze was finally removed. ABC, according to Noble, had to borrow more than \$2,000,000 in 1951-52 to keep its TV network alive with programs. The expertise and hard green money that Paramount offered to the network



would for a while start the re-building process of a viable third national network. It is important in this point in the report because it created the last nail in the coffin for DuMont network efforts.

But enough of this non-FCC trivia—*back to the indecision makers.*

Late in the summer of 1949, while Bridgeport's RCA sponsored UHF was starting to pile up practical UHF operating data and the FCC had a momentary slow down in allocation matters (although color was going full steam!), the Television Broadcasters Association (TBA) petitioned the Commission to release for application television allocations in 11 markets in the west. Relying on the 1946 allocations table, which they apparently still thought was going to fly, the television broadcasters asked the Commission to allow stations to make applications for channels in Amarillo (5 channels were open), Denver (1 channel), El Paso (2 channels), Sacramento (3 channels), Salt Lake City (1 channel), Corpus Christi (3 channels), San Diego (2 channels), San Francisco (1 channel), Seattle (1 channel), Stockton, California (2 channels), and Tacoma (1 channel). TBA said these channels met the co-channel and adjacent channel requirements, and by authorizing their release "early", many people would be able to enjoy television while the freeze ground on. Their arguments were reasoned, logical, and politically expedient at the time. This would be the first television for Amarillo, Denver, El Paso, Sacramento, Corpus Christi; the balance already had at least one channel operating. It was, however, flawed reasoning because it was based upon the 1945-46 allocations table. Still, *the Commission could have taken much of the heat off* that was building on themselves had they at least *granted token relief* for Amarillo, Denver (which was the largest city in Senator Johnson's state and the

largest trade area in the nation without television when the freeze froze), El Paso, Sacramento, and Corpus Christi. But the Commission, busily engaged in surveying forests, was not counting trees at the time, and the motion died.

After the Commission announced it was going to open up the UHF channels, and Bridgeport tests started under RCA's guidance, the FCC had little to say about the allocation portion of the freeze for nearly one year. *All of the attention was directed to the color mess* (see separate report here, Pages 26 to 38).

FCC Commissioner Frieda Henneck did come out in mid 1949 and express her views about the building public pressure to release *some channels some place* for public use:

"I am keenly aware of the intense interest in the progress of television shared by members of the public generally, and especially the families contemplating purchase of a television set, and by manufacturers and by station licensees. But I am aware also of the many problems that exist as to the future status of black and white and color TV, both in the present and the proposed (UHF) bands, and in the multitude of other questions which must be solved to insure the finest development of this great new art for as many people as possible. I feel strongly that these questions must be carefully deliberated and thoughtfully answered by the orderly process of rule making proceedings. We are now in the midst of such proceedings, in which all interested parties are being offered a full opportunity to participate, present their views, and offer technical information. I feel that we must patiently continue to move forward in this orderly manner."

As the color hearings ground on, many members of the industry grew impatient with the snail pace progress of the Commission. Commissioner Robert F. Jones was the leading spokesman for *holding up allocations* until color was settled, and he often spoke out against statements that filtered to his desk from industry spokesmen. Dr. Allen B. DuMont found Com-



missioner Jones' attacks hard to stomach:

"I would like to assure the Commissioner that television broadcasters and manufacturers alike (who were opposing the continuation of color hearings and the freeze continuation) will reap tremendous benefits from a really good color television transmission system. If there were such a system in existence, every industry spokesman would be camped on the Commission's doorstep urging and pleading for the immediate adoption of standards."

But the Commission was not moving. It showed *no interest* in providing even temporary relief on a spot location by spot location basis. When all of the rational arguments failed the proponents of some pretty far out systems began to make their pitches to the Commission.

One of these was Westinghouse. Now Westinghouse had been experimenting, with the permission of the Commission, with a program they called *StratoVision*. *StratoVision* involved the use of converted B-29 gun ships equipped with sensitive television receiving equipment and medium power VHF and/or UHF transmitting equipment. By flying a figure 8 pattern at 25,000 feet above ground, the receiving equipment picked up regular TV broadcasts from one or more stations within a 250 mile radius, and then through the on-board transmitter(s) rebroadcast the received signals outward on a *new* VHF or UHF channel. Westinghouse calculated that 14 such airplanes, flying figure 8 patterns in precise locations across the country, would be capable of relaying television programs *from coast to coast*, and in the process provide *StratoVision* to *ground* television reception for approximately 75% of the people in the United States. Extensive testing of the program was done during the freeze era, and Westinghouse gathered up reams of data to support its contention that *StratoVision* had a place in the FCC allocations scheme of things.

When Westinghouse tried some gentle pressure on the Commission to authorize *StratoVision* on a regular basis, during the freeze, they were sharply rebuked by the Commission with the terse reply that "*The first obligation of this Commission is to provide television to the metropolitan centers of this country which today have no such services; then the rural areas will be considered.*" The Westinghouse plan was primarily promoted on the basis of its providing television service to rural areas which were unserved at that time.

Then there was polycasting, the brainchild of Raymond E. Wilmotte and Paul A. De Mars, consulting engineers practicing in Washington, D.C. Polycasting is best explained in this way:

"Rather than try to cover a metropolitan or trade area with a single high power, tall tower transmitter, the projected coverage area would be covered by a number of low power transmitters. An area with a ten mile radius could be covered by a 200 foot tower and a 200 foot antenna with a gain of 20. All transmitters serving a trade area (i.e. each polycasting transmitter) would operate on the same frequency; the individual transmitters would be 'netted' together to stay exactly on the same frequency to reduce objectional interference between one another."

With the polycasting concept, the high cost of one super power transmitter (the pair was thinking in terms of 6,000,000 watt UHF stations) would be greater than the equivalent 10 or 15 lower power polycast stations which would serve *the same coverage region*. Polycasting earned enough interest to continue to be talked about several years later, but it *never* was a serious contender for Commission attention.

Finally, in mid 1951, after the Commission had reached a decision on color (see separate report here), Chairman Coy resighted on the allocations problem. Speaking before the Rocky Mountain Radio Council (early day version of today's powerful Rocky Mountain

Broadcasters Association) Coy told the broadcasters:

"Why are we today in a freeze which has already halted construction of new television facilities for more than a year and a half? Principally because of a lack of basic information. That information must come in large part from radio (and television) manufacturers. It should be produced as the result of a consistent year-round program of research. For example, we are now proposing to quintuple the number of television channels by moving into UHF. Here is a problem involving the expenditure of millions of dollars by the public and the (broadcast) industry. This part of the spectrum is relatively unexplored for television purposes. And yet, in all America, there were only a half dozen experimental UHF TV stations broadcasting programs last year and they were on the air for limited periods. Another half dozen licensees have carried on propagation studies and other limited research. A billion dollar industry is no place for operation by guess. We cannot afford, and the public will not long permit us, to plan our radio system on a crisis basis. By allocating a reasonable amount of your energy and your money to such research programs, you will be helping to assure the stability of your industry and you will be serving the public interest."

Clearly, in 1951, Coy was preparing the ground work to keep *his Commission* from being blamed for the by now long, drawn out freeze. The half dozen experimental stations he spoke of were probably fewer than that. Only two stations, both operated by RCA (one in Bridgeport and one in Washington), were operating on anything like schedules. Others, many of which broadcast nothing more exciting than test patterns, stayed on the air for a few months, and then only a few hours per day, as various manufacturers worked out bugs in their equipment they were then developing for UHF.

The apparent truth laid *someplace between* Coy's blame of the industry for not providing adequate data and the hard economic realities that the television industry (transmitter manufacturers and receiver manufacturers) had *not yet reached* a level of technical

proficiency where television transmitters and receivers *could be manufactured* for the UHF region. So Coy, knowing this, bided his time awaiting word that the industry was ready to deliver the product, and *tried his best to keep his Commission out of the direct line of fire* of the antagonists.

There was a popular theory running loose in that era, and it was echoed in *subtle terms* on numerous occasions in public by Dr. Allen DuMont. Dr. DuMont didn't say it quite this way, but others did:

"It had become apparent, as early as late 1948, or shortly after the freeze was put into effect, that the 12 VHF channels would not provide adequate 'room' for television service for all of the nation. Anyone with a map of the United States and a compass (see Diagram 3 here) could draw his own coverage rings of the full number of VHF channels available, even under the 1945-46 close-spaced separations, and come to that conclusion. UHF was a possible solution, but no one knew anything about UHF. The Commission insisted that before it authorize UHF operation that somebody go out and find out something about it; the Commission and especially Chairman Coy had no desire to be embarrassed all over again a few years down the road.

The equipment manufacturers, in particular RCA, pleaded for adequate time to 'prove the worth of UHF'; and Chairman Coy bought the argument. What RCA really meant was 'give us time to develop UHF transmitters, UHF antennas, and UHF receivers for the marketplace'.

The Commission *MAY* have struck a bargain with RCA; only they would be allowed to experiment seriously with UHF (i.e. no other applications for serious testing would be authorized), in return for which the Commission would speed up the color TV matter, as a means of diverting attention from the allocations problem.

RCA figured they would win in both cases; become the leader in UHF and win the color prize at the same time. Unfortunately the color hearings proved a disaster to them, when the compatibility problem for existing black and white receivers never gained the importance RCA figured it would. Going into the color hearings, RCA figured CBS would

die early simply because their colorcasts were not capable of being received in black and white on existing receivers. When that argument failed to develop properly, RCA felt they had been stabbed in the back by the Commission. When the Commission approved the CBS color system, and cut RCA out of the color program completely, RCA became angry enough that it considered temporarily backing out of UHF development just to repay the Commission in kind. They knew this would put the Commission in a tight spot.

When Chairman Coy got wind of this, he started a speaking tour calling for 'industry support of UHF research'. The Chairman was smart enough to know that he would (1) scare RCA back into intensive UHF development activity, (2) create a 'cop out' for his own handling of the matter, and (3) possibly even get some others interested in a crash UHF development program, just to keep RCA 'honest'."

The preceding analysis of the situation in mid 1951, just after the Commission had approved the CBS color system, appears in quotation marks *because it is the opinion* of an industry person who is in a position to offer such remarks with a high degree of credibility. The source of this information is not being identified here, for obvious reasons.

Still, even *without* a source, the statement rings very true, and in tracing the actual happenings of that era, *it does explain* virtually every event that happened between 1948 and 1951.

The Commission possibly planned to do RCA in anyhow *before* the color hearings began. Some have ventured the opinion that Chairman Coy felt that if RCA won the UHF prize, "it would only be fair" if CBS won the color prize—sort of an "*equal spoils for equal folks*" approach.

Still others suggest that the overwhelming Commission interest in the period in color was due *almost entirely* to the fact that the Commission had come to the realization that VHF would *not* provide adequate television service to all of the nation, and that it

*might* be several years before UHF was technically ready. So the *color issue became a diversion* for the senators and congressmen and governors pressuring the White House and the Commission in that period.

Pressure began to mount none the less. Former Senator Clarence D. Dill, who in 1934 authored the Communications Act of 1934, took pen in hand as "Citizen Dill" to write Chairman Coy:

"Nearly three years is too long to delay action on at least enough applications to serve regions without television. Surely the Commission could process some for use of frequencies to certain sections of the country. It is not necessary to provide for all small towns immediately. It is highly unjust not to provide for at least one station for thickly populated areas.

I respectfully suggest that the Commission do something about these situations by making exceptions to the freeze order at once. If I were in the Senate, I would address that body and introduce a resolution that would bring the members of the FCC before the Senate Committee on Interstate Commerce for the purpose of impressing your staff with the injustice of the orders of the Commission by the continuation of this freeze order."

So the Commission began what was to be a new kind of regulation, one manipulated by the raising of flags. Apparently the Commission felt that anything it did *would be* controversial, so it set out to find out which of its plans would create the *least pressure* for the Commission.

One by one the plans were marched out, and each was "raised on the flag pole". After a decent interval of flag flying and "enemy sniper attacks", each flag was pulled down and the bullet holes counted. In the end the flag (plan) with the lowest number of holes in it would be the winner.

An early 1951 plan created channels 2-13 and 14-65. During hearings, the inter-mixing of channels in the VHF range and those in the UHF range drew lots of industry comments. Of the inter-mixture, which was even before





WITH VHF AND UHF CHANNELS—even if ALL allocated channels were on the air (i.e. not only allocated, but active), there are still substantial regions of the U.S. (black areas) without television signal coverage. This is NOT the situation that exists today; it is someplace between the VHF only coverage map, and this "ideal" situation.

the fact a very controversial matter, the Commission said:

"It is reasonable to assume that the economic problems which will be faced by the new broadcasters who occupy the new channels (14-65) will be considerable. However, the same problems were faced by the existing VHF telecasters when they began operation prior to the distribution of television receivers in their areas. If the entire UHF band should be allocated for regular telecasting, all receivers will have to be built to receive both VHF and UHF bands. If the inter-mixture is avoided, there may be receiver design and distribution confusion, and it would become necessary to limit many areas to only one or two VHF channels, even though UHF assignments were available, and additional (UHF) stations could be financially supported."

So the die was cast for intermixing of VHF and UHF. By allowing inter-mixing the Commission was faced with wholesale revamping of the allocations table along the lines suggested by DuMont (recall that the DuMont allocation plan found 4 VHF channels for each of 140 large trade areas).

At the same time there was an attack on the FCC's basic "block assignment plan". The Federal Communications Bar Association (FCBA) questioned the Commission's "right" to set up block assignments (i.e. start out with an allocations table which assigned VHF channels by pre-designation to certain areas) on a geographical basis. The FCBA opted for an allocations program similar to that in effect in the AM broadcast band where new station applications were allowed *"when the applicant could demonstrate that his new station would provide new service to underserved areas, without providing interference in the primary coverage areas of existing stations"*.

The ramifications of the proposal were many. As presented to the FCC, it was mostly conceptual. The FCBA spelled out few details how it would implement the program of non-block assignments if approved by the Commission. Basically, though, it would work like this:

"The country would start with the then operating 107 television stations. New applications for new channels would apply for any channel they wished, and it would be up to these applicants to prove that the facility they were requesting would provide new service to an area, and would not interfere in the process with existing service."

It certainly would be a *flexible* plan! But the Commission ruled, "The FCC *does have* the authority to classify stations, prescribe the nature of service to be rendered by each class of station, determine the location of classes of stations or individual stations, and establish areas or zones to be served by each station." They quoted sections of the 1934 Communications Act in their ruling, and further quoted testimony offered in the formulation of the Radio Acts of 1927 and 1934, by Ex-Senators White and Dill. White had said:

"One of the most difficult problems we had to deal with was whether there should be any preferences written into law with respect to any particular character of service. At the time we were working on the legislation the agricultural land grant colleges, for example, were very insistent that they should have privileged status. There were others just waiting for our decision in this area so they could claim prior rights. We were forced to write the authority for the Radio Commission in very general terms, leaving a large amount of discretionary powers in the hands of the Commission. It was hopeless to try to work it out in legislation."

At least one commissioner disagreed with his fellow Commissioners on this ruling. Commissioner Jones pointed out that the (then under discussion) 82 channels of spectrum space did *not* meet any of the five Commission priorities substantially. The five priorities were to: (1) *Provide at least one television service to all parts of the United States*; (2) *Provide each community with at least one television broadcast station*; (3) *Provide a choice of at least two television stations to all parts of the United States*; (4) *Provide each community with at least two televi-*

*sion stations*; (5) *Assign any channels which remain, after the first four priorities, to the various communities based upon the size of the population of each community which might receive more than two channels, the geographic location of the community, and the number of television channels of service available to each such community from other television stations located in other communities.*

Jones said, of the so-called "inflexible assignment program":

"It is clear that an inflexible geographical assignment plan does not meet the criteria which the Commission asserted as a basis for it, and it is therefore illegal."

Legal, or illegal, it was never seriously contended thereafter.

Late in the summer of 1951 the FCC undertook to provide some measure of relief (it said) for the TV-less areas. It allowed some of the existing VHF stations (i.e. the original 107 then on the air) to *increase their transmitting powers*. This had the effect of extending their service areas, and it also had the effect of making more permanent their audience coverage regions *before* the new VHF (and UHF) stations would come on the air. The power increase program was met with mixed reactions; the stations getting the grants were delighted to be able to increase their service areas. Those who felt this would make it more difficult for the new (UHF) stations to make the grade were *less* enthusiastic. These were, however, the first changes of *any type* permitted in operating facilities, by the FCC, since the freeze began on September 30, 1948.

Another flag run up by the Commission came in late 1951 when FCC Chairman Coy visited the RCA Bridgeport UHF experiment. After inspecting the transmitting facilities and visiting several viewing locations, Coy said:

"I am so sold on UHF that personally I would like to see all television service moved to UHF."



They never found enough pieces to that flag to haul it back down!

At about the same time CBS made a pitch for more VHF channels in the major markets. CBS was growing concerned about the interest in UHF, and about how UHF stations might do as CBS network affiliates. CBS, in a statement to the Commission, said:

"...the allocations program proposed will make it difficult for CBS to operate a network effectively because CBS lacks owned and operated stations (i.e. CBS owned stations) in key cities, and we require these stations in these key markets to produce network television shows."

CBS wanted to create a situation where it would be able to own ("for network origination purposes") stations in a number of new cities. Among those mentioned were Chicago, Boston, and San Francisco. Of the future of UHF, CBS said:

"...for a considerable period, perhaps five years, a commercial UHF station cannot expect to compete on anything like an equal basis with commercial VHF stations in the same community..."

As 1951 turned into 1952 (and the nation had nearly 15.5 million TV receivers in user hands), the final shifts and changes in the soon to be announced allocation program fell into place. In March of 1952 Mallory, a manufacturer of component parts, announced the first set top UHF (to VHF) converter. The unit (Mallory ad-

vertised) "receives all UHF channels for all TV sets".

At the same time an old line communication equipment manufacturer, Hallicrafters, advertised a new TV chassis with "the 2 million dollar tuner". Hallicrafters "guaranteed 150 mile TV reception" with its new line of receivers. A very short time later, Hallicrafters gave up television set manufacture and distribution.

### *It Lifted*

More than 3½ years after the freeze began, the Commission released its new allocation plan. Apparently industry was ready for UHF.

The Commission had settled on expanding UHF channels over the range 14-83, and new assignments were made in nearly 1,500 new "communities".

Zenith Vice President H.C. Bonfig echoed many when he said:

"Crystal gazing is always a rash venture, but on the basis of what we know about UHF and what we know about the ability of engineers to discover new advantages for these new frequencies, I make the prediction that the stations on the UHF channels are going to render as good or better all around service than the VHF stations now in operation."

The freeze was officially lifted by (new) FCC Chairman Paul A. Walker on April 13, 1952.

### **AFTER THE FREEZE**

When the "freeze" was finally lifted, most FCC people thought CATV would simply dry up and go away. Many 1950 era Commission sources honestly believed that CATV had been only a short-term, interim solution to the freeze! When it became apparent that CATV would continue to grow, and that the post-freeze allocation table was far from fault-free, then and only then did the Commission begin to take an active interest in making CATV fit into their mold of television for America. How the Commission went about this task, and how CATV reacted, is the subject of our Part Two report appearing in the April CATJ.

# THREE YEARS OF INDECISION FOR COLOR. . . . THAT DID NOT WORK!

*Why talk about color?* What possible lessons can be learned from the development of a national color TV policy, as relates to our present world of Community Antenna/Cable communications?

Simply put, the manner in which the Commission handled the establishment of a national color TV policy illustrates, perhaps even better than the subsequent handling of the UHF fiasco, how many grave errors a federal agency can make, *and still stay in business*. Those who believe "right will prevail" or that "the issue(s) will be settled on the merits" probably will have their bubble burst after reading this chronology. In this report, you can almost feel the "electricity" that existed between the two giants CBS and RCA, and one wonders how RCA representatives managed to "keep their cool" when Commission decision after decision went against them. In spite of our concern about their power positions *today*, we have to admire RCA's virtually complete control over their tempers in the crazy years 1949-1951.

An editorial appearing in a popular trade magazine in 1950 asked the question "*Why the Mad Rush to Color?*". It was a good question. At the time the FCC allocations freeze was well entrenched. There were 107 operating television stations in the United States, in 63 cities. The vast majority of the country had yet to see *any* television, and the FCC was holding up the

approval of new channels for these areas, then unserved, while it wrestled with the color standards problem.

In all probability, FCC Chairman Wayne Coy never expected the color mess to become such a burden on himself and his staff. In complete fairness to the Chairman, the Commission was under the blustery and frequent attacks of Colorado Senator Edward Johnson who constantly badgered the Commission to approve color (new channels, etc.) *yesterday*.

## Not Compatible

To understand fully the complexity of the color issues to follow, you must understand that in 1949, when color studies began:

- (1) There were two proponents of systems, CBS and RCA;
- (2) The RCA system was best described as experimental, and in 1949, *not capable* of producing anything approaching satisfactory color;
- (3) The CBS system had been around nearly ten years, but it had one considerable flaw. It could not transmit programs in color which *existing black and white* receivers could receive in black and white.

On a present day standard of 1 to 10, RCA produced a color quality with a scale rating of 2 and CBS produced color with a scale rating of 4, which

made the CBS pictures twice as good as RCA's pictures for that time, but not half as good (scale rating of 5) as today's average home color pictures.

As you have already read, during this period (1949), the allocations freeze was "on". *No new applications for stations were being considered*, and, as explained in the freeze-era report, the original premise of the freeze (how to straighten out the allocation table mess) was *expanded* in 1949 to include straightening out the color mess.

The two problems, sufficient channels and approving a national set of color technical standards, interwove because the original CBS "sequential field" color system would not fit into the then (and now) standard 6 MHz wide channel assignment. In fact, to produce *acceptable* (scale rating of 6) color, the CBS system required a channel 12 MHz wide. This is another way of saying that *had that particular color format prevailed*, today we would have *half* as many channels (each *twice* as wide in frequency spectrum) as we have today. Or to put it into 1949 vernacular, the then operating 12 VHF channels would be shrunk to 6 VHF channels, each twice as wide (big, etc.) as the present channels, and since fewer than 600 VHF channels, each 6 MHz wide, could be accommodated nationwide, it followed that fewer than 300 channels, each 12 MHz wide, could be allocated nationwide.

So color, as long as it required a 12 MHz wide channel (i.e. the early CBS system) would force the FCC to try to plan a nationwide television allocation program that had only *half as many channels* and channel assignments available as we have today. This had, potentially, a dramatic effect on the ultimate allocation of new channels problem, *which was the original reason for the freeze*.

There was talk in 1949 of placing all colorcasts into the then unexplored

and untried UHF region, where a spectrum more than 400 MHz wide (adequate to handle 35 new channels each 12 MHz wide) existed. This talk was quickly discarded, because not only would existing receivers *not* be able to receive the programs colorcast in black and white, the existing receivers *could not receive them at all*. Where *relatively simple* black and white converters (which would make black and white reception of colorcasts possible on existing receivers) could convert existing receivers to receive color in black and white, a *much more elaborate converter* (costing perhaps more than the original receiver) would have been required to convert the UHF 12 MHz wide colorcasts into standard black and white pictures.

CBS offered to solve the problem, with a "slight reduction" in color quality, and the battle began.

Senator Edward C. Johnson was one of the early advocates of color. Some have said of the Senator, "*Johnson wanted to get television in Denver (a city without television when the freeze hit) and he viewed the color matter as an obstacle to getting television for his constituents. Consequently, he was quick to jump on anything the FCC did which threatened to put off television for his Colorado.*" Later, because Johnson ran for (and was elected as) Governor of Colorado, others would say in looking over his record that "*Johnson wanted to run on a platform that he brought television to Colorado.*" Whatever his reasons, he was (it appears in historical perspective) mostly *nettlesome* to the Commission and did not have a profound effect on television in the country (or his state) until years later when he was Governor Johnson.

Still, in the summer of 1949, Senator Johnson was *already* fed up with the color indecision (*it had hardly begun*). So he urged that the influence-free high scientific community, represented

by the highly esteemed National Bureau of Standards, select a committee of experts to study the subject. The Senator said he wanted a *"comprehensive and unbiased report from an independent group, so the public can be supplied, as soon as possible, with a true picture of what we have in color and can expect in the future"*. There was some low level scratching to form such a committee for a few weeks, but it eventually drifted into oblivion.

Early in the fall of 1949, the FCC got its color TV show on the road. It had decided it *would be* the unbiased expert panel, all but itself, *without any help* from the National Bureau of Standards thank you!

Held in the Commission's session room in the Department of Commerce Building, reams of evidence and testimony were taken from virtually every area of electronics. Just as the hearings got under way, CBS did a razzle-dazzle bit of one-upmanship and staged a private demonstration of its color system in the Armory in Washington. The demonstration was attended by invitation only, and guess who one of the invitees was! *Right—Senator Edward C. Johnson*. Immediately after seeing the demonstration, Johnson drafted a letter to FCC Commissioners Robert F. Jones and Paul A. Walker, in which he said:

*"...the color show was magnificent and utterly convincing proof that color TV is here now, and that all that is necessary for it to sweep the nation is for the FCC to remove the roadblocks and promulgate standards for its operation."*

Then the Senator added a postscript to his letter and noted:

*"However, the reluctance to show the FCC the facts by those who know the most about color and who can most effectively demonstrate its development disturbs me."*

The Senator from Colorado was upset, after writing his glowing report to two FCC Commissioners, *why CBS had not made such a presentation to*

the Commission. Apparently, he realized after-the-fact that he may have been *had* by CBS.

Several days later FCC Commissioner Jones wrote CBS President Frank Stanton:

*"Your zeal appears to have been tarnished; you insist on trying to promote your color system outside of the FCC hearing rooms; apparently because this Commission has taken the initiative in this matter. Your action in this matter might well lead one to the conclusion that while your company is anxious to transmit color TV, it is reluctant to permit others to operate color video receivers to appraise what you have transmitted. We must know whether laymen can operate the receivers, and we can learn this only by allowing laymen to operate the receivers under as many diverse conditions as are common in black and white."*

The gauntlet was down. The FCC had challenged CBS to "show off its color". After all, the Commissioner reasoned, the FCC had begun hearings and was taking testimony. *They would decide* the fate of color. So show *them* the color; back up the testimony and claims!

For nearly a year the FCC would stage a side-show, main-show, and after-the-show show. Millions of dollars would be spent by CBS, RCA, and a few other late-comers as they built special sets, hand crafted color cameras and receivers, built special transmitters, and generally came in on-cue from the Commission. Up to that time, most of the color tests had been conducted in New York City. That was logical; both CBS and RCA headquartered there and both had their extensive production studios there (virtually all television programming originated in New York at that time; microwave inter-connection existed only between Boston and Washington, running through New York). However, to accommodate the FCC, CBS spent a large sum to convert Washington's WOIC (channel 9, now WTOP) to color, and RCA equipped both WNBW and



an experimental UHF station they had operating in Washington for color.

The main arguments through the period October 1949 until a decision was reached in early fall of 1950 were these:

- (1) The CBS system started out requiring a 12 MHz wide band (the equivalent to two TV channels), but converted to a 6 MHz wide system when the CBS people saw that if they wanted to broadcast color on VHF, *this would be a requirement.*
- (2) The CBS system, called field sequential color, was a mechanical nightmare. At the TV studio, the cameras were equipped with large discs which were equipped with blue, red, and yellow filters. The discs were driven by a motor at 1440 RPM and as the filters passed (rapidly) in front of the camera pick up tube, for fractions of a second, the camera pick up tube saw only those colored objects which corresponded to the filter positioned in front of the camera lens at that instant. At the receiver, another color disc driven by another motor turned or spun the disc in front of the receiver picture tube. By synchronizing the two motors *exactly* (i.e. one at TV camera and one at TV receiver), the illusion of a colored image was created.
- (3) The CBS system was *not* capable of transmitting compatible color; that is, existing black and white receivers tuned to a CBS colorcast did *not* receive a picture in black and white (or color). They simply *received no picture at all.*
- (4) CBS told the Commission that while they were demonstrating color pictures on only receivers with 7, 10, and 12 inch picture tubes, that their tech-

nique would work just as well with the new larger 16 and 19 inch screens also. Some would question this, as we will see.

- (5) The public, should the CBS system be approved, would be faced with the following:
  - (A) Buying a color receiver, which would receive CBS colorcasts *and* black and white telecasts;
  - (B) Converting his existing receiver to a color receiver (approximate cost several hundred dollars), to receive CBS colorcasts *or* standard black and white telecasts;
  - (C) Installing a less expensive converter so that when CBS colorcast, his receiver would produce the program *in black and white*, but *not* in color (approximate retail cost, \$75);
  - (D) Doing nothing, in which case when CBS colorcast, he could *not* watch the program.

In 1949 there were 3,600,000 television receivers in the hands of the public. By the end of 1950, when the Commission reached a decision on color, there would be 9,700,000 black and white only receivers in public places. By the end of 1951, when the Supreme Court had finally settled the dispute, there would 15,420,000 television receivers in the hands of the public.

CBS hit hard and long (and repeatedly) on the fact that its color had the *best looking pictures*. It harped on the 10 year program during which they had color, and Senator Johnson didn't help things with *his insistence* that color was here and ready, and the public wanted it.

The RCA compatible color had the following arguments going for it:

- (1) It was *all* electronic, and neither the TV studio nor the



home receiver required large rotating color cellophane discs in front of the picture tube;

- (2) The *existing* receivers received the colorcasts in black and white, with about the same black and white clarity as regular black and white telecasts;

However, the RCA compatible color had failings at that time, and it was these failings which the Commission focused on:

- (1) The hues were unnatural, and required almost constant viewer juggling of the receiver controls (it later turned out that the majority of this aspect of the problem was being caused *at the studio*, and that, as studio techniques improved, the user-viewer got to sit in his chair more of the time and play home-technician less of the time);
- (2) The color smeared; that is, the colors tended to run. Bright colors, such as ruby red lips, tended to keep right on going past the lips into the face area beyond;
- (3) Color quality was unstable, it changed drastically from minute to minute.

Clearly, RCA had a good concept going, but it had *more than a few bugs* left to be worked out in 1949 and early 1950. Equally clearly, *CBS knew deep down* that RCA could and would solve these problems, so it pushed *extra hard* to get its system accepted as "the national standard" *before* RCA could work out the bugs. It was more than a matter of corporate pride; CBS had patent rights on its system and anyone constructing a CBS-system color receiver would have to pay a patent royalty *to CBS* for their rights. A few bucks were involved. CBS kept the pressure up on the Commission, and Senator Johnson periodically reminded the Commission that *he was*

*satisfied* with the quality of the CBS pictures and he wanted television now! (Perhaps because Colorado had no television, Senator Johnson was not worried about his constituents badgering *him* about his approval of a system which would antiquate their television receivers; *they had none at the time!*).

In the fall of 1949, at the urging of the Commission, RCA set up their owned and operated WNBW in Washington to start limited schedule color-casting. Six custom receivers were placed in "typical locations and used under typical home conditions".

During the fall of the 1949 hearings, *others appeared* on the scene for the color television standards prize. One hung in there until the end: Color Television, Incorporated of San Francisco (CTI). The CTI system was also all electronic; but their major contribution to the color squabble would be nearly one year later.

Late in 1949 the FCC announced the game plan and rules for color demonstrations before that body:

"The demonstrations will include color television camera equipment, color television receivers, monochrome receivers, and converted monochrome receivers (i.e. converted to receive CBS color in black and white). The receivers to be demonstrated will include 4 receivers receiving color only in a 6 MHz wide band, 1 receiver for demonstration of 6 MHz color versus wider (12 MHz) color; one conventional black and white receiver converted for color reception and one black and white receiver not converted.

The demonstration will include slides, test patterns, dancing, singing, juggling, fashions, near and far shots, different types of lighting and backgrounds. In one demonstration the camera equipment will be located at a local (Washington) high school football field."

CBS, the company first slated for demonstration really put on a show. One Commissioner said, "This was the darndest three ring circus you ever saw. TV studio equipment was all over the hearing room. We had to thread

our way to our seats through cables, lights, and jugglers rehearsing!"

The RCA demonstrations had a *little less* of P.T. Barnum to them. Set up in the studios of Washington's WNBW in the Wardman Park Hotel, they consisted of two color cameras for live (TV studio) presentations, a color film camera, and a color slide camera. Two color TV monitors in the studio, plus a special 16 inch receiver, were set up for the observers.

RCA put on an elaborate, tasteful program consisting of solo performances by network stars of that era, and a musical program staged with 19 musicians all brightly attired in colorful costumes.

After the two shows, the general attitude was that the RCA demonstration produced impressionable black and white (i.e. compatible) pictures, but that color pictures were flawed. RCA had *not* developed a single gun picture tube for the receiver at that time, and, to produce a 16 inch picture, RCA had to custom build a (large) cabinet that housed *3 separate black and white picture tubes*, arranged with dichroic type mirrors to focus the 3 separate red, blue, and yellow images on a single 16 inch screen.

The RCA tests lasted one full week, and as the week wore on, the picture quality improved considerably. Unfortunately, FCC personnel were among the first to see the show. Senator Johnson came late (i.e. towards the end of the week), and after he saw the RCA demonstration he said:

"I am impressed by the demonstration and I was surprised because of what I had been told to expect. I think the RCA method has some vital features."

While the demonstrations attracted only RCA and CBS at that point, the testimony and evidence being taken simultaneously by the Commission was not limited to the two contenders. Many firms had a vital stake in the hearings. One of these was DuMont.

DuMont's contribution to the early television era (pre-war until the early 1950's) cannot be overestimated. DuMont originally owned and operated television stations in New York (WABD), Washington (WTTG), and Pittsburgh (WDTV). These stations were among the first on the air in the nation, and DuMont was a major producer of television equipment of all types. DuMont also operated a television "network" in that era, competing with NBC (RCA) and CBS for station affiliations and audience.

DuMont had no *direct* interest in color development, and Dr. DuMont, as we shall see, really *seriously questioned the importance of color* at that point. For its role in the color hearings, history must award to DuMont the title of *Devil's Advocate*. DuMont personnel submitted briefs and testimony, and for one fleeting, highly entertaining moment, put on a memorable demonstration for the FCC. The occasion was late in the fall in 1949. DuMont personnel, headed by Dr. Goldsmith, sat through the CBS demonstrations and apparently got madder by the day. As scientists and electronic engineers, *they saw through the technical mumbo-jumbo* which CBS was dishing onto the non-technical Commissioners. One thing really stuck in the craw of DuMont, and that was the CBS glib dismissal of big screen color TV utilizing the spinning wheel which was a part of the CBS system. Because the wheel was more than twice the diameter of the picture tube screen, large screen receivers became (physically) very large very soon. A 20 inch screen, for example, would require a disc more than 48 inches in diameter, protruding not only far to the side of the screen itself but far above the screen. DuMont had hoped that this point, and the fact that *CBS demonstrated no receivers* with larger than 12½ inch screens, would become *apparent* to the Commission.

When it did not, DuMont's Dr. Goldsmith asked for and received time on the program for a "demonstration". At the appointed time DuMont personnel rolled in a huge cart. On the cart was a 700 pound apparatus consisting of a color spinning wheel, motor to turn the wheel, and the associated receiver. The machine, carefully constructed to be representative of the true situation and as modern as the CBS color wheel art would permit, measured 6.5 feet long, 4.5 feet thick, and 4.5 feet high. The end result was 700 pounds of motor, whirling wheel, and a (then) "giant" 20 inch picture tube. When the huge 4 foot-plus wheel began to spin at 210 miles per hour, the load on the electrical circuit in the FCC hearing room became too great and the fuse blew throwing the system into darkness!

FCC Chairman Wayne Coy became irate at this point and shouted at Dr. Goldsmith to *"stop this side show"*. FCC Commissioner Frieda Hennock also blasted Goldsmith and called the demonstration *"a ridicule of CBS and completely unfair to CBS."* Chairman Coy called a recess and the room cleared. Two Commissioners, Jones and Sterling, stuck around as Dr. Goldsmith re-ignited his machine. Over the roar of his 210 mile per hour 48 inch-plus whirling disc, Dr. Goldsmith told the two remaining Commissioners, *"We just got sick and tired of all of the claims about easy conversion of present receivers to CBS type color and decided to show folks how ridiculous such conversions really are."*

There were also cooler, calmer heads present. One, David B. Smith, Vice President of Research and Development for Philco, told the Commission the view of his company regarding the establishment of color TV standards:

*"The standards must be such as to permit the public, individually, and at their personal option, to be able to have either black and white or color reception with no loss of pro-*

*gramming service either way. Both color and black and white must be transmitted on a single set of standards so that each type of signal can be received interchangeably on either black and white or color receivers. The standards must provide a quality of service at least as good as that now provided by the present commercial standards. The continuity of existing service to receivers in the hands of the public must be maintained. Any proposal of non-compatible standards must include a detailed program to accomplish this purpose. In arriving at these standards there shall be no experimenting at the expense of the public. The Commission must assure the public that the system has been thoroughly proven before authorization of commercial service."*

Seemingly, this type of statement *should* or *would have come* from not a member of the industry, *but from the Commission itself.* Alas, it did not, and aside from its historical perspective on the right and wrong ways to do things, it apparently had *very little impact* on the Commission at the time. *It was probably too sane, and made too much sense to be seriously considered!*

Because the RCA and CBS systems were viewed by the Commission under different circumstances, the Commission then decided they would spend more of the two applicant's (and public) money. They would ask for so-called field trials, side by side comparisons. Thus the stage was set for the next round of the side show.

Throughout the tests the quality of the color was the ladder rung on which the Commission stood. *Public interest* seemed to be *the interest of getting good quality color*, and no one *seriously* considered the non-compatibility aspect of the problem.

Most of the official remarks sound pretty much like this quote:

*"The images were far brighter and truer in color fidelity than in earlier tests. Operation was stable and completely free of flicker."*

During the course of the field trials, others became embroiled in the controversy. The RMA (Radio Manufac-



turer's Association) put out a booklet which was titled "Is Color Television Ready For The Home?". This was a blunt, no-holds barred booklet that stated:

"...the majority of television set manufacturers urge that no color broadcasting standards be approved by the FCC until all proposed systems have been thoroughly field tested. When standards are set, all future improvements must be within the framework of the basic original standards. The original standards must be sound, and suitable for decades to come. The proposed CBS system uses only 405 lines for picture definition; this is a 45% reduction in picture detail and clarity."

As the tests ground on, Dr. Allen B. DuMont chastised Senator Johnson and FCC Commissioner Robert F. Jones. The Doctor said:

"Commissioner Jones condemns private interests who question the Commission's handling of color TV standards to date, simply because these private interests think it would be a grave mistake to foist unsatisfactory color on the American public. The Commissioner condemns more than 100 manufacturers of television receivers, television broadcasters, and television transmitter manufacturers because we think it a criminal mistake to make the future allocation of additional channels for black and white wait for a decision on the matter of color. A truly intelligent and lasting decision on the matter of color may take years, and spokesmen for our industry do not think the public will be willing, or should be forced, to wait these years to enjoy adequate television reception."

Of the two primary contenders for the color prize, Dr. DuMont said:

"Neither system is adequate. In one the color changes every minute (RCA) and in the other the color fidelity is poor (CBS)."

By mid spring of 1950, the hearings had ground down to who could claim they would do the most for the public. NBC's John H. McDonnell told the Commission his network would immediately start regular colorcasting from New York. McDonnell stated his network would extend color service to places like Providence, Philadelphia,

Toledo, and Davenport by the end of the summer (1950). CBS's Stanton promised 20 hours of color programming per month within 90 days of authorization of their system.

McDonnell countered Stanton's hours claim by stating:

"Broadcasters would be unable to transmit color during the choice (i.e. prime) evening hours with the CBS system because they would lose virtually all of the black and white only audience, something that is not economically feasible when programming must be paid for by advertising dollars."

In May RCA's General Sarnoff created a bit of a stir when he stated that if the RCA system was approved, RCA would share all of the data with every manufacturer and anyone would be free to manufacture and sell compatible system color receivers. This took CBS back a step or two because they had been quite blatant about their plans to be the primary source of their own receivers, and to allow secondary royalty paying receiver sources to develop only after they were tooled up first.

Finally it all came to a head. Over 10,000 pages of testimony, and 250 exhibits of material, diagrams, data, and engineering studies. Very late in the race Colonel Donald K. Lippincott, representing the California firm CTI, shook the FCC with several statements. He said:

(1) The RCA system and the CBS system were too complicated for the average service technician to handle or the average viewer to adjust;

(2) The CBS system would be financially difficult if not disastrous to all but a handful of the largest television manufacturers;

(3) And why has no one looked into the matter of interference in color reception?

The last point created a first class rhubarb. RCA and CBS in particular moved that CTI field experience (they had been testing their system over KPIX in San Francisco and perhaps had more actual on-the-air time with their system, through a non-test facili-

"NEITHER COLOR SYSTEM IS ADEQUATE..."

ty, than CBS and RCA combined) *not* be allowed into the record. The contention of RCA and CBS was that *no one else* had conducted field trials in medium signal and fringe areas, as CTI claimed to have done, and the CTI results of these tests should not be considered as evidence when they *alone* had conducted the tests. CTI's interference evidence was quite harmful because it showed that color transmissions were *much more susceptible to interference* (man made and weak signals) than black and white transmissions.

This plainly upset Chairman Wayne Coy who recalled quickly that all of his problems with an *allocations freeze* had come from the *emergence of interference* as a limiting factor in station coverage zones. He quickly saw the potential of a whole *new* set of interference problems (now *color* related) leading to another allocations fiasco.

That nobody had sought to prove color's transmission characteristics *outside of the secure in-town reception areas* is incomprehensible today. It accentuates however the Commission's concern *only with "color fidelity"* and their almost complete ignorance of the *real* questions involved in approving a color transmission and reception standard.

After the clamor died down in the hearing room, Chairman Coy remarked:

"I would like to comment that this exhibit brings into sharp focus the difficult problems which the Commission faces. It is apparent that a successful television system cannot be maintained unless a sound allocation (of channels) program is established. A sound allocation program is not possible unless the Commission has adequate interference data. It has been the consistent experience of the Commission in this and other proceedings that it is virtually impossible to get the parties to submit adequate interference data. So far as the parties are concerned, no adequate interference data was offered by any of the parties at the outset. Moreover, when, after extensive prodding by the Commission, the

parties did produce some interference data, it is apparent (from the CTI exhibit which was extensive) that not nearly as much effort and ingenuity went into the preparation and presentation of such evidence as compared with other aspects of the parties' cases.

I hope that this proceeding will teach all of us the importance, not only to the Commission, but to the industry and the public, of securing and offering adequate data on interference, so that sound decisions can be made on an allocation basis, under which the (TV) industry can build with reliance on the fact that unforeseen interference conditions will not severely limit the service areas which have been anticipated, and thus deprive many rural viewers of service. People who live in rural areas are important people."

Seemingly, the Commission now had *plenty of reason* to delay for quite some time the decision on color. To restate them now:

- (1) The leading contender system, CBS, was *not* compatible; people could *not* watch CBS color programs in black and white without special converters;
- (2) In spite of the CBS statements to the contrary, the CBS color system was *limited* to relatively small picture tube sizes, and, as DuMont demonstrated, even 20 inch pictures with the giant whirling wheel were impractical;
- (3) The two electronic systems, CTI and RCA, had made dramatic progress in the 1949-1950 one year period. Even the Commission was aware that every week brought improvements;
- (4) The CTI and the RCA systems *were compatible*; that is, people could see colorcast programs in black and white on the existing nearly 9,000,000 receivers;
- (5) Based upon CTI evidence, the question of color picture quality in areas outside the principal city (where interference and weak signals could be a problem) was *largely unresolved*. CTI said that pictures in rural



areas went down hill faster in color than in black and white and that satisfactory service areas for color were much smaller than with black and white.

Seemingly, with the exception of Senator Johnson, most everyone could agree that a further delay was in the best interests of the public.

So it was *with some surprise* when in September of 1950 that the Commission released a 48 page "memo decision" that awarded the color prize to CBS.

The Commission, by a 4-2-1 vote, approved the CBS system, but left a carrot dangling for CTI and RCA. They told the two firms, "You have until December 5th to demonstrate how improvements in your existing color will bring it up to the 'grade' of the CBS quality." In the 48 page memo, *virtually no mention* was made of the compatibility problem. What was said was:

"If a compatible system that produced satisfactory pictures was available, it would certainly be desirable to adopt such a system. Compatibility would facilitate, for the broadcaster, the transition from black and white to color broadcasting and would reduce to a minimum the obsolescence problem of present receivers. However, no satisfactory compatible system was demonstrated at these proceedings."

Senator Johnson did what you would expect him to do. He made public a letter to Chairman Coy in which he said:

"The decision brings very close the day when this great new improvement will serve the American people. I know every effort will be made to push forward rapidly the allocation decisions so that television will be made available to many more millions of citizens who are waiting impatiently to have television in their homes."

Dissenting on the rush-choice of CBS, Commissioner Frieda Hennock declared:

"Incompatibility will produce a serious problem for the broadcaster, and its effects will very likely be felt by all television view-

ers. To the extent that there are receivers in the hands of the public which are unable to receive field-sequential color broadcasts, every program broadcast under those standards will entail a loss of audience for the broadcaster. The decision to produce a program in color will be a difficult one for the broadcaster if it means that the program will become less saleable."

While the shock of the decision was wearing off, and RCA and CTI were working 24 hours per day to try to make the December 5th reprieve deadline, someone noticed some fine print in the 48 page memo-decision. It said that within 60 days of the finalization of the new color standards rules, that *all receivers* produced for shipment in interstate commerce would be *required* to have a built-in capability to "switch" between standard 525 line black and white and 405 line field sequential color (in black and white). This meant that all sets would have to be capable of receiving standard black and white broadcasts in black and white, *and at the throw of a switch*, CBS colorcasts in black and white. This was a "conversion" which CBS had earlier stated the average set owner (by now there were 9,000,000 sets in use) could make at \$75 per set.

*The receiver manufacturers came unglued.* "We can't change over that fast" most cried. Others *questioned the authority* of the Commission to force an extra cost receiver standard into receivers. CBS considered the ruling a victory.

When the receiver manufacturers brought their case to the FCC, a new bit of intrigue developed. FCC counsellor Harry Plotkin (we will hear more from Harry later!) let the cat out of the bag when he announced that FCC Engineer Ed Chapin had constructed in the FCC laboratory a receiver which *"featured automatic adaption from 525 line black and white to 405 line color-shown black and white"*, thereby eliminating the need

for a manual switch. If the receiver manufacturers were upset when they went into the session, they became irate when Plotkin dropped *that* bomb.

The RCA attorney arose and said:

"This development of Mr. Chapin's constitutes what might be considered an improvement in the CBS system. The Commission has set itself up in a judicial capacity to hear evidence between 2 or 3 competing systems. Now the Commission's own staff comes forward with an invention which seems to be an improvement of the system proposed by one of the litigants. It seems to us as if we have a situation where the judicial group is assisting one of the parties in the contest. We think this is inconsistent with the judicial position which the Commission should take in these proceedings."

Chairman Coy showed a flash of temper as he rebuked the RCA attorney, defending the role that the Commission had played to date. He then explained that the Chapin circuit was going to be the subject of a patent application, said patent to be *owned* by the United States government. The exchange left an extremely bitter rift between the Commission and the receiver industry, not to speak of RCA who felt that the Commission was aiding the CBS proponents by assisting them to develop their system.

Within weeks two law suits were filed, both landing in the U.S. District Court in Chicago. One suit was filed by a TV receiver manufacturer (Emerson) and another by RCA. Both suits charged:

"...that industry, broadcasters, and set owners stand to be seriously affected by this ruling of the FCC; ... the order is contrary to public interest, is arbitrary and capricious, and exceeds the authority of the Commission; ... the order is not supported by the evidence."

The purpose of both suits was to seek injunctive relief from the courts to withhold the FCC enforcing the order and putting the color standards (and new compatible receiver standards) into effect. One of the suits stated:

"...although the Commission has no jurisdiction over receiver manufacturers, the Commission seeks to require that such manufacturers agree with the Commission to build all of their black and white receivers according to specifications laid down by the Commission. These specifications require extensive alterations in present production model receivers."

Those readers of this report who are too young to remember those early days of television have already figured out that today's color receivers do not have large spinning color discs, so *somehow* we must have gotten out of this predicament. Most are betting, we suspect, that the courts turned the matter around. *Well, they did not.*

The case moved through the courts with lightning speed, and the Supreme Court of the United States of America had it in no time at all. Because the FCC was the defendant, U.S. Solicitor General Philip B. Pearlman presented the case for the FCC. The Supreme Court provided a good forum, although they initially were uncertain just how far the court should go; should it, for example, re-study all of the technical evidence that went into the FCC decision, and perhaps hold another round of hearings on CBS vs. RCA vs. CTI color performance? Justice Jackson was particularly interested in this question, because everyone was plowing new ground.

Justice Frankfurter asked the CBS counsellor if "*... the FCC decision does not create a condition in which a possible monopoly might develop if the incompatible system were developed?*" The same Justice also wondered how a government commission, *not composed of experts*, could foreclose *once and for all* the further development of color systems and improvements by accepting the CBS system at this point, and then closing the door to others thereafter.

Well if the suspense of this is getting to you, be advised that after a couple of months the Supreme Court released a

decision: *it backed the FCC's right to establish standard for color television, and in effect, the CBS system was finally approved.*

But in the process of passing judgement on the FCC's legal right to set and adopt standards for color television, it was evident that the Supreme Court had dug down deeply enough into the evidence and exhibits to make another determination. In its decision, the Supreme Court said:

"However, the wisdom of the decision (by the FCC) can be contested, as evidenced by the fact that two of the Commissioners dissented in the decision. It is not the job or function of the courts, however, to overrule an administrative decision, merely because the courts may disagree with its wisdom."

It appeared that the Supreme Court was establishing a dangerous precedent for future contestants of the FCC. In effect, as long as the FCC was within its *legal framework* to make a decision, it could make *virtually any decision it wished*. And these decisions would not and should not be overturned by a federal court, even the Supreme Court, *merely because* the wisdom of the FCC decision was questionable. Perhaps the broadcasting industry (with all of its ramifications) did not realize it at the time, but this was to become a very significant milestone for future television hassles. The *doctrine of administrative agency expertise* was to become supreme, *larger even than the Supreme Court* of the land. All the FCC had to do to stay out of trouble was to base decisions on whatever criteria it wished, *as long as it stayed within the broad regulatory areas* which the Communications Act of 1934 established.

Well now, we obviously do not have CBS field sequential color spinning discs in our receivers today. Even a small child knows that we have all electronic colorcasting. If the Supreme Court backed the FCC, what prevented CBS from running with the ball?

*Believe it or not, it was the Korean War!*

During the late summer and fall of 1951, CBS felt pretty comfortable, even though RCA and others were steadily making large scale improvements in color of their own making. CBS made a big noise about ordering 250,000 small electric motors to build color receivers with, and there was a small (very small) increase in color broadcasting activity.

Then in mid-fall of 1951 the Washington Chief of Defense Operations, Charles E. Wilson, did what the federal courts could not do for RCA and the all electronic color group. *It shut down CBS production of color sets.* The defense requirements for the Korean War had built steadily, and the use of certain materials which were going into CBS color receivers was required for the war effort. Because CBS was the only manufacturer of CBS color receivers at that point, CBS also announced that it would shut down (for the duration of the war) CBS colorcasting (i.e. no receivers, why have programs?).

At the point of shut down, CBS color receivers were just beginning to come off the production line. At the same time, the compatible color group had made dramatic improvements in their system. The *smart money* of that era was certain that CBS had engineered the shut down to keep themselves from being financially and nationally embarrassed by a color system that was doomed before it ever began. The *not-so-smart money* of that era was betting that RCA and others prompted the visit to CBS Prexy Frank Stanton by Defense Head Charles Wilson to keep CBS from getting a head start with 12 inch whirling disc color receivers. Those who didn't bet money on anything merely accepted the fact that the CBS production really did need to be shut down for the war effort.



And when the Korean War was over, and the manufacturing embargoes were lifted, the interim development of compatible color had run full circle. In a not very controversial and not very lengthy debate, the all industry supported compatible color program initiated by RCA *became the standard*, and in 1954 the nation would purchase 5,000 compatible color television receivers, followed by 25,000 the following year.

### What Does All Of This Prove?

Consider the litigants before the FCC: RCA, the owner of the NBC network, the most influential and extensive developer of black and white television standards, and a company that poured millions upon millions into the development of the television art in the 30's and 40's. No one could or would ever question the heavyweight status of this giant. They had nothing but the best people, at all levels, *and they knew their way around Washington*.

Then there was CBS, a company which, if you go back far enough into the history of broadcasting, began as an offshoot of RCA (Remember the red and blue radio networks? Few do!). It was by all *odds* the underdog in this contest, simply because it was not heavily into manufacturing and hardly had the financial resources that RCA

had. *But it was far from being a lightweight*, and it had top people also. On a one to one basis, CBS people were every bit the match of NBC people. *And they knew their way around Washington*.

CBS was also pretty swift on its feet. It did things (like the Armory demonstrations of color for Senator Johnson, which riled the FCC) which RCA would ponder long and hard before doing. *Youth is impetuous*, and CBS was (in comparison to RCA) the youth of the pair.

*Neither could be considered a true underdog*, because both had top notch people and top notch credentials.

*Both were much more capable than the Commission*. The 7 Commissioners of that era were no more nor no less capable than the average Commissioner. Chairman Wayne Coy was an extremely sharp fellow and a good leader. Still, the Commission seemed determined to make a dumb decision, and to make it too fast, without a satisfactory understanding for what it was they were doing. No facts, no evidence, could apparently deter the Commission from making their dumb decision. The Korean War, for all of its terrible side effects on our nation, at least saved us from non-compatible color television, even if it did not save all of Korea from Communist domination.

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# UHF COST THIS NATION MILLIONS OF DOLLARS . . . THANK YOU FCC!

## So It Began

To set the proper perspective for the immediate period *after* the freeze lifted, one has to imagine a nation swept with the frenzy that "*Every town in the country was going to have television soon!*" First there were rumors that the whole nation would see the World Series, and then it was going to be the Rose Bowl.

So much had been written about the wonders of television that it was no wonder at all that people, firms, radio broadcasters, newspapers, and corporate giants were standing in line just to file their applications!

Virtually anyone with a few bucks of cash and a few more of credit was convinced he would *soon be a millionaire*; the *license to riches* was the FCC authorization to build a television station.

The allocation table set up the VHF-UHF program pretty much as we still have it today. Many small towns were given allocations because the *allocation table* created allowed channels to fall *near* the towns. Ely, Nevada, for example (1970-74 population = 4176), received VHF channels 3 and 6.

Nationwide, the VHF channels were limited. In 1952, UHF channels were *for all practical purposes* "unlimited." The smart money figured a VHF license was more valuable than a UHF license, so it filed there. However, few VHF channels had *only a single appli-*

*cant*, and they would therefore require FCC comparative hearings to determine who would get the coveted permission to build and operate.

To some *not-so-smart* money, where VHF and UHF channels were allocated to the *same* community, the UHF channel seemed the fast way to get on the air. Simply because there was less likelihood that you, as an applicant, would have a competitive applicant there. So, many who would have *preferred* a VHF channel filed for the UHF, simply because they expected no competition and hoped their permission to operate would come quickly.

The Commission set up to *speed* applications through. It is entirely possible that many of the early applicants were stamped "approved" by the Commission with no real investigation of the applications or the financial qualifications of the applicants. As the results would show, *too quickly* for some of the applicants, many were in truth *not qualified* for the financial drain which would follow. And short of capital, they would start big, and die soon. But that is getting ahead of our story.

The first grants were to places like Denver, Portland, Springfield-Holyoke, Flint, New Britain, New Bedford, York, Youngstown, and Bridgeport. Denver had *three* applications approved quickly: channels 2, 9, and 26. Portland had a single channel ap-



proved, channel 27. Channels 55 and 61 went to Springfield-Holyoke; Youngstown received channels 73 and 27; channel 28 was approved for Flint; New Britain-channel 30; New Bedford-channel 28; and York-channels 49 and 43. New Britain, where RCA conducted UHF tests for many years, received channel 43.

Meanwhile, some cities showed displeasure with their assignment of channels. Pittsburgh was notable because radio station WWSW filed an action in the U.S. Court of Appeals, Third Circuit, asking the court to review the Commission's table of assignments. The station sought a third VHF channel allocation for Pittsburgh, noting that "*Pittsburgh had been allocated only two commercial VHF channels*" (plus three UHF commercial channels). "If market area population is the criteria the FCC went by," the appeal said, "there are twenty-seven smaller markets than Pittsburgh which received three or four commercial VHF channel assignments." In other markets, others were upset with the Commission and filed similar appeals. Radio stations WLOA-Bradock, Pa., KVOL-Lafayette, La., WISC-Madison, Wis., and WLAN-Lancaster, Pa., all filed in the U.S. Court of Appeals in Washington, citing local (to themselves) allocation situations which they did not like.

But in spite of these problems, most of the industry was "upbeat" at this time. Commission sources revealed that "over five hundred applications for new stations had been filed" within ninety days of the lifting of the freeze.

To handle the influx of applications, the Commission set up a priority system. Lists were prepared and released by the Commission, ranking cities where *competitive applications* would be heard first, second, and so on. The list riled two FCC Commissioners. The top three cities on the list were Denver, Canton, and Portland. Commis-

sioner Bartley dissented in the issuance of the list and said:

**"The Commission should consider making additional new grants to those cities where the greatest need exists. Denver does not need three additional channels (it received three immediately after the freeze lifted). It is foolish to consider three new grants for Denver when St. Louis only has a single outlet and it is a city twice the size of Denver."**

There were many fault-finders berating the Commission in those days. To offset the bad press they were receiving, Commissioners Walker, Sterling, and Webster mounted the speaking tour and began to defend the allocations table. The earlier attempt by the FCBA to have applications considered on the *same basis* as AM radio allocations (see Page 23 here) was the most often quoted example of "a-better-way-to-do-things formula" by the Commission *opponents*.

Commissioner Hyde joined the trio at the Virginia Association of Broadcasters meeting and *defended* the Commission block assignment plan:

**"Unless we utilize the chosen block assignment plan, there would be a chain reaction of applications and hearings. It is conceivable that one applicant for channel 9 in Pittsburgh would eventually involve a giant hearing that would take in every applicant for a high-band station from South Carolina to Nebraska, and east to the East Coast as far north as the Canadian Border."**

The Commission was purely *selling hard* for the allocations program, and in historical perspective, it appears that they had to be selling hard *for only one reason*: they feared that the block assignment plan *might end up in court*.

Shortly thereafter, the Commission backed down on the assignment of only two VHF channels to Pittsburgh, with the assignment of channel 4 to Irwin, a suburb only 15 miles from downtown Pittsburgh. This action pleased station WWSW that had instituted the suit

against the Commission, but the Mayor of Pittsburgh wanted at least *one more* channel for his city. He mounted an intense campaign to get his way and bluntly declared that "*UHF will never work in this hilly terrain.*"

Other VHF assignments were having a rougher go of it. If you recall the report in these pages concerning the freeze period, station WGAL-Lancaster was the shining example of too close spacing on a single channel and *the indirect cause of the freeze itself*. In the new allocation table, channel 4 was to become channel 8 in Lancaster. Seemingly, WGAL would simply shut off its channel 4 transmitter one day and return to the airwaves on channel 8 the next day. *At least that is the way WGAL and the Commission expected it to happen.*

But, radio station WLAN-Lancaster had other ideas. Way back before the freeze, when both channels 4 and 8 were assigned to Lancaster, WLAN had *planned* to file for channel 8, and it said so frequently. Now, channel 4 was being eliminated, and channel 4's inhabitant, WGAL, was moving to channel 8. To WLAN, this was "their frequency," and they protested the move. They had two requests: (1) Let WGAL turn off their channel 4 transmitter and go away, granting channel 8 to WLAN or, (2) at least hold a comparative hearing between WGAL and WLAN for channel 8. Eventually the Commission did neither, but WLAN tried very hard.

Somebody had to be the first station on the air after the freeze lifted. It turned out to be KPTV, channel 27, in Portland. RCA had contracted with KPTV to dismantle the test UHF transmitter operating at Bridgeport and to haul it to Portland. In September of 1952, this was accomplished, and the station was not only the first post-freeze station to get on the air, it was the first real (commercial) UHF station to get on the air. Within weeks, over

5,000 UHF-equipped receivers had been delivered to Portland for its first experience with television.

So, after nearly four years to the day, when the FCC stopped granting new TV applications, the television boom was back in business. It would continue that way through the balance of 1952 and into the first half of 1953.

This would be an appropriate place to analyze just what happened to those stations (or permittees) who received the "green light" from the Commission in that first year. Perhaps the best way to measure the effectiveness of the Commission's allocations plan and the way in which the FCC granted new permits, is to analyze the *sum* of the successes and failures of these early permittees. We judge a man by his accomplishments, so let's extend the same courtesy to the Commission.

### In The First Year

During approximately the first year of applications and grants:

*Total VHF Stations Approved . . . . 102*

*Total UHF Stations Approved . . . . 199*

Virtually all of these grants were to applicants who were mutually exclusive; that is, they were the only applicants for the particular channel. In this situation, there were no hearings on their applications and because of the rapid processing of the applications, there is some logic to the conclusion that not all of the permittees were financially qualified for what lay ahead.

Now filing for a construction permit to build a new television station is one thing; actually building it and putting it on the air is quite another! So the measure of the success of the Commission's program is best found by looking at the track record of the 102 early VHF and 199 early UHF grantees.

Look first at the station permittees who actually got on the air:

*VHF—102 granted . . . . 102 Went on Air (100%)*

*UHF—199 granted.....107 Went on Air (51.2%)*

So nearly 50% of the grantees for new stations, in UHF, *never did build* those stations. Now what about those stations that did eventually start telecasting? How many of them made it and are on the air (*still*) today?

We have selected the first 90 stations (VHF and UHF) to *actually* go on the air for our study. To try to get a handle on the potential market area of each of these stations, we have assigned them to present-day markets based upon the station location and on present-day market classifications.

	<u>Markets 1-50</u>	<u>Markets 51-100</u>	<u>Markets 101 Up</u>
VHF — made it	6	11	30
VHF — went off	0	0	2
UHF — made it	4	6	7
UHF — went off	6	6	12
VHF — made it	100%	100%	94%
VHF — went off	0%	0%	6%
UHF — made it	40%	50%	37%
UHF — went off	60%	50%	63%

Clearly, UHF was a risky business. As we shall shortly see, even if the station was in a market pretty much devoid of VHF, UHF was *still* risky. Network affiliation was still the big problem. The great wealth of syndicated or off-network programs available *today* did not exist in 1953. Video tape was not yet a reality. Stations not connected to network lines had to rely on kinescopes or film, and they lost all of the immediacy of live television *which the networks were catering to in that era.*

Later, in 1955 television station KFSA (channel 22) in Fort Smith, Arkansas, appearing before the Commission for permission to install *its own* microwave relay link, would testify:

"The closest coaxial cable with network programs is 150 miles away; the use of the interconnection facility would cost \$5,200 per month for microwave service from the telephone company. If we could operate our own microwave system, it would cost us \$2,000 monthly."

At that time, FCC rules only allowed microwave hookups for *temporary* events, such as covering live events remote from the studio. The Commission would *eventually* change that rule, but *not before* many UHF stations had folded; *many of whom* would cite the *high* cost of physical interconnection to the networks as *part* of their reason for failure.

As the previous data, studying the first 90 stations to take to the airwaves, illustrates, only 17 of the first 41 UHF stations to get on the air are still on today (41%).

Of the 17 which made it, *11 of these (65%) would later be required by the Commission to change channels.*

### The Losses Incurred

There is probably no accurate way to estimate the losses to the licensees and the public for the early UHF failures. Still, an attempt must be made because public (and private) losses caused by whatever reason are of some concern; and when they *may have been caused by a federal agency*, they have *special* reason for study.

First, look at the 11 UHF stations that made the grade but were subsequently required to change channels. Understand that in the early days of UHF, there were two common methods of receiving UHF on the receiver. The first was to buy a VHF receiver (channels 2-13) and have your serviceman go into the receiver and take out



one of the VHF channel strips (say 3) and replace that strip with a new UHF channel strip (say 61). This cost the average home viewer about \$25, plus the money that he would put out for his UHF antenna and, of course, the basic receiver. The second most popular method required the viewer to purchase a VHF receiver (2-13) and a UHF converter (a separate set top box with a separate UHF tuning knob). This cost the average home viewer \$40-50 *above the cost* of his VHF receiver. As the early years wore on, receivers came from the factory with built-in UHF tuners, although they typically cost \$30-60 *more* than standard VHF receivers. So the cost worked out about the same, regardless of which approach the home viewer took.

When a UHF station changed channels, at FCC instructions (or for any reason), here is what happened:

- (1) If the viewer had a UHF set top converter, he merely tuned his converter to the new spot on the UHF tuner dial and continued watching the station;
- (2) If the viewer had a UHF tuner built into his receiver, he did the same thing: simply retune his receiver to the new channel;
- (3) However, if the viewer had a VHF set with a single channel UHF strip installed in it, *the viewer had to throw out that strip and install a new strip for the new channel.*

So when the original channel 61 in Springfield changed to channel 22, approximately 40,000 home viewers had to make one of the three adjustments. Those who had UHF strips in their VHF sets had to spend another \$25 or so to receive channel 61 after it converted to channel 22.

There were 11 such situations *just in the 17 UHF stations that made the grade in the first 90 stations on the air* after the freeze ended. This cost these viewers some money!

Based upon our CATJ study, the approximate cost to the home viewers for these changes, *mandated by the FCC*, was in excess of \$2,657,000!

Now what about the losses incurred by the 24 stations that went on the air on their new UHF assignments but subsequently left the air? Again, there are at least two areas of losses: (1) The cost of the TV station facility, less whatever salvage value there was in the equipment, *plus* whatever operating losses were run up while the station was on the air; (2) The losses to the public for UHF tuner strips, UHF converters (if no other UHF stations were on the air in the area), UHF antennas and so on.

Converters and antennas could (and would) later be utilized for other (later) UHF stations, if they came on the air. If UHF *never* came back to the area (such as Little Rock, Arkansas, where channel 17 was the first station on the air in Little Rock, and after the UHF channel left the air, no other UHF stations ever came on the air), the public investment in UHF receiving equipment *was simply a write-off.*

The total loss to the American public *and the UHF broadcasters may have totaled as much as 150 million dollars in the 1950's.* Clearly, there are so many factors involved, it is probably *beyond* the study capabilities of this publication.

Still, we can study with a high degree of accuracy the losses sustained by the public and the telecasters *in those 24 situations* where of the original 41 UHF stations to go on the air, 24 *eventually* (some very quickly) *folded up.*

The 24 stations involved cities as large as St. Louis (market number 12 today) and as small as Atlantic City (no market number today). *For the 24 stations*, there were *direct reportable losses in excess of \$7,200,000.* Some, like WCAN-25, Milwaukee, held on far be-



yond the point where they should have abandoned the ship.

There were no *fewer* than 610,834 home receivers equipped (totally) to receive the signals of these 24 stations that did *not* make it. This ranged from as many as 300,000 UHF-equipped receivers in Milwaukee to as few as under 5,000 in Atlantic City. Allowing the tuner strips, set top converters, built-in UHF tuners; allowing for markets where UHF came back (and we limited *our come-back period* to five years, assuming after that period the UHF equipment was useless or lost), we have a total loss for 610,834 UHF-equipped sets of \$15,270,850. Thus, in just the first 24 UHF failures, between the losses to the stations and the losses to the public, there was a combined loss of investment totaling more than \$22,470,800. Add to this the loss of \$2,657,000 estimated for the 11 UHF stations which did make it but that later required their viewers to re-equip for new FCC assigned channels, the total public loss for this short period was in excess of \$25,000,000!

And as we noted, the *probable* loss for all of the UHF-equipped receivers that went dark when later UHF telecasters went dark, would run, we estimate, to in excess of \$150,000,000. Of that vast sum, CATJ estimates that *the loss to the home viewer* was as high as 77% or \$115,500,000. It is almost beyond comprehension that a federal agency could get that far into the American pocket book over something so mundane in our lives as television broadcasting and reception.

### So Hearings Began Again

The failure of UHF was a disaster for the FCC. *If* there was ever a period in FCC history where the desire to cover up the facts was paramount, *this would have been the time*. No matter who you talked to, UHF was a fiasco. The reasons were not nearly as impor-

tant as the fact that it had happened and was happening. And seemingly, as they would demonstrate over a two-year-plus period, the FCC was about as capable of finding a solution to the UHF fiasco as they were capable of selecting the proper color TV system for this country.

"WTAC-TV in Flint, Michigan reported it was forced to suspend operations because ad agencies and advertisers refused to accept the station. The station reported Flint had a 62% conversion rate (to UHF). The Flint station reported it had begun operating from a new \$125,000 building on Thanksgiving Day in 1953 and had been losing \$10,000 per month since that time. WTAC was an affiliate of ABC, but market encroachment of low-band (VHF) signals from Detroit, Lansing and Bay City had driven it off the air.

In Atlantic City, N.J., WFGP-TV suspended operations until Washington and others could find a satisfactory solution to its problems. The station lost 33 half-hour segments of network programming from the network when Philadelphia VHF stations were permitted to increase their power levels. The 60-mile distant Philadelphia signals had established a concept of coverage which advertising agencies bought, and Atlantic City was no longer considered a distinct market apart from Philadelphia. Therefore, extreme audience and economic loss compels suspension of WFGP operations because the station can no longer render a service of pride to South New Jersey, the premise on which the station was planned, built and dedicated."

In that same era, a UHF station in New England tried a unique experiment. The station, not a network affiliate and stuck with very old movies, wanted to see just *how bad off* it was. *So for one full evening, at each station break, the station offered \$1,000 to any viewer who would call in to the station.* The announcements ran *all evening*, and the station received *no* phone calls. Plainly, *nobody was watching them*, at all! The station promptly suspended operations.

The FCC was on the defensive. FCC chief economist Hyman Goldin, speak-

ing before a meeting of educators in Columbus, Ohio, told the group:

"The rumors of UHF's death are greatly exaggerated. There is no denying that there is a long list of woes for UHF, but these high channels will eventually be used."

Goldin's comments did little to console the operators of two UHF stations in Spartanburg, South Carolina. In line with the *then* FCC round of granting existing VHF stations permission to raise powers to 100,000 watts for channels 2-6 and 316,000 watts for channels 7-13, and to use 1,000-2,000-foot towers or elevated sites, the Commission was permitting channel 7 in Spartanburg to move to a 3,500-foot (above sea level) mountain 25 miles from the city. Two UHF stations then on the air in the area protested that "this would allow the channel 7 station to cover our coverage area from some distance away, and we will lose our network affiliation."

FCC Commissioner Frieda Hennock responded:

"These economic injury allegations are purely speculative..."

The station moved to the mountain top; the two UHF stations subsequently left the air.

Madam Commissioner had more to say about the problem of "who is to blame" the next month (mid-1954) when Senator Charles Potter of Michigan opened Senate hearings into the UHF mess. The Commissioner burst out:

"If you want me to tell you the truth, when you Senators call this Commission to tell us to hurry up and give you television in your community, and give us until tomorrow to do it, and in the most unethical manner known to man... I am ready to cry and give up!"

Subsequently, FCC Commissioner Hennock scolded the Senate for "permitting station applicants to file and not allowing anyone to compete for the specific channel involved, or allowing two applicants to merge their applications without the FCC holding merger

hearings or letting the public know about the merger."

She retired from the stand with:

"I have no intention of serving on a dishonest Commission if I am an honest woman, and I don't want to see the Commission get all of the blame for this mess."

An honest or dishonest Commissioner, Frieda Hennock would retire in the summer of 1955.

In the same hearing Dr. Allen B. DuMont made *one last stand* for the saving of his crumbling empire and for network competition. He urged that the Commission adopt one of three plans to save UHF. They were as follows:

- (1) "Each of the networks should be required to make full-time affiliates of specific UHF stations where the stations are suffering and may go off the air;
- (2) Or, each network would be required to release on demand 25% of its prime time and other time (by category) programming on demand to UHF stations in the same market;
- (3) Or, as an incentive plan, for each seven UHF stations which the network affiliated with, full time, the network would be allowed to own and operate one additional UHF television station itself, up to a maximum of 11 stations (VHF of which they could own five and UHF of which they would own six under the DuMont plan)."

The operator of UHF station WCAN in Milwaukee told the Senate committee:

"...viewers have invested upwards of \$30,000,000 in conversions in the UHF market of Milwaukee alone; there are presently 300,000 receivers so equipped. We propose that the present VHF stations be given five years to move to UHF, and this will allow everyone to adjust to a truly equal situation."

With things as bad as the hearings indicated, it was inevitable that a new round of "solutions" would start popping up. Shortly after the hearings began in the Senate chambers, FCC Commissioner Frieda Hennock proposed:

"All further VHF drop-in assignments must be halted; network programs must be made available to UHF stations; UHF construction permits which were canceled for lack of construction should be reinstated; UHF stations should immediately be authorized substantial power increases and tower height increases; legislation should be passed to bar from interstate shipment any TV receivers not equipped for VHF and UHF; and eventually, all TV broadcasting should be moved to UHF."

Senator Edwin C. Johnson popped up again when he told the nation's CATV operators in their 1954 annual meeting, "*The decision to mix channels (VHF and UHF) was insane; it is like trying to mix water and oil. Yet the FCC still stubbornly maintains that its original decision was correct.*"

CBS President Frank Stanton took exception to everyone else's concerns. He said:

"To move all television to UHF would weaken the whole system, deprive some areas of service, and damage the quality of programs. The suggestion that VHF antenna heights and power levels be reduced is absurd; this is the equivalent of abandonment of the low bands because service areas would be reduced."

Which of course was exactly what the UHF proponents had in mind. They were losing network affiliation because they did not have or could not obtain circulation in sets. Without programming, they could not compete with big network quality programs; it was a vicious circle that the networks were completely in control of.

In the early fall of 1954 the Commission sanctioned two measures which they hoped would help ease the UHF pain. In historical perspective, it was about as effective as chasing an elephant with a fly swatter:

- (1) The 10% excise tax on television receivers was modified to allow a \$7 discount to the buyer when he bought a receiver equipped to receive both VHF and UHF. On a \$500 receiver, 10% was \$50, while \$7 was

1.4%. Senator Potter had *originally asked* that the full 10% excise tax be eliminated on all VHF-UHF tuning receivers.

- (2) The FCC authorized TV stations to set up satellite stations, programming as relays the programs of the mother station. *This was not restricted to UHF stations*, however, but was authorized for any stations.

The \$7 discount was of *no importance to anyone*; not when combination tuning sets sold for up to \$60 more than VHF-only sets. The authorization for VHF stations as well as UHF stations to operate satellites was the cause for a new cry of "foul" from the beleaguered UHF broadcasters. Many feared, and rightfully so as it turned out in places like Lufkin, Texas, that the new satellites would improve VHF signals even further out from the origination transmitters and *further encroach into UHF regions*.

The early hearings, first held in 1954, paved the way for a more comprehensive array of hearings in 1955. Named to head the inquiry was former FCC Commissioner Robert Jones and former FCC General Counsellor Harry Plotkin. Plotkin was to represent the Democratic minority of the Senate Interstate and Foreign Commerce Committee. One of the areas the committee would consider was "an investigation into industry licensing among transmitter and receiver manufacturers." This had been a pet project of Jones's when he was a Commissioner, but it had been shelved when it was discovered the Commission did not have the statutory authority to regulate in that area. Some time later the matter found its way over to the Justice Department, but it was eventually dropped at Justice also.

Another name that TV and CATV would learn well came along about that time: Nicholas Zapple would serve as a "communications expert" in the gath-



ering of data and a comprehensive report, which he would make directly to the full committee in January of 1955.

It might be well to stop our study right here for a short time and report on *some of the stations* which began operation after the freeze lifted but which had *already gone off the air* by January of 1955. The impact is in both their numbers and their locations:

KITO-TV, channel 18, San Bernadino, Calif.; WTAC-TV, channel 16, Flint, Mich.; KACY-TV, channel 14, Festus-St. Louis, Mo.; WKLO-TV, channel 21, Louisville, Ky.; WFPG-TV, channel 46, Atlantic City, N.J.; WACH-TV, channel 33, Newport News, Va.; WKAB-TV, channel 48, Mobile, Ala.; WCOC-TV, channel 30, Meridian, Miss.; KSTM-TV, channel 36, St. Louis, Mo.; WCHA-TV, channel 46, Chambersburg, Pa.; KBID-TV, channel 53, Fresno, Calif.; WRAY-TV, channel 52, Princeton, Ind.; KFAZ-TV, channel 43, Monroe, La.; WBKZ-TV, channel 64, Battle Creek, Mich.; WFTV, channel 38, Duluth, Minn.; WDEB-TV, channel 59, Buffalo, N.Y.; KNUZ-TV, channel 39, Houston, Tex.; WTOV-TV, channel 27, Norfolk, Va.; WKJF-TV, channel 53, Pittsburgh, Pa.; WECT-TV, channel 18, Elmira, N.Y.; KUSC-TV, channel 28, Los Angeles, Calif.; WLBR-TV, channel 15, Lebanon, Pa.; KCEB-TV, channel 23, Tulsa, Okla.; WNMA-TV, channel 42, Neenah, Wis.; WPFA-TV, channel 15, Pensacola, Fla.; WTVE-TV, channel 24, Elmira, N.Y.; WTRI-TV, channel 35, New York, N.Y.; KMPT-TV, channel 19, Oklahoma City, Okla.; WBTM-TV, channel 24, Danville, Va.; WKNA-TV, channel 46, Charleston, W. Va.; and WCAN-TV, channel 25, Milwaukee, Wis.

This list is *by no means complete*; the total list is quite a bit more extensive. Keep in mind, however, this was *only through* late December 1954 and that many more UHF stations would leave the airwaves in the ensuing balance of the 50's and beyond.

Again, the calculated (estimated and closely computed) total losses to the American public is in excess of \$300,000,000 for the period.

As the Senate probe progressed, Senator Warren G. Magnuson told the gathering:

"The Plotkin Memo accuses the industry and the federal agency (FCC) for a lack of initiative and progressive thinking."

The Plotkin Memo *could* have been a turning point in the FCC's supreme rein of control over all facets of television broadcasting. It was not—for apparent political reasons—pursued as it should have been (see separate report coming in April CATJ). The Plotkin Memo represented the Democratic faction on the Senate committee. Former Commissioner Robert Jones, representing the Republican majority on the Committee, said:

"It does not appear practical that the television industry and the public (note the order he placed them in!) would accept any plan to drop VHF. Many of the past actions of the Commission, however, have served to accentuate rather than minimize the operational difficulties of the UHF stations facing VHF competition. The pending (FCC) proposal to double maximum antenna heights, to 2,000 feet, will further lessen the chances for successful UHF operation. An increase in transmitting antenna height of this magnitude would substantially increase the size of the VHF service area and act as a halter to the successful operation of UHF stations. The future of the UHF stations lies in economics. The allocation problem is the core of the problem. Many VHF operators simply had too much time to build up their systems and as a result promote the purchase of too many millions of VHF-only receivers. And even after the freeze ended, the only transmitting equipment available to UHF was low-power transmitting equipment (less than 5% of the maximum powers then authorized—Ed.), and so the march to VHF continued. No amount of wishful thinking or executive fiat will remove these differences, until there is adequate circulation of UHF receivers."

Former Commissioner Jones also found fault with the FCC's VHF allocation program, noting:

"During the freeze much expertise was directed at obtaining proper spacings between VHF stations so that they could derive maximum set circulation in their fringe areas. Co-channel spacings and adjacent channel spacings were carefully calculated so that sig-



nals would penetrate to their furthest extremes. This was based upon the assumption of maximum powers and maximum antenna heights for VHF, something that has been attained by many VHF stations. Thus the VHF stations operate at maximum coverage capacity while the UHF stations, because of a lack of adequate power transmitting equipment, operate at 5% or less of coverage capacity."

### The Chill of 1955

Freeze was an ugly word. So the Commission announced a "chill," having heard, in the Senate hearing chambers, all of those not very complimentary things being said about their abilities and past actions.

The plan called for a "stop" (or freeze if you will) on the granting of *any new VHF channels* in areas *within 50 miles of a community where UHF operation has been authorized*. At the same time, the Commission announced it would not act on any pending applications that fell within 50 miles of a UHF community, including applications for power or tower height increases in those areas.

The Commission also began to talk about "UHF islands," secure regions where UHF stations would operate without any VHF stations inside of the islands.

At that time, the Commission reported, 5,000,000 of the 35,000,000 TV receivers in the country were capable of UHF reception; and 20% of the annual (1955) output of 5.8 million receivers would be factory equipped for UHF.

Later in the spring the Commission would announce its plans to de-intermix (i.e. create UHF-only service) for the cities of Evansville, Ind., Peoria, Ill., Hartford, Conn., and Madison, Wis. All four areas had each been assigned a single VHF channel, and each had two or more UHF channels allocated. *Twenty years later*, it is interesting to note that Evansville, Hart-

ford and Madison *still have* one VHF channel and two or more UHF channels each; only Peoria became a UHF island. In the other three markets, the VHF stations, through their national trade association, their Senators, Congressmen, and state officials, were able to bring sufficient pressure to bear on the FCC that it eventually *dropped* the de-intermixture program.

And the stations continued to go off the air. A few of the new dropouts included KTVU-TV, channel 36, St. Louis, Mo.; WTVI-TV, channel 54, Belleville, Ill.; KGTV, channel 17, Des Moines, Iowa; WLAM-TV, channel 17, Lewiston, Me.; WRTV, channel 58, Asbury Park, N.J.; and WFMZ, channel 67, Allentown, Pa. For these stations and their viewers, de-intermixture and Plotkin Memos were of little comfort.

As the FCC tried hard to look busy, it began to grind out more flags for raising. One of the popular creations in the early summer of 1955 was a plan which the FCC conceived to *make the transmitter and receiver manufacturers responsible* for the ills of UHF. The FCC toured the country talking it up, and these remarks by Commissioner George C. McConnaughey were typical:

"The Commission feels strongly about the advent of super power for UHF telecasters. We have instructed the FCC staff to initiate rule-making proceedings designed to step up the maximum legal power for UHF stations to 5,000,000 watts. We are also looking into how UHF receivers can be made more sensitive. We want to equalize the comparative coverage of VHF and UHF stations."

Somehow that all seems *pretty dumb* twenty years later; sure UHF stations suffered coverage problems, and sure UHF receivers were pretty bad, when compared to VHF receivers. But the *biggest* problem facing UHF broadcasters was not their coverage; it was the fact that *they couldn't obtain network affiliations* or programs which people wanted to watch. All of the coverage in the world wouldn't attract

viewers, as the New England station found out when it offered \$1,000 to *ANYONE* who would call the station; all evening long, *and nobody called.*

The Senate Interstate and Foreign Commerce Committee hearings were scheduled to start anew in the fall of 1955 but were put off until after the first of 1956. Senator Magnuson said:

"I just cannot round up enough members of the committee to sit as a hearing this fall. I am also afraid that the FCC's tabling of their program to investigate and start selective de-intermixture of VHF and UHF operations has soured some members of this Committee who want to see how that goes before we reconvene these hearings."

With the hearings canceled, there was also another failure. Sidney Davis, the counsellor for the group, resigned shortly after he announced that the Committee should immediately begin hearings into network practices (see special report in April CATJ). He resigned for reasons of "ill health," but many were *certain* he resigned because ranking Republican members of the Committee *did not want him looking into* hush-hush network operations.

Without any hearings going on and the FCC "chilling new VHF" and "tabling de-intermixture," *the radical plans came back.*

Commissioner Robert E. Lee wanted all of the UHF channels scrapped and the VHF channels expanded above channel 13 (like the original allocation table that had channels 1-19 before World War II).

Commissioner Doerfer wanted *all* television operation in Los Angeles, New York, and Chicago placed on UHF.

A Washington consultant liked another plan. He said that at least 200 more low-power channel 2-13 stations could be "dropped in" those 100 communities where VHF already had a good foothold, "through a liberalization of mileage separation standards now practiced."

Nobody took him seriously enough at the time to even point out to him that 200 high-power VHF stations *would have the same commercial problems* as 200 low-power UHF stations; if they could *not* compete for area coverage with the established V's in the area, they would *not* get network affiliation and would fold up and go off the air also.

Commissioner Robert E. Lee didn't give up so easily however. He came back the next month with a plan to scrap UHF ("*It isn't going anywhere anyhow,*" he would say) and expand the VHF range from 174-216 MHz (channels 7-13) to 174-342 MHz (adding 21 new VHF channels). Lee suggested that the Commission "simply move all of the existing users of that frequency range (made up of the military, thousands of two-way radio users, and virtually all of the important air navigation frequencies for commercial use) to the UHF TV band." The plan never flew, although Lee kept the flag flying for a couple of years.

In the meantime many additional UHF stations left the air, among them: WQXI-TV, channel 36, Atlanta, Ga.; WNEX-TV, channel 47, Macon, Ga.; WEEU-TV, channel 33, Reading, Pa.; WNET-TV, channel 16, Providence, R.I. The number of UHF stations then on the air, in this period, was actually going down month by month as more stations left the air then came on new to replace them.

Just to muddy the water, CBS, which was rapidly becoming known in official Washington circles as "*the spoiler*," hired a "consultant" who delivered his own glad tidings of the *future* of television. He said:

"The forecast that within five years of the TV freeze lift at least 2,000 television stations would be operating in the United States was wrong. There is a ceiling of 600 stations, give or take 50, for this country. These 600 stations will take care of the television viewing needs of 95-97% of the families throughout the country, without broadcasting satellites. With the use of station-operated satel-

lite stations, this number can be pushed to 100% of the families in the nation. I expect that two-thirds of the 1,800 channels set aside by the Commission in 1952 will go unused, or they will be used only for short periods of time by stations which will face bleak futures.

The maximum number of 600 (commercial, not ETV) stations was arrived at by estimating the coverage of VHF stations (he completely ignored UHF as a failure) at 50-75 miles. Larger radii of coverage (i.e. larger than 50-75 miles) would lead to fewer economically supportable stations to cover a given area, while shorter radii reduce the number of market centers which can support a station. That is, many market centers which can support a station with a 50-mile radius of service can no longer support a station when the radius is drawn in to 25 miles."

It made the best sense in the world, and had the Commission bought this thesis *even as late as 1956*, or even understood it, at that time the nation's TV coverage problems could have been vastly eased with a slightly revamped *VHF-only* allocations program. But alas, the Commission was still counting forests, and the trees were just not that interesting. However, today, twenty years hence, with a *virtually saturated TV station* situation nationwide, there are just 700 *commercial* VHF and UHF outlets in the country, some of which *are* satellites. Allowing for the national growth in the interim twenty years, the CBS consultant was not very far off!

Under heavy attack, the Commission sent out a "Gee, Look What a Good Job We Have Done" announcement. It reported that "many of the objectives of the 1952 allocations order have been met; over 90% of the population can now receive a degree of service from at least one television station, and approximately 75% can receive some service from two or more stations. At least 275 communities have one station operating, and 112 of these have two or more stations operating."

When the delayed Senate hearings began once again after the first of the year in 1956, Senator Pastore laid down the law for the Commissioners present:

"We have got to act fast and get the allocation situation really straightened out."

To which the Commissioners reported on their plans for de-intermixture, and they talked of a *new* plan. This one was called "translators," which the Commission explained would operate unattended to extend the coverage areas of television stations by rebroadcasting the direct received signal into a community or valley on a UHF channel (70-83). "*Such stations would not locally originate any programming; they would merely serve as relays for the parent station,*" it was reported.

Some of the Senate Committee members were not very impressed, and they announced that the FCC needed some help from an outside group. Accordingly, an ad-hoc committee of 12 was formed to look into a "competitive-to-the-FCC allocations plan." Among those serving on the ad-hoc group would be William S. Duttera, Chief of Staff Allocations at NBC; Dr. Allen B. DuMont of DuMont; Frank Marx, Vice President of Engineering for ABC; Curtis B. Plummer, Chief of the FCC Broadcast Bureau; Ralph Harmon, Westinghouse Engineering Vice President; T.A.M. Craven, Washington consultant, former FCC Chief Engineer and former FCC Commissioner; and CBS Vice President William S. Lodge.

Strangely how, twenty years hence, the cards look stacked against the viewer and the UHF operator!

RCA announced an interesting self-help proposition in the spring of 1956. They said:

"If the Congress will exempt all-channel (i.e. channels 2-83) color sets from the excise tax, we will take appropriate steps to provide

for the production of only all-channel color receivers as soon as practicable."

By early summer of 1956 *even the Commission* was looking at some far-out, radical plans. It was announced (here comes the flag) that they were considering moving *all* stations to UHF from a line drawn between Chicago and New Orleans-east. In effect, the east would be all UHF, and the west would be primarily all VHF.

The flag stayed up until early fall, when it came down never to be heard from again.

When the *all-UHF east* didn't fly, the FCC decided *once and for all* to blame the mess on the receiver and transmitter manufacturers. It came out and asked the industry to "expedite" its research-and-development plans to implement more-sensitive receivers and more-powerful transmitters.

And one month after the FCC abandoned the *all-UHF-east* program, the Senate Commerce Committee showed that *it was up to date* when it approved of the FCC's (earlier) plan to shift all TV to UHF, or a substantial part of television to UHF, *as the Commission saw fit*.

And so the cycle had gone the almost full circle. The Senate was *through*; Interstate and Foreign Commerce had

appointed a 12-man committee to *look* into the problem, and Commerce had given the FCC the green light to shift everyone or most everyone to UHF.

The Commission *itself had decided* to put the blame on industry receiver and transmitter manufacturers. FCC Chairman George C. McConaughy told a broadcaster group:

"The present plan and goal offers the best hope on the horizon for facilitating the expression of this nation's TV service. As a citizen of a country which can send aircraft hurtling through the air at speeds approaching 2,000 miles per hour, how can I doubt the capability of the engineers of this industry to surmount the obstacles which until now have impeded progress in the utilization of the UHF portion of the spectrum for effective TV broadcasting?"

Even the fiery Plotkin Memo that started people thinking about the network influence on the eventual success of the TV allocations program died, although it went out with something of a bang. Senator John W. Bricker, former chairman of the Senate Interstate and Foreign commerce Committee, wrote "*The Network's Monopoly*," in which he said:

"The FCC must be authorized to regulate the networks, because the two major networks exercise a stranglehold over the entire industry. This is a yoke of economic dominance which must be broken..."

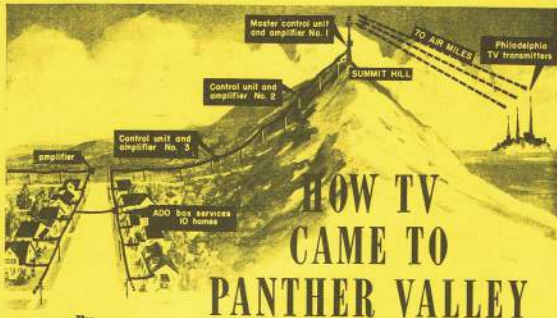
#### MEANWHILE — CATV FILLED IN THE HOLES

While Washington was *trying* to duck the issues, individual entrepreneurs in towns such as Lansford, Pa. were finding innovative ways on their own to make television service available to their communities.

One of the earliest systems, in Lansford, was described in considerable detail in the March 1951 issue of *Radio-TV News*. From this single magazine article, dozens of CATV systems would germinate across the country as *Radio-TV News* readers applied the science of Lansford to their own particular situations.

This article, reprinted here (see Page 52) with the permission of Ziff-Davis Publishing Company, describes a basic CATV system **not** dis-similar to those operating in hundreds of communities today. Yes, our equipment is now largely solid state; and yes, we employ more sophisticated aluminum cables and feeder distribution systems; but the **basic premise** and the basic approach followed by pioneer Bob Tarlton and his associates in 1950 still apply, and are still being emulated 25 years later. Tarlton's Lansford system was a pioneer system for a **brand new industry**.





By  
**E. D. LUCAS, JR.**  
Philco Corporation

***A detailed report on America's first community aerial system—how five men of initiative brought television to what was once an isolated TV area.***

**T**HIS is the story of how communities beyond the fringe of television reception now receive clear, strong television signals from transmitters 75 to 125 airline miles away. It is the exciting story of the first "community aerial"—telling how a single master TV antenna system can serve an entire city, just as one master aerial brings television reception to all the tenants of a large apartment building.

The community aerial is a particularly important new development because of the "freeze" on new TV station construction. This freeze is now in its third year and likely to continue for some time in view of the national emergency. Meanwhile, with the community aerial, a new pattern has been established for widely expanding television coverage from existing stations—for bringing television to hundreds of towns now blind spots on the TV map.

In this article, we present a detailed case history of a typical community aerial system in a typical town. Lansford, Pa., in the heart of Panther Valley, is a coal-mining community of 10,000 persons and until recently was "beyond the fringe" of television reception for two reasons: distance, about 75 airline miles northwest of the nearest TV stations in Philadelphia; and location in a valley, blocked off

from these stations by the Blue Mountains.

This case history of how good television reception has come to Panther Valley tells of the initiative of a group of small-town businessmen, four radio dealers and a lawyer, and how they have solved the variety of problems, technical, legal, political, financial, which confronted them in building a community aerial system. Such information has already proved useful to other towns planning their own community aerials and will, we hope, be helpful to many other communities now TV-blind. For here is the story of how television can reach new audiences by the million, just as television has come to Panther Valley.

#### **The Problem of Panther Valley**

There was no television in Panther Valley a few months ago. This is easily understood if you glance at a map, which shows the towns of Mauch Chunk, Nesquehoning, Lansford, Coal-dale and Tamaqua, strung along the valley on a line roughly from northeast to southwest in the hard-coal region of east-central Pennsylvania, some 75 airline miles northwest of Philadelphia and about 33 miles south of Scranton.

Between Panther Valley and the three television stations in Philadelphia are interposed, as mentioned

before, both distance and the formidable bulk of the Blue Mountains—a range of the Appalachians that has effectively blocked off the valleys behind it from TV reception.

What made the 45,000 people living in these towns in Panther Valley feel especially irritated was that their neighbors, up on the hills a short distance to the east, could put up antennas and receive television programs from the three Philadelphia transmitters: WPTZ (Channel 3); WFIL-TV (Channel 6); and WCAU-TV (Channel 10).

For instance, at Summit Hill, a village less than a mile up the mountain from the much larger town of Lansford, the people on the hill could enjoy television. Their much more numerous neighbors down in Panther Valley felt as if nature—and television—had discriminated against them. As Mayor Evan H. Whildin of Lansford expressed it, "The signals used to go right over our heads."

The radio dealers of Lansford were doubly irked about this situation. They couldn't watch television and, even worse, they couldn't sell TV sets in the valley. So they decided to do something about it.

One of these dealers, Robert J. Tarlton, remembered reading about master antenna systems for apartments, hotels and other multiple-set installations. Tarlton went into a huddle with the other three radio and appliance dealers in Lansford, William McDonald, Rudolph Dubosky, and George Bright, vice-president of *Bright's Stores, Inc.*, leading department store in Panther Valley. The group agreed

idea was as simple as that. But would it work?

To test their theory, they took their truck with its extensible antenna tower, the amplifier and distribution units, and several hundred feet of RG-11U cable up to Summit Hill. They connected all this equipment together, looping the cable around over the ground—merely to get the right length for a run downhill to Lansford—finally hooking up a TV receiver to the cable end furthest away from the antenna on the truck. It worked! Even this crude test proved they could bring television reception down the mountain from Summit Hill to Lansford.

Now they were ready to go ahead with their pioneer community aerial, using the plan shown in Figs. 1 and 4.

#### Construction of a Community Aerial

After completing their tests on Summit Hill last September, the four Lansford dealers realized that they needed a business organization to bring television down the hill to Panther Valley. So they enlisted a fifth associate, William Z. Scott, leading local attorney and a member of the Pennsylvania State Assembly, who could help solve both the legal and political problems.



Fig. 2. The five founders of Panther Valley Television Company, Inc. From left to right: Rudolph Dubosky, George Bright, William Z. Scott, Robert E. Tashiro, and William McDonald. Scott is a state assemblyman and the others are Lansford TV dealers.

Fig. 2. Lansford's "community aerial" is located on Summit Hill atop this 85 foot tower. Three separate double-stacked yagi antennas are oriented to pickup Channels 3, 6, and 10 from Philadelphia. The MC-1 master control and amplifier unit may be seen about halfway down the antenna mast, to do some experimenting. They got a truck with an antenna that could be extended to a height of about 40 feet. They also bought some equipment, including master control and amplifier units, distribution outlets, and several hundred feet of cable.

Their plan was to erect a tower at Summit Hill, where they knew they could get clear signals from the three Philadelphia stations. From the tower they would amplify the signals and "pipe" them downhill by cable to outlets in the town of Lansford. The basic

With his help, they named their enterprise Panther Valley Television Company, Inc., and incorporated it under the laws of the Commonwealth of Pennsylvania. Tarlton was elected president; Bright and McDonald, vice-presidents; Scott, secretary; and Dubosky, treasurer. See Fig. 3.

Each of the five officers of the company—which everyone now calls "PV-TV"—provided \$500 as his share of the capital. To this \$2500, they added \$10,000 which they borrowed from a local bank.

#### The Antenna Tower

First project for the "PV-TV" group was constructing an antenna tower on a site they obtained at Summit Hill. They were fortunate in finding a location where electric power was readily available, near the poles of the local

power company leading down the hill to the town of Lansford.

They consulted with engineers and learned that it would be desirable to have a separate high-gain antenna for each of the three television channels they planned to receive, Channels 3, 6, and 10 from Philadelphia. At first they planned to stack the three antennas, one above the other, on a mast at the top of the tower. But then they realized it would be almost impossible to service the topmost antenna on a slim mast above an 80-foot tower, particularly since this tower is on the summit of an extremely windy hill.

The final design of the tower is shown in Fig. 2. Above the top of the tower is the central mast topped by a double-stacked yagi antenna for Channel 10, a high-gain antenna that picks up WCAU-TV in Philadelphia about 75 miles away.

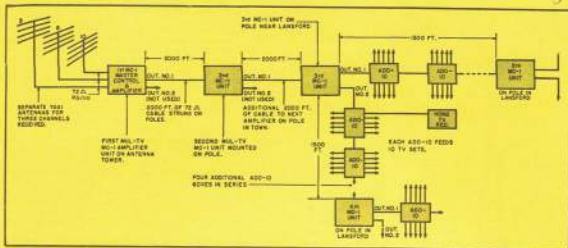
Below this central mast is a sturdy, all-welded cross-member at each end of which is mounted a double-stacked yagi antenna, one for Channel 3 (WPTZ) and one for Channel 6 (WFIL-TV). This welded girder across the top of the tower is supported by bars attached to the tower and bracing it, as well as by guy wires to the ground which prevent the wind from twisting

this cross-member and thus converting the whole tower into a giant pretzel. Such careful engineering is important in designing a tower for any exposed and windy location, naturally. The antenna tower of "PV-TV" is so well designed that when a hurricane struck the area last November, as George Bright says: "We didn't have a nickel's worth of damage!"

#### The Amplifier System

All of the equipment used in setting up Panther Valley's "community aerial" was designed and built by Jerrold Electronics Corporation of Philadelphia with Philco Corporation engineers serving as consultants.

In a multiple-television system, as installed in apartment houses and other buildings, a separate antenna is used for each channel to be received.



as noted before. From each antenna, a cable leads to a master control and amplifier unit, the MC-1, shown in Fig. 6.

It is important that the cables from the antennas to this amplifier unit be as short as possible, because each foot of cable introduces additional loss and thus weakens the signal. Hence in an apartment building, the master control and amplifier unit is usually installed in a shelter on the roof, or right under the roof, as near the antennas as possible.

Following the same practice, the PV-TV group installed their first MC-1 master unit right on the antenna tower, as shown in Fig. 2, so that the signals from Philadelphia would be amplified right after leaving the antenna.

A word about the MC-1 unit is desirable. This unit has separate 6-tube amplifier strips for each channel, achieving two important advantages:

1. The signal is amplified transiently with a gain of up to 500 times

In other words, the MC-1 is a super-booster. In addition, a new technique is being developed to utilize a pre-amplifier unit between the antenna and the amplifier unit. The pre-amplifier makes it possible to utilize signals as low as 100 microvolts to achieve an output voltage from the master control and amplifier unit of 0.7 volt. This means an over-all gain of as much as 7000. Certain other new developments in amplifier design and usage are also under way, and being tested by the equipment engineers at the

"PV-TV" installation, which will further increase the efficiency of amplifier performance.

2. Because each channel amplifier strip in the MC-1 unit is tuned for that particular channel, there is good rejection of extraneous noise and interference. This means a clear signal as well as a strong signal after leaving the amplifier.

The MC-1 unit also includes a mixing circuit at the output, so that signals from all channels go out from this unit on a single cable. Hence it is pos-



Fig. 5. A view of Panther Valley from Summit Hill. In the foreground are the poles of the Pennsylvania Power & Light Co. which are used to carry the television cables into Lunenburg. Prior to the installation of the "community aerial," the surrounding ridges of the Blue Mountains cut off the effective reception of video signals.



Fig. 2. A "TV-IV" technician adjusts a new MC-1 master control and amplifier unit before installation. The unit amplifies each channel separately and then mixes the amplified television signals in the output to system's distribution boxes.



Fig. 7. Lineman completes wiring of ADO-10 box during the installation. Each antenna distribution box feeds 10 connections and the units can be connected in series to feed an almost unlimited number of receivers.

sible to mix the signals from the three Philadelphia channels and send them down the mountain from Summit Hill to Lansford on a single cable, instead of three cables.

After some experimenting, "PV-TV" has found that one MC-1 unit will amplify the signals enough to "push" them through the cable for about 2000 feet between amplifier units, on the average. Where there are distribution outlets between the amplifiers, as in the town of Lansford as indicated in Fig. 4, then the length of cable between MC-1 units should not exceed about 1500 feet. However, as indicated before, new technical developments and improvements in the system are being made so rapidly that, in the near fu-

ture, much longer runs of cable between amplifier units will probably be possible.

At present, the pioneers of "PV-TV" are using five MC-1 units to bring strong, clear television signals from Summit Hill into various parts of Lansford. Actually, each MC-1 provides two outlets, each with a composite or mixed signal from all the TV stations received. Thus in Lansford it is now possible to run the signal 1500 feet in two directions from a single MC-1 unit, as shown in Fig. 4.

"PV-TV" is using RG/11U coaxial cable, a standard 72-ohm cable used for many television and other electronic applications. This cable is used with standard Jersold fittings and connectors throughout the community aerial system, from the tower on Summit Hill to the homes, stores and clubs in Lansford where "PV-TV" outlets are provided. Note the cable strung downhill to Lansford on power company poles, shown in Fig. 5.

One important fact should be noted. "PV-TV" binds all its RG/11U television cable to steel messenger cable to provide added strength and support. This practice of "messengering" TV cable conforms with typical telephone company practice, and is essential for a truly permanent installation. Standard telephone company equipment is used for binding the RG/11U to the steel messenger cable.

Installations of cable, MC-1 master control and amplifier units, and distribution outlets are all made by experienced line crews of the leading local coal company, the Lehigh Navigation Coal Company. These coal company electricians work in their spare time, and string cable on poles of the local power and telephone utilities. All work complies with safety regulations and meets the utility companies' standards.

Just as in apartment-house master

antenna systems, it is important with a "community aerial" to have soundly engineered distribution outlets to individual television sets, in addition to the right kind of antennas and amplifiers.

For instance, in Panther Valley a distribution unit called an ADO-10 is used. This unit taps off the main line from the master control and amplifier units, and feeds 10 television receivers. The advantages of using this ADO-10 unit over other methods of distribution are:

1. There is real isolation between neighboring television sets. There is no interference between receivers, even if the sets are placed side by side and tuned to different channels, because the ADO-10 has a separate tube (a plate-loaded pentode) to feed each receiver and electronically decouples it from adjoining sets.

2. You can feed any number of receivers from 1 to 10 with a single ADO-10 unit, and then continue to another ADO-10 to feed 10 more sets, and so on, until you reach a distance of about 1500 feet from the nearest MC-1 amplifier unit. Then you have to insert another amplifier unit, and "pump up" the signal again. This is shown in Fig. 4.

Fig. 7 shows a lineman from a "PV-TV" crew installing an ADO-10 unit on a pole, prior to tapping off ten leads to ten homes in Lansford.

#### Legal and Political Problems

The pioneers of Panther Valley Television Company, Inc. have had to settle a number of problems, both legal and political, which were unique because this is the first community aerial on a major scale.

First, they found that they could use poles of three utility companies serving Panther Valley, including the Pennsylvania Power & Light Company, the Bell Telephone Company of Pennsylvania, and a local independent telephone company, the Carbon Telephone Company. Fortunately, the power company's poles down the mountain from Summit Hill to Lansford could be used. Then in the town the poles of all three utilities proved useful for stringing television cables, and for mounting MC-1 master amplifier and control units and ADO-10 distribution boxes where needed.

However, shortly after the first installations in Lansford so much interest was aroused in neighboring communities that the utilities realized the importance of establishing formal contracts and engineering standards for their part in this development. For a few weeks, the work of "PV-TV" in connecting new subscribers for television was halted until engineering standards and rental contracts with the three utilities could be completed. Since this has been done, "PV-TV" has been able to proceed rapidly with connecting new subscribers on a clearly defined legal and technical basis, using the utilities' facilities as required.

Fig. 8. Wiring on ADO-10 antenna distribution box for use in the Panther Valley "community aerial" system. Signals from Philadelphia's three television stations, seventy-nine miles away, are being received in Lansford, Pa. clearly and cleanly.





A second important consideration was to clear the operations of "PV-TV" with the Pennsylvania Utility Commission. Here the services of Scott, as a State assemblyman and attorney, proved invaluable. It was determined that Panther Valley Television Company is not a public utility but rather a service company. This precedent is highly important for others planning to establish similar community aerial programs in other areas.

Another essential precedent was set when the Federal Communications Commission was informed of the "PV-TV" operation. The FCC decided that no license was necessary, because the signal is merely amplified and distributed, and there is no broadcasting or transmitting involved.

### Financial Organization and Growth

As noted previously, the five founders of "PV-TV" each contributed \$500 for a total of \$2500, and supplemented this capital with a loan of \$10,000.

At first, the "PV-TV" group planned a non-profit corporation, to supply television reception to the community at cost, and make their profit from the sale of television sets. But when they approached their bank for a loan, the bankers insisted on a regular corporation which would attempt to make profits before approving the loan. All concerned are now glad that this arrangement was made.

Expenses of Panther Valley Television Company, Inc., were heavy for the initial installations, of course, including relatively large outlays for the erection of the tower, purchase and installation of amplifiers, cables and distribution outlets, promotional and legal costs, and all the other expenses of starting in business. Also a considerable supply of additional material, including extra MC-1 and ADO-10 units and cable, has been purchased to take care of the many additional outlets planned in Lansford, as well as an extension of the system to the neighboring town of Coaldale.

When this was written, a total of about 100 subscribers had been connected to the "PV-TV" community aerial. Rates have been established as follows:

1. Residential: \$100 for the original installation, and \$25 for each additional outlet. Service charge is \$3 a month for one outlet; \$1.50 per month for each additional outlet.

2. Commercial (defined as any place of business): \$100 for first outlet, and \$25 for each additional outlet. Service charge is \$3 a month for one outlet; \$2.50 a month for each additional outlet.

Thus a total of about \$10,000 in connection fees has been collected, and monthly service contracts obtained from 100 subscribers. In the same period, a total of about \$15,000 has been spent by "PV-TV" to establish their community aerial system.

"PV-TV" has surveyed the community and has established a reasonable potential of 750 subscribers at the end of six months. This will mean a revenue for installations of \$75,000 and a monthly service income of around

\$2500, including residential and commercial contracts. These estimates are based on serving about one-third of the homes in Lansford, and seem conservative on the basis of the tremendous enthusiasm for television in Panther Valley.

To connect 750 subscribers will require a further outlay of about \$15,000, or a total of about \$30,000, according to estimates by officers of "PV-TV." Because the installations are being made by experienced line crews, using the best and most durable equipment, total service and maintenance expense can be expected to run well under \$1000 a month.

Obviously, even after allowing an ample sum for depreciation and to extend the "PV-TV" system further, the company will make a handsome profit.

It should be explained here that the founders of Panther Valley Television Company have already surveyed the adjoining town of Coaldale, the city limits of which are only 1/4 mile east of Lansford. With this town so close, it is planned to use the same tower on Summit Hill and merely extend the Lansford cable to serve Coaldale. This will add a potential of many hundreds of additional subscribers, without much additional capital expense.

The "PV-TV" group has also been approached by the other towns in Panther Valley, including Tamaqua, Nesquehoning and Mauch Chunk. Plans are now being made by "PV-TV" to construct community aerial systems for these towns, using the knowledge gained from the Lansford installations in tackling the job.

### Service and Maintenance

Careful arrangements have been made by "PV-TV" to handle all service and maintenance problems on a 24-hour basis, seven days a week. Practically, of course, most calls for service will come in the period from 4 p.m. to midnight.

At the company's headquarters, 132 W. Ridge St., Lansford, a crew of trained service technicians is on duty at all times. In this office is a huge enlarged street map of the town, with the locations and telephone numbers of all subscribers clearly marked on it. If a call for service comes in, the source of the trouble can be isolated in a matter of minutes by a few telephone calls to subscribers on either side of the one who complained. If the subscribers on both sides of the complaining one are getting good reception, then the complainant is told his TV set is probably at fault and to call his dealer for service.

However, when the "PV-TV" service technician goes out, he takes with him test equipment, spare units and parts, and a portable TV receiver in good condition. There have been very few calls for service to date, and most of them have been caused by failures in the subscriber's own television set.

### Towns with a Community Aerial

Since the success of Panther Valley's community aerial became known, other towns in Pennsylvania have already proceeded with a similar operation.

Mahanoy City, Pa., is 15 miles west of Lansford and about 90 air miles from Philadelphia. There the antenna tower is on a hill three miles from the city, and several additional MC-1 units are used to amplify and re-amplify the signals so as to provide clear reception from all three Philadelphia stations. George Koval, a leading automobile dealer, and Emmanuel Liadrakis, a radio and appliance dealer, are two of the six principals in this operating company, known as City Television Corporation. Here the rates are \$125 for the first outlet, with the monthly service fee \$3.50.

Honesdale, Pa., is about 30 miles northeast of Scranton and about 80 air miles from New York, 130 miles from Philadelphia. There a system installed by a local company organized by Kenneth A. Chapman, appliance dealer, is bringing in clear reception to Honesdale residents on Channels 2, 4, and 5 from New York, Channel 3 from Philadelphia, and Channel 12 from Binghamton, N. Y.

On the West Coast, similar activity is under way. Although "PV-TV" was the first master antenna system organized to bring in reception from several stations for a whole community, the same equipment has been used for a year by Ed Parsons of Radio & Electronics Company in Astoria, Oregon, nearly 100 miles southwest of station KING-TV (Channel 5) in Seattle, to bring reception from this station to Astoria, at the mouth of the Columbia River.

Bellingham, Wash., a lumber center about 75 miles north of Seattle, is another city now being served by similar equipment in a community aerial system.

Palm Springs, Cal.; Logan, Utah; Salisbury, Md.; Olean, N. Y.; Wilkes-Barre, Scranton and Pottsville, Pa., and many other cities and towns "beyond the fringe" are now being surveyed for a similar lifting of the TV veil.

### New Developments

Jervolt is now developing special equipment to make the installation and operation of a community aerial system much more efficient and economical. Here are typical new developments:

1. At the antenna tower, instead of an MC-1 master control and amplifier unit, there will be a preamplifier, converter, and new amplifier and mixer unit. The preamplifier will make it possible to utilize much weaker signals and obtain much greater total gain, as previously mentioned. The converter will convert any high-band channel (for example, Channel 10) to an unused low-band channel (say, Channel 2) and thus make possible greater gain in the amplifier and lower loss in the cable. The new amplifier, similar to the MC-1 unit, will provide separate channel amplifiers for each channel and assure even higher gain and better noise rejection.

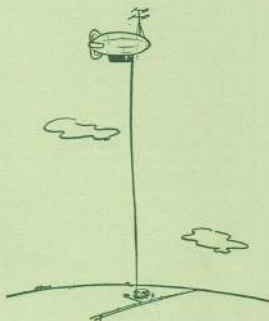
2. New distribution boxes are being designed which introduce practically no attenuation of signal between amplifier and receiver, and thus the only

Con't. on Page 58

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GUESSING GAME — can you guess which famous CATV entrepreneur sat through an NCTA Board meeting in 1964 and listened to a report from the NCTA Research Council of **their plans** to change "community" to "broad-band cable", and drew the cartoon-sketch at the right on his yellow legal pad? (Answer next month!)



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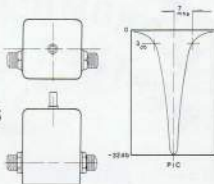
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Con't. from Page 56

effective losses are in the cable. This will make it possible to install, in the community served, a new distribution box beside each amplifier and then run 900 to 1000 feet of cable from this box, tapping off a much larger number of receivers. Thus the number of distribution boxes, will be greatly reduced.

3. A new isolation network has been designed for insertion in the cable at the point where you tap off for each receiver. This is a very small, efficient, and inexpensive component.

4. With this new amplifying and distribution equipment, it is possible to use RG/59U cable for practically all

runs, instead of the RG/11U now used in Panther Valley. This will mean a saving in cable cost of about 60%.

#### The Potential

The potential of the community aerial is truly tremendous. Every city and town now beyond the fringe of television reception, either because of distance or intervening mountains, or both, now stands a chance of getting good TV signals from a master antenna system. For the town in a valley, there is probably a hilltop near enough, a hilltop where distant stations can be received as in the case of Summit Hill and its antenna tower

serving Lansford. For the town out on a wide, flat prairie with no convenient hill, the most probable solution is to erect a lofty antenna tower at the edge of town nearest the TV stations to be received, which may be 80 to 100 miles away. Then the amplified signals can be "piped" around town from the base of the tower, and savings in amplifiers and cable (with no run down a mountain needed) may compensate for the added height of tower required.

By this new technique of the community aerial, it is feasible for television to reach new audiences by the million, just as television has come to Panther Valley.

-3-

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# ULTRA ECONOMY DEMODULATOR AND COMPANION MODULATOR

## Economy Local Video Source

For the average cable person to obtain a source of video to check out a modulator or microwave, life can be a hassle. The simplest and quickest local video source is a vidicon camera. That is, provided the system has a spare camera *when you need* the local video source. Or you could get along with a B & K Analyst or a complete demodulator. In any case, the cost ranges upward from a few hundred dollars.

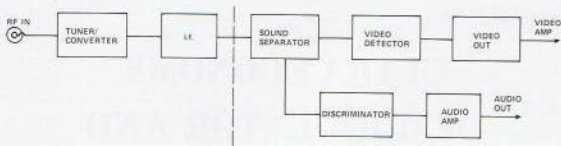
One very *simple* answer is to build a demodulator. Really! Many people have grown up in CATV, or have come into the industry, believing that the demodulator is a sacred cow that is much too complex to attempt on your own. Before you are turned off by that thinking, read on for another couple of paragraphs. With modern technology, there is really *not* very much to it.

In Diagram 1 we see the basic building blocks of a demod (demodulator). The RF tuner or converter receives the incoming TV signal and frequency translates (i.e. mixes or converts) the incoming frequency to the i.f. (intermediate frequency) range of the demod. There is some gain in the RF section but a whole lot less than you might suspect at first glance.

The i.f. section is really nothing more complex than a high gain "single channel" amplifier. The "channel" hap-

pens to be in the i.f. range, but it is directly comparable to any single channel strip amplifier in CATV. Yes, there is filtering (to reject adjacent channels) in the i.f. strip, just as there is filtering in a single-channel strip amplifier when you add input (and/or output) bandpass filters to the gain module/block. The purpose of the i.f. gain strip is to provide a high (RF voltage) level single-channel signal to the detector in the demodulator. In every CATV head end in the country, there are single-channel strip amps, and/or heterodyne processors and/or high (RF) level single-channel modulators. Any of these devices or units can provide a stable, high-level *single TV channel signal* as a substitute or replacement to a conventional RF tuner/i.f. gain strip in a demod.

So realistically, we already have in our head ends everything we need for a demod *except* the stage which converts the RF signal to a video signal. In our normal "need local video" situation, we don't really need (or want) any audio; our test requirements are basically for *video*. We can therefore dispense with the need for a (complicated) audio separator and audio detector *in our scheme here*. What we have left is a video detector (a diode) and a video amplifier (a very simple circuit with no tuning).



DEMODULATOR

## DIAGRAM 1

See Diagram 2 here. This circuit was put together on our bench one day when we desperately needed a local video source and every other source normally available was tied up on another project.

As the photo shows, this is a bread board kind of project. Yes, you could dress it up in a mini-box if you wished. The truth is that we have been using it almost constantly since it was originally "thrown" together, and there hasn't been time to dress it up in a container!

The operation of the circuit in Diagram 2 is very simple. The diode (a 1N82A is specified, but virtually *any* diode will detect video) detects the video and couples the detected video through a .1 mfd capacitor to the gate of an E-300 (or equivalent HEP series) FET. The FET amplifies the video signal and directly couples the amplified video voltage to the emitter of the 2N3564 follower stage. This matches the output to the 75-ohm output impedance.

The entire detector/video amplifier was wired *into the RF output* of a CADCO all American Sports Amplifier, an out-of-production single-channel bandpass filter amplifier that provides the required amount of gain and out-of-channel filtering to drive the input to the detector/video amp with +40/50 dbmv of RF signal. You can build your own demod into a mini-box, and couple through a coaxial jumper a single-channel RF source from any single-channel strip/heterodyne/modulator source. You could even use the output test point jack on a high-level single-channel device, although to obtain one-volt peak-to-peak video *from the economy demod*, you need between +40 and +50 dbmv RF *input to the detector* in the economy demod.

The unit is "spiced" to run on +10 vdc, a voltage I found easily in the single-channel strip I built my unit into.

### Sound Carrier Down

It may be necessary to trap down (or out) the sound carrier from the high-level RF source that drives the detector. This can be accomplished by using an external tuneable trap (*B-T MWT-2*, etc.) or by building into the unit a simple series trap to ground. In the unit I built, as the photo shows, a simple trap (see Diagram 3) was built right into the strip amp at the input RF connector. If you *fail* to trap the sound down so that it is 20 db below the video carrier (RF) level to the de-



ECONOMY DEMOD is built in Cadco AASA Sports Amp. Cadco unit is available at factory close out, \$30, each: CADCO, Inc., 2706 National Cr., Garland, Tx. 75401, (214-271-3651).

detector, you will have some herringbone (from the audio beat) in the detected video output from the economy demod.

### Now Back To RF

Now that we have an inexpensive source of local video for test purposes, the next obvious step is to make that local video source work for us as a video modulation source for a *companion economy modulator*.

Quite often it seems I need an RF signal, *modulated*, on say channel 12 (not available locally) or channel F (also not available locally). Because the need for a modulated carrier varies with the project I am working on, what I was really looking for was a simple (cheap!) way to put out a modulated TV carrier virtually anyplace from 50 to 300 MHz.

With the economy modulator, I have a way to turn local channel 4 into detected video, at one volt peak to peak. Now to put that video source on channel 12, or F, we developed the simple modulator shown in Diagram 4.

The circuit, like the economy demod, is exceedingly simple. The input video (from the economy demod) is first amplified in the E300 FET. The 2N5139 in

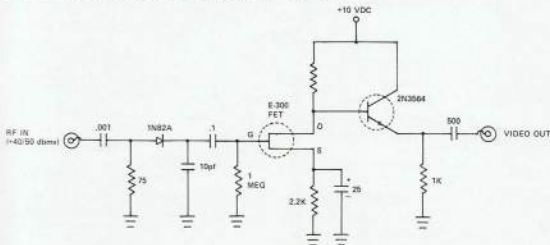


SOUND TRAP is inserted at Input to strip amp, as shown in Diagram 3.

the source along with the 10K pot adjusts the DC level. From there the video source is fed through a second 2N5139 for additional amplification to a 1N914 diode which serves as a *modulator*.

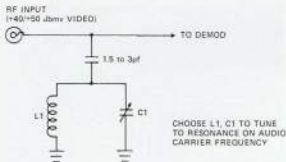
The RF IN connector (top right on Diagram 4) is where you plug in your sweep source, in the CW (straight single frequency carrier) mode, at a +50 to +55 dbmv level. This carrier, CW, from the sweep, becomes the carrier which your video source will modulate. By combining the video source and the CW carrier from the sweep in the 1N914, we have a *modulated RF signal*. The frequency of the signal is determined by the frequency setting on the sweep-tuning knob.

Adjustment of the "modulator" is as follows:



VIDEO DETECTOR AMP  
**DIAGRAM 2**





AUDIO CARRIER TRAP  
**DIAGRAM 3**



BREADBOARD MODULATOR is about as simple as the law will allow. See Diagram 4.

- (1) Set the input pot (100 ohms) for minimum attenuation;
- (2) Set the 10K pot to mid range;
- (3) Set the two compression trimmers (1.5 to 7 pF) to maximum capacity (i.e. trimmer plates *down* full);
- (4) Connect the video source to the video in port and the CW source from the sweep to the RF in port;
- (5) Connect the output of the economy modulator to a TV set through an RG-59 jumper;
- (6) Adjust the sweep-tuning knob until you have a blank carrier on the TV screen (i.e. put the sweep *on frequency*);
- (7) Adjust the 10K pot until you get a picture;

- (8) Balance the 100-ohm pot and the two compression trimmers for *best picture quality*.

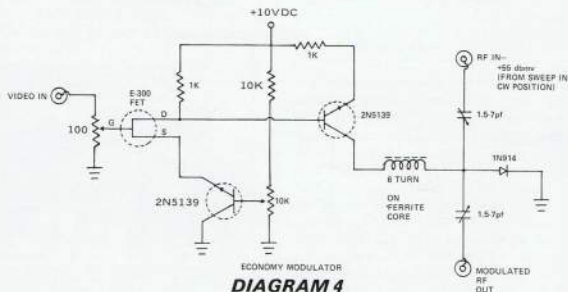
### Summary

Construction of both units is extremely simple. In no more than two hours you should have both working satisfactorily. The total cost, depending upon the stock in your parts bin, should be between 10 and 15 dollars for *both* units. The semiconductors are *not* critical, and most general replacement parts such as the Motorola HEP series will work just fine.

by:

*S.K. Richey*

*Richey Development Company  
Oklahoma City, Oklahoma*



**DIAGRAM 4**



# cata

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Jerry Conn & Associates, 550 Cleveland Ave., Chambersburg, Pa. 17201 (D3, D5, D6, D7)  
C-COR ELECTRONICS, Inc., 60 Decibel Rd., State College, Pa. 16801 (M1)  
DAVCO, Inc., P.O. Box 861, Batesville, Ark. 72501 (D1, S1, S2, S8)  
ENTRON, Inc., 70-31 84th Street, Glendale, N.Y. 11227 (M4, M5, D4, D5, S8)  
JERROLD Electronics Corp., 200 Witmer Road, Horsham, Pa. 19044 (M1, M2, M4, M5, M6, M7, D3, D8, S1, S2, S3, S8)  
Microwave Filter Co., 6743 Kinne St., Box 103, E. Syracuse, N.Y. 13057 (M5, bandpass filters)  
MID STATE Communications, Inc., P.O. Box 203, Beech Grove, Ind. 46107 (M7)  
QE Manufacturing Co., Box 227, New Berlin, Pa., 17855 (M9, tools & equipment)  
RMS CATV Division, 50 Antin Place, Bronx, N.Y. 10462 (M5, M7)  
TEXSCAN Corp., 2446 N. Shadeland Ave., Indianapolis, Ind. 46219 (M8, bandpass filters)  
Theta-Com, P.O. Box 9728, Phoenix, Az. 85068 (M1, M4, M5, M7, M8, S1, S2, S3, S8, AML Microwave)  
TIMES Wire & Cable Co., 358 Hall Avenue, Wallingford, Ct. 06492 (M3)  
TONER Equipment Co., 418 Caredean Drive, Horsham, Pa. 19044 (D2, D3, D4, D5, D6, D7)  
WAVETEK Indiana, 66 N. First Ave., Beech Grove, Ind. 46107 (M8)

NOTE: Supplier areas are keyed at the end of each listing, as follows:

### Manufacturers:

- M1 — Full CATV equipment line
- M2 — CATV antennas
- M3 — CATV cable
- M4 — CATV amplifiers
- M5 — CATV passives
- M6 — CATV hardware
- M7 — CATV connectors
- M8 — CATV test equipment

### Distributors:

- D1 — Full CATV equipment line
- D2 — CATV antennas
- D3 — CATV cable

- D4 — CATV amplifiers
- D5 — CATV passives
- D6 — CATV hardware
- D7 — CATV connectors
- D8 — CATV test equipment

### Service Firms:

- S1 — CATV contracting
- S2 — CATV construction
- S3 — CATV financing
- S4 — CATV software
- S5 — CATV billing services
- S6 — CATV publishing
- S7 — CATV drop installation
- S8 — CATV engineering

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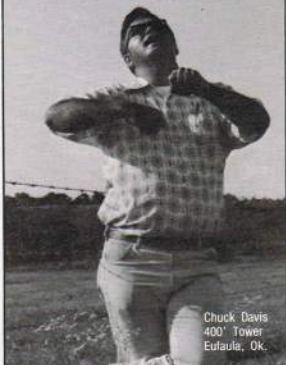
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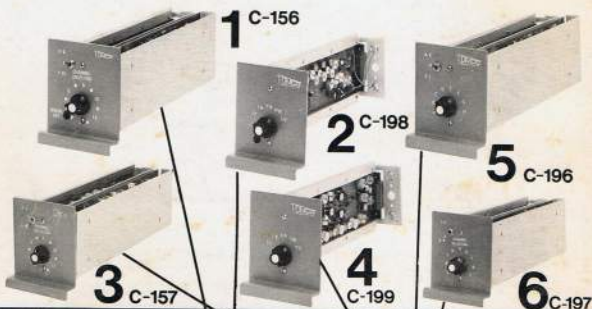
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