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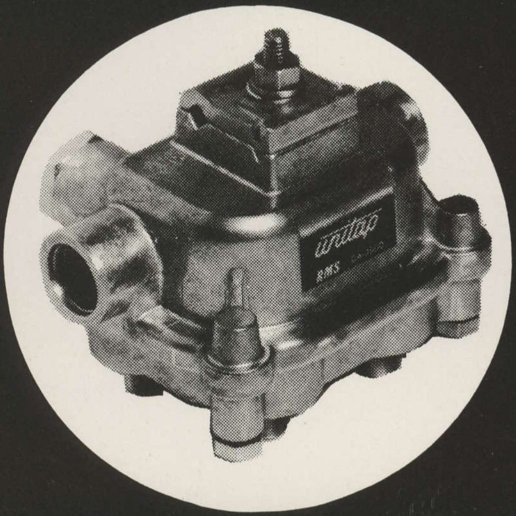

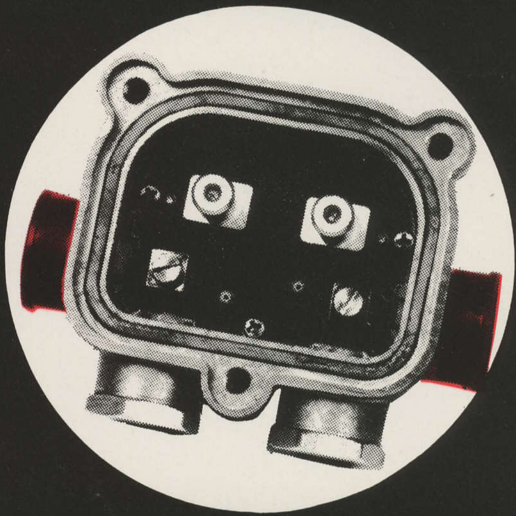

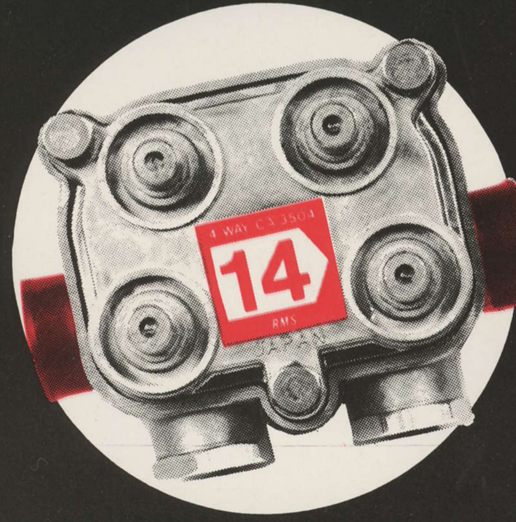

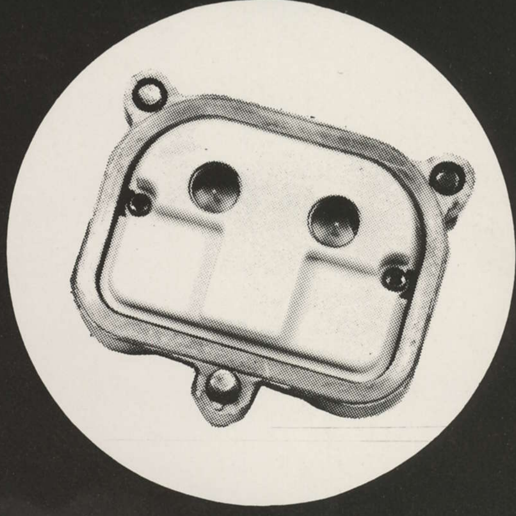

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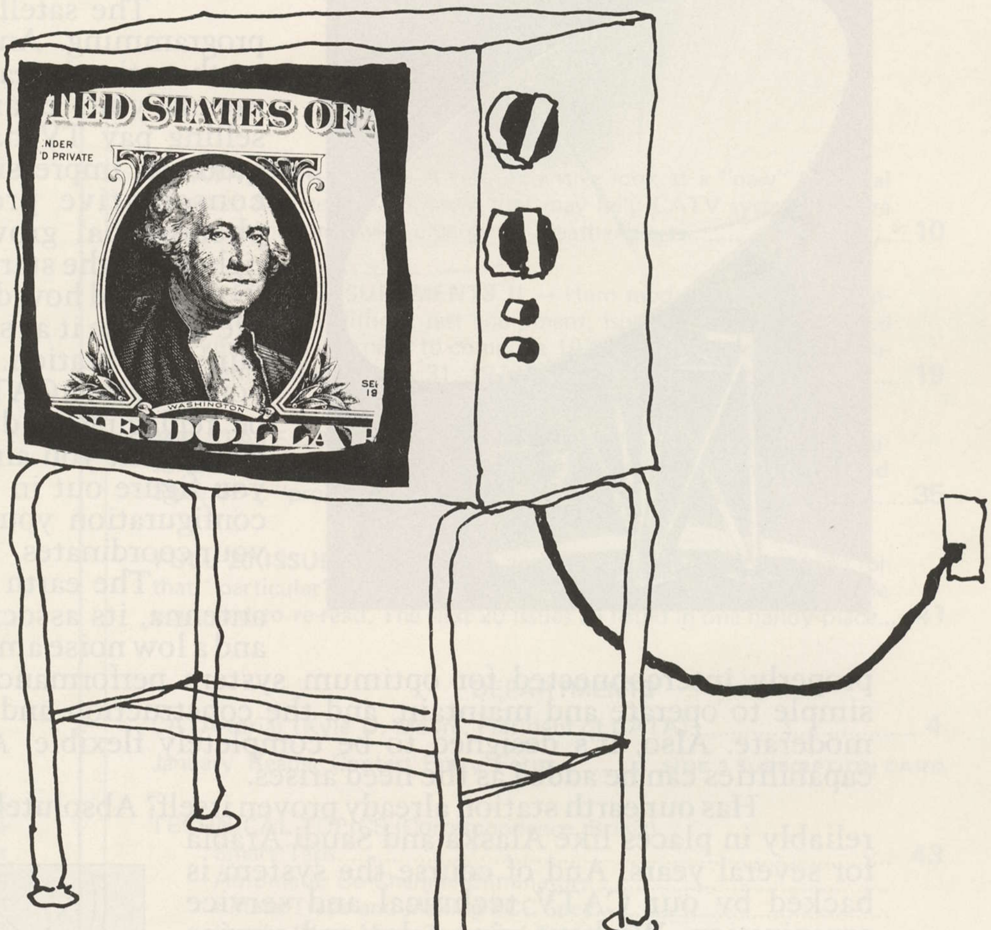

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CATJ

JANUARY 1976

VOLUME 3-NUMBER 1

PUBLISHED MONTHLY, AS ITS OFFICIAL JOURNAL, BY THE COMMUNITY ANTENNA TELEVISION ASSOCIATION, INC., OKLAHOMA CITY, OKLAHOMA AS A SERVICE TO ITS MEMBERS AND OTHERS PROVIDING CATV/MATV SERVICE TO THE TELEVISION VIEWING PUBLIC LOCATED THROUGHOUT THE WORLD.

OFFICES
CATA/CATJ
4209 NW 23rd, Suite 106
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DEPARTMENTS

OUR COVER

TORNADOES — One is bad enough, two at once is spine-tingling. The '76 severe-weather season is just around the corner and CATJ has developed a new Cable-Severe-Weather program plan for the industry using a little-known nationwide National Weather Service plan called "NOAA Weather Radio." Here is an innovative new program that will increase system cash-flow and earn the system good marks with the local subscribers; see page 10. Photo courtesy of Paul Huffman; taken April 11, 1965 near Elkhart, Indiana.

CATA-TORIAL

KYLE D. MOORE, President of CATA, Inc.

Priorities, Sunshine and The Public

Cable television is a medium of abundance. That is, unlike our distant cousin the over-the-air broadcaster, our major asset is our relatively unlimited spectrum (i.e. channel) capacity. And where the broadcaster must constantly select programming which holds the greatest **mass** (i.e. numerical viewer) **interest**, we may, in theory, select programming that has limited and perhaps even infinitesimal interest.

One of the rapidly moving changes now affecting our Government is the so-called "Government In Sunshine" program; a plan whereby 47 federal agencies (including our own FCC) would be **required** to conduct most agency business in meetings that are **open to the public**, and, the press. For the record, FCC meetings now are closed to the public and the press. The "Sunshine" program is not limited to our federal government. Many city governments have adopted similar rules which have the affect of precluding any (for example) city council meetings not previously announced and fully open to the public and the press. One major city with such a rule on its books recently modified the rule to state that anytime the city fathers have more than 40% of the elected city officials in "one spot" the "meeting" must be open, and, it also must be previously announced. In Canada, the House of Commons in Parliament recently gave their approval to allow the full, live, un-edited telecasting of all meetings of the House of Commons. This would be the equivalent to our House of Represnetatives agreeing to allow all of their sessions to be televised, live, un-edited.

The Canadian's actually have been in favor of this "Sunshine Approach" for quite some time; Parliament agreed to this awhile back. However, because of the scarcity of broadcast facilities, none of the Canadian over-the-air broadcasters were willing to devote long hours, day after day, to coverage of Parliament's House of Commons. So the plan lay dormant until the Canadian CATV operators saw the opportunity to provide a much needed service in their climate of spectrum plenty. Consequently, the plan is in high gear and within approximately 18 months it is expected that the Canadian cable viewers (some 7 million homes representing nearly 50% of all Canadian homes) will have unedited access to their House of Commons sessions.

WILL SUNSHINE ROT THE SECRET SEVEN ?

Our own government has shown a mixed reaction to the sunshine program. Recently, the United States Senate voted 86-0 to open all committee meetings and 81-6 to open all conference committee meetings to the public and to the press (with one exclusion, where national security is involved in the testimony or discussions). And more recently, the U.S. Senate voted 94-0 to open 47 federal agencies to the "Sunshine Process". To their dishonor, the FCC has persistently **refused** to adopt **on their own** a "Sunshine Program" and even in the very limited area of Rights of Public Access (under the Freedom of Information Act) the Commission has consistently shown great reluctance to release **any** information unless the requestor was willing to go to the expense, time and trouble of taking the FCC to court. Recently, the FCC issued a Memorandum Opinion and Order responding to a request originally filed by the National Citizens Committee for Broadcasting in which NCCB had requested that certain Commission documents be produced for NCCB study. In this "Opinion" the FCC noted **"In our judgement, the release of the** (exempt) **staff analysis would inhibit** (the staff's) **ability to give candid recommendations and advice to the Commission, thus posing the risk of denying to agency decision makers the uninhibited advice they need to make intelligent and informed decisions".**

That statement, from the Commission, is worth re-stating in a different form.

"The material which the seven Commissioners receive from the staff (and staff **includes** Cable Television Bureau) should not be divulged to you people (people being the public) because if the information and advice given to us by these (low level) staff people is subject to the scrutiny of you people (i.e. public), you will intimidate the staff personnel and they will in the future be reluctant to give us any information or advice. And lacking that, how can we as seven Commissioners make 'intelligent' decisions"?

Now one must ask **how we people** would intimidate these lower level staff people? If the material provided to the FCC's seven man governing board is accurate and beyond the taint of personal bias, then how could we intimidate the staff? If the material being supplied to the Commission is accurate, honest, and conceived in direct response to the problem in question, **how could the people** (public) **intimidate?**

On the other hand, if the material being supplied to the full Commission is laced with partial-truths, or it steps over boundaries into new territory not originally addressed by the matter at question, then you can be certain the public would probably howl, and howl loudly when it became aware that the seven man Commission is making decisions and adopting rules based upon something less than the full and accurate truth of a matter.

Like it or not, CATV is part of this "sunshine" technology. We have the unfortunate cross to bear of having surplus spectrum on our hands. And try as we might to hide that surplus, **it is there** and it has attracted the interest of people who are in a position to influence policy making decisions that will, at the federal and state levels, be with us for many decades to come. One such person, attracted by our surplus spectrum reserves, is Bridgette L. Kenney, Associate Professor of the Graduate School of Library Sciences, Drexel University. In a letter to Mr. H. Lynn May, Deputy Director of the Domestic Council, at the White House, in November, Professor Kenney said (in part) "(as regards to a possible national cable policy, as formulated by the White House and President Ford) there needs to be a recognition on the part of government of the role of information in an enlightened society. We need to insure that every person has the right and the wherewithal to access the kinds of information needed, at the time and place needed, and in suitable form for his consumption. To provide information of all types to everyone, freely and with minimum delay, would insure a better-trained more fulfilled citizenry, and better decision-making at all levels of government."

The "Sunshine Decade" is about to descend on us, throughout all levels of public and private life. Cable's role, yet to be specified, will be substantial, whether we like it or not.

Bet you thought that a good solid-state sweep for your system would cost a grand or two—maybe more. Well, that was before Wavetek introduced the Model 1051, a rugged solid-state instrument that covers the frequency range of 1 to 400 MHz.

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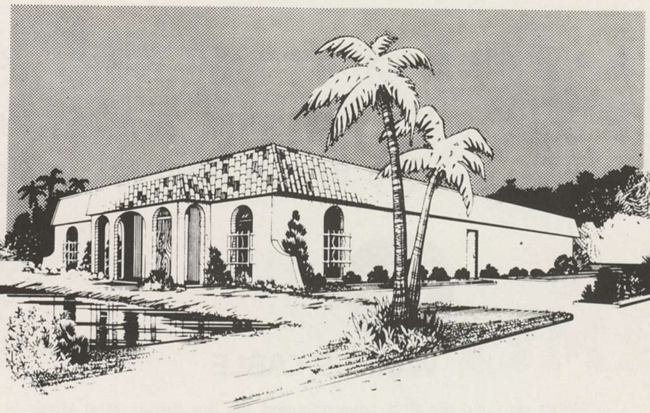

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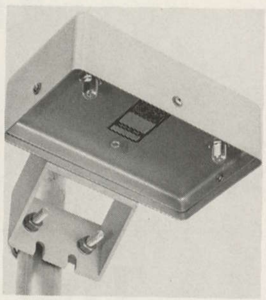
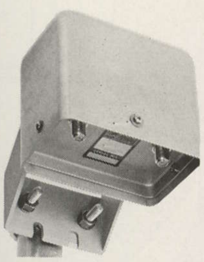
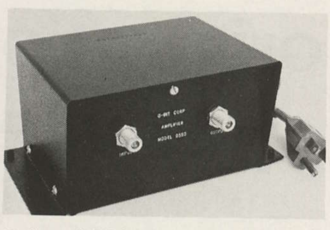


SX–0500 Single Channel Tower Service Preamp.



SX – 0506 VHF Broadband Tower Service Preamp.



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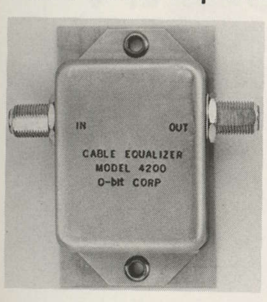

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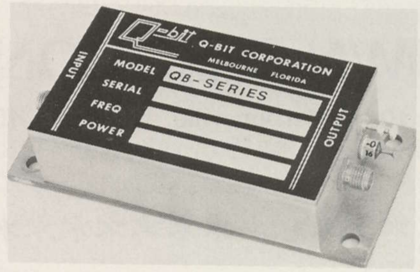
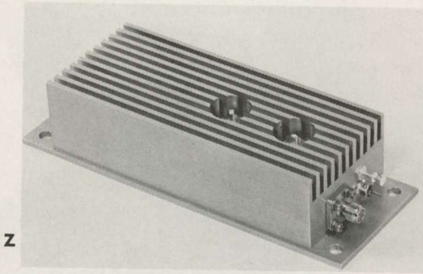


QB – 500
2 – 500 MHz



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WEATHER OR NOT (A New Way For A CATV System To Make Money)

A well-known philosopher of the 30's ventured the thought that "everybody talks about the weather, but nobody does anything about it." Some 40-plus years hence, things haven't changed that much.

Or have they? Actually, if anything, more people *are* talking about the weather, and some people are even doing something about it. Our purpose here this month is to tell you about a new program which your CATV system may wish to investigate because it offers your subscribers a new opportunity to hear somebody talking about the weather, and it offers you an opportunity to do something about it.

Many years ago a fellow down in Texas (1) developed something for CATV called the CATV weather channel machine. Ever since that time, people have been watching their favorite CATV system weather machine either (A) scan back and forth over a bank of weather instruments, (B) rotate in front of a camera a set of weather instruments, or most recently, (C) print out via a character generator the "latest" weather information. Of all the automated channel machines ever developed for CATV, the "weather channel machine" has endured longest and has found the greatest cable viewer acceptance. Seemingly, weather is a natural CATV sales tool.

Because some people have such an abiding interest in weather (a system in New Mexico apparently pioneered simply positioning a camera at the headend where it gazed for a hundred miles to the west to warn of advancing storm fronts), and because in some parts of the country (see Table 1) severe-weather warnings are a way of life for all residents, seemingly if a better weather service could be brought into the home via CATV, it would help build system customers and perhaps even attract new customers from previous holdouts.

Back in 1973 a small CATV supplier announced something it called the Civil Emergency Alert Systems or CEAS (2). This particular system, which qualifies for federal OCDM (Office of Civil Defense Mobilization) matching funds on a 50-50 basis, was designed to allow someone in authority in a town to activate a special CATV headend transmitter/modulator set of equipment and simultaneously warn all cable homes in the community of any local emergency, including severe-weather warnings. Because the CEAS package breaks in on all cable channels simultaneously, removing the video (that get's a viewer's attention all right) and replacing the audio with the emergency message, the system has the natural appeal of giving aid and comfort to a small out-of-the-way community where normal severe-weather warning systems do not reach.

However, like many other great plans, this one has a flaw. The CEAS package requires *someone* to operate it, and that someone has to have *direct knowledge* that a severe weather condition is threatening the community. In those communities where the advantages of local weather bureau radar and sophisticated communications do not exist, very often a seemingly harmless thunderstorm can creep up on a town and without warning drop a tornado cloud to the ground. And because anybody can look out the window and see a thunderstorm brewing, the system often falls short of its promise simply because when accurate, precise warnings are required, there is no *local* source for the warning *data.*

If there is an ultimate source for accurate weather data, it is the National Weather Service. NWS operates as an arm of the National Oceanic and Atmospheric Administration (NOAA), which is in turn chartered by the U.S. Commerce Department. NWS is the agency responsible for your hour-to-hour (day-to-day, etc.) forecasts. It is also responsible for the severe-storm, tornado warnings and watches; which if you live in any of the states shown in Table 1, you need no further explanation of. In years long gone by, the United States Weather Bureau performed these same functions on a lesser scale, but the Weather Bureau has been replaced in the federal scheme of things by the NWS nameplate.

The science of weather forecasing and reporting has been rapidly refined during the past decade. At the same time, the reporting systems utilized by NWS and others have been steadily improved so that today fewer and fewer severe storms go

TABLE — TORNADO STATES

The "worst severe weather states," as a function of the number of "annual tornados per 10,000 square miles" (area 100 miles by 100 miles) are as follows:

Oklahoma	8.8
Kansas	6.4
Indiana	6.1
Massachusetts	5.2
Iowa	4.5
Nebraska	4.4
Florida	4.4
Illinois	3.9
Texas	3.9
Mississippi	3.5
Arkansas	3.2
Louisiana	3.2
South Carolina	3.2
Georgia	3.0
Alabama	3.0
Wisconsin	2.9
South Dakota	2.7
New Hampshire	2.6
Michigan	2.0

unnoticed or unreported, even when they are confined by happenstance to remote areas of the country with low habitation levels.

As the amount of material or raw data available to NWS has risen steadily, so too has the compilation of that data into forecasts and reports risen to the point that very few citizens — if indeed any — need be uninformed about the weather for very long periods of time. Particularly noteworthy has been the steady advancement of the science of predicting severe weather, and the subsequent warnings that are issued by NWS to all citizens. In the last decade alone the increased use of weather satellites, for example, has cut the losses of life associated with hurricane-type weather to just a fraction of that reported in the 30's and 40's. The storms are no less severe, and the property damage is no less substantial. But because of the detailed warnings and tracking systems now available, the public receives adequate warnings of the true paths of the storms as well as accurate indications of the intensity to expect; and this allows people to take cover or precautions accordingly.

To a considerable extent, the same statistics would bear out with the most deadly of all U.S. severe storms, the tornado. As Table 1 indicates, unless you live in D.C. or Rhode Island, tornados are a persistent problem. Based upon the number of such storms reported, the states of Oklahoma, Kansas, and Indiana are typically hardest hit annually, on an adjusted "number of tornados per 10,000 square miles" study base.

The NWS has long relied upon the cooperation of radio and television broadcasting stations to *get the message out* when severe weather threatens. To back up the official NWS advisories, most television stations and many larger radio stations have their own weather reporting and advisory systems worked out. Those with staff meteorologists usually expand upon the NWS advisories with their own interpretations and station-generated data. Many midwestern stations have installed their own "weather radar" systems, primarily because this gives the station weather-reporting personnel the added flexibility of knowing what the storm is doing *full time;* they are not limited to merely reporting on advisories received from the NWS.

Finally, a couple of years ago NOAA set out on their own to *reach* the public *without the* customary assist from the nation's broadcasters. Through a program of nationally interconnected VHF (FM) radio transmitters, NOAA Weather Radio was born.

Constant Weather

In addition to observing that everyone talks about the weather but nobody does anything about it, Humorist Will Rogers is also credited with the observation that "if you don't like the weather here (he was in Oklahoma at the time), stick around a few minutes; it will change!" The NOAA Weather Radio broadcasts apparently believe in that statement, because the stations to be described here are for the most part constantly updating, revising, and making current the weather forecast and report data broadcast. Here is how the system works.

Through a present "network" of some 82 VHF stations (17 more are scheduled "on the air" in January and February; see full list here), NOAA-operated transmitters on either 162.4 or 162.55 MHz transmit weather data 24 hours per day. The broadcasts are manned by NWS personnel, and there is no delay time between the preparation of the weather data and the broadcasts, save for a brief transit time while the material is placed in front of a NWS microphone and a weather bureau person is pressed into duty to read the "copy." The weather reports, which include the current climatological data as well as comparisons with other temperature

OTP and NOAA NWS

Just about a year ago the Office of Telecommunications Policy officially "adopted" the NOAA system as the "official" home warning system for enemy attack or natural disasters. With that decision, the NOAA stations have taken on additional importance in the overall scheme of things.

At one point the Government was considering legislation which would have required all sellers of AM and/or FM home receivers to incorporate into the receivers the same type of "tone-alerting" system which is now part of the NOAA weather station program. After several years of study, it was determined that this constituted an invasion of the privacy of the individual and the plan was dropped. Not dropped, was the Government's goal of having an official coast to coast, border to border program for "officially", through government tended transmitters, alerting citizens of disasters. The NOAA program was then chosen as the service to make this disaster warning program work.

This would seem to make the "selling of the NOAA program" easier for the cable operator who opts to provide this type of service. Generally speaking, the public is virtually unaware of either the NOAA weather program or the official appointment of the NOAA systems to the responsibility for disaster warning service.

extremes for that same date, the rainfall accumulations for the month and year to date, and forecasts of what to expect in the coming forecast periods are placed on tape several times per day, or as often as updating requires change. The automatic equipment then cycles and recycles the data over and over again, so that if a typical listener tunes in at any point, within 5-7 minutes he has all of the current data. Then the tape automation equipment replays the current tapes from start to finish. As the material is updated, the tapes are made fresh also. The broadcast material is always the *latest* NWS data; in short, weather buffs hear the reports *first* on the NOAA broadcasts. On commercial broadcasts, there are delays for wire-service transit time, and individual commercial station airing schedules of up to an hour or more before the *same data* finds its way into the normal AM radio or several hours before it ends up on a regularly scheduled television station weather-cast. Additionally, most NOAA stations are now supplementing their basic weather data with additional information of particular interest to a locale. The Kansas City NWS outlet, for example, regularly reports on Missouri River levels; the Los Angeles NWS outlet covers the smog-alert index, and coastal stations deal out data on tides, wave heights, and so on. In the final analysis, all of the data presented is in

NOAA STATION LIST

* – denotes not on air 12-31-75 but due on before 3-31-76

Location	Call Sign	Frequency	Power	Antenna Height (1)
Akron, Oh.	KDO94	162.4	330w.	672′
Anchorage	KEC43	162.55	330w.	30′
Astoria, Or.	**KEC91**	**162.4**	**100w.**	**35′**
Atlanta	KEC80	162.55	330w.	300′
At. City	KHB38	162.4	330w.	300′
Baltimore	KEC83	162.4	1000w.	300′
Boston	KHB35	162.4	330w.	475′
Brownsville, Tx.	KHB33	162.55	330w.	218′
Buffalo	KEB98	162.55	330w.	380′
Bay City, Mi. *				
Charleston	KHB29	162.55	330w.	500′
Chicago	KWO39	162.55	1000w.	1500′
Cleveland	KHB59	162.55	330w.	300′
Coos Bay, Or. *				
Corpus Christi	KHB41	162.55	330w.	280′
Crescent City, Cal. *				
Dallas	KEC56	162.4	330w.	300′
Daytona Beach, Fla. *				
Denver	**KEC76**	**162.4**	**300w.**	**85′**
Des Moines	KEC75	162.4	300w.	165′
Detroit	KEC63	162.55	300w.	360′
Eden, Md.	KEC92	162.4	1000w.	450′
Erie, Pa.	KEC58	162.4	330w.	365′
Eugene, Or.	KEC42	162.4	80w.	45′
Eureka, Ca.	**KEC82**	**162.4**	**80w.**	**38′**
Ellsworth, Me. *			1000w.	
Forks, Wi. *				
Ft. Worth	KEC55	162.55	330w.	250′
Galveston	KHB40	162.55	330w.	360′
Gulfport, Ms. *				
Honolulu	KBA99	162.55	80w.	91′
Houston	KGG68	162.4	330w.	182′
Hyannis, Ma.	KEC73	162.55	330w.	320′
Indianapolis	KEC74	162.55	300w.	508′
Jacksonville	KHB39	162.55	330w.	205′
Kansas City	KID77	162.55	1000w.	335′
Kauai, Hawaii	**KBA99**	**162.4**	**90w.**	**42′**
Key West *				
Lake Charles, La.	KHB42	162.55	330w.	100′
Los Angeles	**KWO37**	**162.55**	**275w.**	**55′**
Maui, Hawaii	**KBA99**	**162.4**	**300w.**	**26′**
Miami	KHB34	162.55	1000w.	306′
Milwaukee	KEC60	162.4	300w.	285′

SLOWED NOAA STATION GROWTH

As we go to press, it has become apparent that the near-future growth of the NOAA VHF stations is in some limbo. The station list shown here separately is accurate. However, the expansion of the station list beyond those locations shown, in the near future, is in considerable question.

Initially, as reported in this article, more than 300 stations were contemplated. Strangely, the funds to make these stations operable are available and ready to be spent. However, it appears that there has been a very slow response from ''bidders'' (i.e. commercial suppliers of station equipment) to turn the cash available into working stations. Whether the NOAA people are insisting on terms the suppliers cannot live with, or the station suppliers are simply not interested in the project, is unknown at this time. The fact remains that even with the money available, further expansion in 1976 is in considerable question.

Therefore, if your CATV system is within receiving range of one of the locations given here, you are home free this year. If not, it may be quite sometime before your area has service.

There may be another answer to this problem. In some cities (example: Albuquerque) private groups have provided the equipment and installations to the Government for a nominal charge of $1.00 per year. With the transmitter, etc. in place, the Government's local National Weather Station office then goes ahead and programs the ''civic provided'' station. There are apparently five such transmitters now in operation, provided by local people with local funds. Groups interested in providing such a station for their own area are urged to contact Mr. Harold Scott at the National Weather Service at (301) 427-7858.

Minneapolis	KEC65	162.55	330w.	84′
Mobile	KEC61	162.55	330w.	500′
Monterey, Ca.	**KEC49**	**162.4**	**275w.**	**40′**
Morgan City, La. *				
Myrtle Beach, S.C.	KEC95	162.4	330w.	240′
Newbern,N.C.	KEC84	162.4	330w.	600′
Newport, Or. *				
New London, Ct.	KHB47	162.4	330w.	85′
New Orleans	KHB43	162.55	330w.	250′
New York	KWO39	162.55	1000w.	860′
Norfolk	KHB37	162.55	1000w.	479′
Oahu, Hawaii	**KBA99**	**162.55**	**250w.**	**90′**
Panama City	KBB67	162.55	1000w.	200′
Pensacola	KEC86	162.4	330w.	200′
Pharr, Tx.	KHB33	162.4	330w.	310′
Phoenix	**KEC94**	**162.55**	**330w.**	**100′**
Portland,Me.	KDO95	162.55	330w.	315′
Portland,Or.	KEB97	162.55	275w.	39′
Philadelphia *				
Pittsburgh *				
Rochester, N.Y. *				
Sacramento	**KEC57**	**162.4**	**275w.**	**75′**
St. Joseph	KEC77	162.4	300w.	50′
St. Louis	KDO89	162.55	300w.	325′
San Diego	KEC62	162.4	300w.	52′
San Luis Obispo *				
Sandusky,Oh.	KHB97	162.4	330w.	335′
Salt Lake City	**KEC78**	**162.55**	**330w.**	**48′**
San Francisco	**KHB49**	**162.55**	**275w.**	**55′**
Santa Barbara, Ca. *				
Santa Rosa, Ca. *				
Savannah,Ga.	KEC85	162.4	330w.	225′
Seattle	**KHB60**	**162.55**	**275w.**	**37′**
Seward, Ak.	KEC81	162.55	90w.	45′
Tallahassee, Fl. *				
Tampa	KHB32	162.55	330w.	161′
Traverse City, Mi. *				
Washington, D.C.	KHB36	162.55	1000w.	250′
West Palm Beach	KEC50	162.4	330w.	200′
Wichita	KEC59	162.55	300w.	135′
Wilmington, N.C.	KHB31	162.55	330w.	320′

1) Antenna height is height above ground. Some sites may now be higher than indicated. **Bold face listings** are sites located at elevated sites (i.e. Astoria is 1990′ AMSL; Maui is 9976′ AMSL, etc.) so ranges will be considerable greater with sites shown in **bold face listings** than antenna height would normally suggest.

plain English; it is easily understandable by the average man in the street, and unlike the specialized NWS services such as flight aviation weather, it does not take more than a grade-school education to interpret what is being said to you.

This all has lowest-common-denominator appeal to the average cable viewer. And in fact a number of cable systems are already offering "relays" of the NOAA broadcasts. We'll talk more about that shortly.

Transmission Facilities

The typical NOAA transmitter facility operates with a transmitter output power of between 300 and 1,000 watts. This is loaded into an omni-directional gain antenna that results typically in ERP's of from 2 kW to 6 kW. The transmitting antennas are elevated, with some examples being the Chicago station located 1,500 feet above ground level on the Sears Tower; others are side-mounted on television broadcast towers, on hilltops, or atop mountains, such as the Los Angeles facility on Mt. Wilson.

With these types of ERP's and elevated transmitter sites, the typical NOAA service contours range from 40 to 60 miles. This is not unlike the coverage one would expect with a TV broadcast station, to a modestly equipped rooftop antenna receiver. However, the NOAA-predicted contours are based upon very simple receivers equipped *not* with rooftop antennas but rather with built-in quarter-wave vertical antennas (see photo here). Like any VHF receiving situation, a good outdoor antenna does wonders for the coverage range.

The transmitters presently operate on either 162.40 or 162.55 MHz. A third "split channel" will be put into service in 1976 in some locales on 162.475 MHz. Transmissions are via FM, 5 kHz deviation.

Severe-Weather Alerts

Anyone with a receiver for these broadcasts in their possession learns quickly that in the event of severe-weather threats, one of the first things you should do is turn on the NOAA weather receiver and find out what is *really* going on. However, because the broadcasts are on tape and repeat in 5-7 minute cycles, a person would quickly lose interest if after a few minutes he heard no real warning data (indicating everything was normal, or *below severe* limits). So the NOAA people have come up with a system that borrows rather freely from the VHF two-way radio industry something known as *"tone-alert."* It works this way. When there is to be a severe-weather warning or report of any type, the actual broadcast of that information is automatically preceded by a 5-10 second "blast" from 1050-cycles - per - second tone generator. This audio tone is a special signaling tone which triggers a buzzer or alarm in the NOAA weather receivers available commercially. The buzzer or alarm in the receiver operates independently of the volume control, through a muting circuit. When the receiver is placed into the "tone-alert" mode, all normal transmissions are silenced. But a transmission preceded by the 1050 cycle tone is heard because the tone "unlocks" the receiver muting circuit. Therefore, a receiver user can set the receiver in the mute position and go back to whatever it was he was doing previously, secure in the knowledge that if a severe warning or broadcast is transmitted, his receiver will "unmute" and he will hear the broadcast. And because this service functions 24 hours per day, a NOAA Weather radio placed on the bedside table becomes a *24-hour-per-day weather alerting system* for the radio owner/user.

Not all NOAA broadcast receivers are equipped with this "tone-alert" muting function. This is an optional extra, which we will cover in some detail shortly. However, it should be noted that of those receivers optionally so equipped, many also have one other nice feature: a light which is tied to the muting circuit. If the receiver is on, in the muted position, and the receiver owner has left the room for the span of time when the 1050-cycle alerting tone is broadcast (and he therefore misses the severe-weather warning), the light is his clue to something severe being up. The light begins to blink, about once a second, when the 1050 hertz tone is received. And the light *continues to blink* on and off until someone pushes a slide switch on the receiver which shuts the light down. That serves as a *visual reminder* that a severe-weather broadcast *has been* transmitted, and it tells the receiver user to change from mute to regular reception to check out whatever it is that is happening.

The Basic Receiver

In developing the background material for this report to the CATV industry, CATJ met with not only the NOAA people in charge of this project nationally, but also with suppliers of the NOAA equipped receiver. If you ply the Radio Shack stores or other consumer-oriented electronics outlets, you are *already* aware that there are dozens of two-band, three-band, four-band, etc. radios on the market, some of which have "Weather Radio" receiving capabilities. Most of these multi-band radios are made in the Far East and sell under hundreds of label names for prices that range from $30 to several hundred dollars each.

In addition to these multi-band radios, there are also a few lines of Weather Radio "only" receivers available: generally in retail price configurations that start as low as $10 (for a Radio Shack Cube special) up to perhaps $75. These FM receivers are generally compact, battery operated or battery and AC operated, have a built-in whip antenna, and offer switch or manual (sometimes innards concealed) selection of *either* of the present two NOAA broadcast frequencies of 162.4 or 162.55 MHz.

After looking at the performance specifications and the general interface capabilities of the units on the market, CATJ has zeroed in on a line known as the Weatheralert Radios available from Weatheralert, Inc. (639 South Dearborn Street, Chicago, Illinois 60605). A separate box-style review looks at a couple of these receivers in some depth as a companion report to this full article.

The CATV Interface

Because of the unique qualities of the NOAA broadcasts, it appears to CATJ that this particular program may have considerable appeal for CATV sys-

WEATHERALERT RECEIVERS

Frequency Range—162.40 or 162.55 MHz (switch selected)
Oscillator Control—crystal control
Design—dual conversion, narrow band FM, solid state
FM Recovery—5 kHz deviation

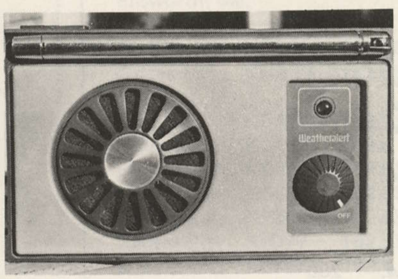
Model TA4

(1) 2-¼'' speaker
(2) 117 VAC powered
(3) External 300 ohm antenna terminals
(4) **Retail price—$29.95**
(5) Size—3'' x 3-½'' x 4''

Model TA3F

(1) 2-¼'' speaker
(2) 117 VAC powered, automatic switching to internal 9 VDC battery with power failure
(3) External antenna jack (requires phono plug adapter) for 75 ohm fitting
(4) siren/beeper alarm for severe-weather broadcasts
(5) LED flashing light indicator when warning is received
(6) **Retail price—$49.95**
(7) Size—3'' x 5'' x 1-¼''

Manufacturer/Source—Weatheralert, 639 South Dearborn Street, Chicago, Illinois 60605 (Mike Arkes / 312-939-2398)



tems. Here is why.

(1) The direct from the "Weather Bureau" (remember *they* are known as NOAA/NWS now) nature of the transmission is good for the creditability aspect of the program; in terms of believability and speedy delivery of the facts.

(2) In our discussions with NOAA people, we quickly decided that they are indeed very flexible people (a pleasant surprise in itself for feds!). They want their service to be of maximum utility, and they are anxious to fill voids not now filled. We'll have more about that shortly.

(3) The 24 - hour - per - day broadcasts, coupled specifically with the full-time 1050 hertz tone alerting function for severe weather really sounds good to those of us who find ourselves staying up well beyond our normal bedtimes several nights a month in the spring severe-weather season, fearful that *if* we go to bed while a nasty cold front is passing through, a tornado line may develop and crush us in our beds without our even having the advance warning necessary to cause us to run for the basement or storm shelter. That *may* sound *paranoid* to someone in Rhode Island, but when you live in the "tornado belt," that *is* a seasonal fact of life.

(4) Finally, as a CATV business person, we like the general costs involved in (A) making this service available to our system, and (B) making it available to our subscribers. Furthermore, we are particularly interested in how the addition of the NOAA broadcasts might result in additional subscriber revenue.

Service Options

There are any number of ways to implement the NOAA weather broadcasts on your own system. We'll discuss how the off - air - to - cable connection works shortly.

First of all, you could simply provide the service as an audio service to your existing weather channel. This requires a demodulator (audio receiver) at the headend, and the NOAA broadcasts at audio are coupled to your weather channel modulator audio input. This gives your weather channel a brand new "sound," and by inference a new "look." The inference is that as the NOAA broadcasts relate the official NWS weather information for the *region*, the weather instruments display the *localized* conditions. That should jazz up the weather channel quite a bit. The costs should be very low; one of the $50 receivers plus an antenna is probably all you need at the headend to get in business.

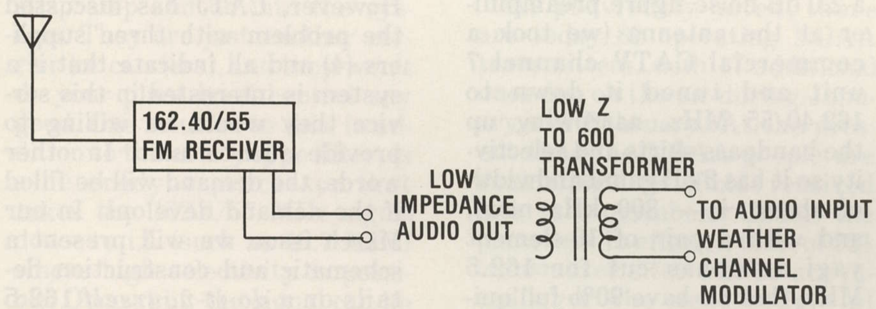


DIAGRAM 1

Next of all, you could recover the audio with an NOAA receiver and use the NOAA audio to modulate an audio modulator on an unused TV channel (if you have no weather channel machine, or like the present music format of the weather channel).

Or you could recover the audio and use it to modulate an FM band headend modulator (such as a Catel unit) (3). This would give FM service customers the additional service of an FM-type weather service.

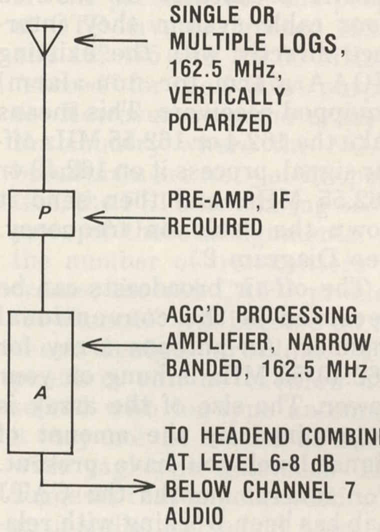


DIAGRAM 2

None of these will really make you very much *additional* money. And all of these overlook the important tone-alerting function for severe-storm warnings. Sure, the tone will be heard regardless of where it appears, but *unless* the tone is picked up by a receiver specially designed to turn the tone into an alert or alarm, there is *no true alarm function.* The solution to both problems (making money with the service and retaining the alerting function) is to simply design your carriage of the NOAA broadcasts so that on your cable system they interface directly with the existing NOAA alarm (or non-alarm) equipped receivers. This means take the 162.4 or 162.55 MHz off-air signal, process it on 162.40 or 162.55 MHz, and then send it down the cable on frequency. See Diagram 2.

The off-air broadcasts can be received in the conventional manner. An antenna array for 162.40/55 MHz is hung on your tower. The size of the array is determined by the amount of signal level you have present. For several months the CATJ Lab has been working with relatively long-haul NOAA broadcast transmitters from Wichita (150 miles) and Kansas City (290 miles). We have found that with a 2.0 dB noise figure preamplifier at the antenna (we took a commercial CATV channel 7 unit and tuned it down to 162.40/55 MHz, narrowing up the bandpass skirts and selectivity so it has 3 dB gain-bandwidth of about +/— 300 kHz now), and with a pair of 10-element yagi antennas cut for 162.5 MHz, that we have 90% full quieting reception on the 150-mile Wichita signal and about 50% full quieting on the 290-mile Kansas City signal. *Normally,* you would want to use the NOAA transmitter *closest to you,* since the NOAA broadcasts are regionalized. You want the weather information that most pertains to your own locality. However, there is nothing to prevent you from carrying two NOAA broadcasts: one on 162.40 and one on 162.55 MHz. Dallas and Fort Worth, for example, *both have* NOAA facilities, and they occupy the two assigned frequencies. There are many similar situations where two transmitters will be in range (see Table 2). Normally, you should be able to expect full quieting reception from any NOAA station within 100 miles close to 100 percent of the time, if there are no intervening mountain ranges.

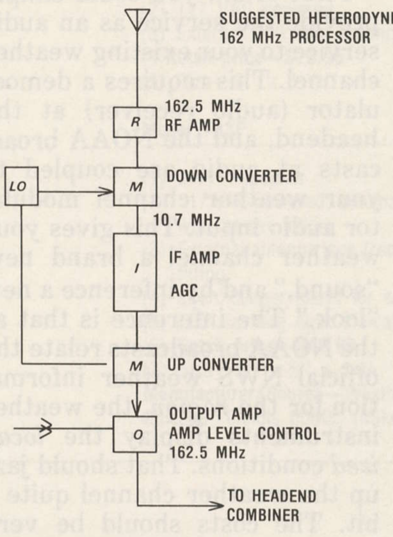


DIAGRAM 3

At the present time there are *no* readily available AGC'd "strip amps" for this service. However, CATJ has discussed the problem with three suppliers (4) and all indicate that if a system is interested in this service they would be willing to provide such a unit. In other words, the demand will be filled if the demand develops. In our March issue we will present a schematic and construction details on a *do-it-yourself* 162.5 MHz AGC'd strip amp for this service. The antennas (5) and the preamplifiers (6) are readily available at this time. Prices are in the same respective ranges as CATV single-channel amplifiers and log (high-band) antennas.

In our CATJ Lab test system we have been running the Wichita transmitter through our system at about the same RF level (to the trunk) as our channel 7 audio. This we have found is *more* than adequate (it can be dropped 6-8 dB, and in our short plant we find no receiver noise problems at customer tap points).

Thus the NOAA broadcasts *can be* interjected *on frequency,* as received off the air, and through a two-way splitter at the home the customer receives his normal TV service and at the opposite spigot the NOAA broadcasts. This could be refined so that the house split delivers a much lower signal level to the NOAA broadcast receiver outlet if the system wished to keep the second tap from being utilized for TV.

<u>Service Charges</u>

What do you charge for the service? How do you put receivers in the cable customer's hands?

CATJ went to Mike Arkes at the Weatheralert receiver firm in Chicago and talked with him about how the CATV system operator might be treated as a "dealer" or "distributor" for the receiver. Obviously, when you have the service available, your next concern after putting the NOAA broadcasts on the cable is that the customers have a way to obtain the receivers.

There are several possibilities as to how you might handle this as an operator.

(1) Stock and sell receivers: if you could buy the receivers "right," you could simply become a dealer or distributor and *sell* them *directly* to the customers. Many CATV are prevented, by the terms of the franchise/permit with the city, from engaging in *TV receiver* sales. Often that limitation does *not* apply to other types of receivers. Mike Arkes at Weatheralert has agreed that if CATV systems will purchase minimum bulk quantities (such as 72 units), that they can purchase the receivers for approximately 30% off of the retail price (a retail $39.95 radio would sell to the CATV system operator for $28.00).

If you chose to handle the program this way, you would resell the receivers, making a 30% mark-up profit, and obtain a second outlet to add to your regular system revenue.

(2) Purchase the receivers as a dealer, for the same discount structure, and then *rather than* selling the receivers, provide them as a part of a "Cable Weather-alert" service for a flat fee of say $2.00 per month. The amount charged for the combination receiver and extra drop would vary as a function of the receiver "chosen" by the cable subscriber. There are two basic receivers available. One has the standard *two-channel* NOAA broadcasts available (either 162.40 or 162.55 MHz, switch selectable *at the receiver*), but no tone-alerting function for the severe (emergency) weather broadcasts. This receiver retails for $29.95 up to $39.95 (see receiver descriptions separately here). Your dealer price would be $21.75 to $28.00. The second basic model has the *same* features *plus* a standby DC (battery) power source, the tone alert beeper alarm, and flashing "severe weather warning" light. This receiver retails for $49.95 and will net to you as a dealer for around $35. Based upon these numbers it would seem that the typical CATV system might develop both full-year packages and "seasonal" packages of the drop outlet plus receiver for lease charges of from $2.00 to $3.00 per month.

Such a program should be bankable locally in a way that will allow you to cover or "floorplan" the receivers over a 1-2-year payout period. An installation charge of $10 would not be out of line for the receiver, with or without the added extra outlet charge. A receiver deposit fee might also be collected (ala set top converters).

Headend Problems

There is only one headend problem *we have run into* during our two months of lab tests. The 162 MHz region is heavily populated with a wide variety of public safety (police, fire, etc.) transmitters. In your own locality, you *may* find that somebody is "parked" in the same frequency range with a big fat signal. In this case you have two problems.

(1) The *off-frequency* but *nearby* transmitter source may overload your preamp (if one is required) and/or your AGC'd strip amplifier. The solution to this one is a cavity filter (i.e. one with extremely sharp bandpass skirts). These are fairly expensive animals ($100. up typically) (7), although you can build one if you have normal sweep gear. *If* there is sufficient interest, *we'll show you how* here in CATJ.

Even if the off-frequency "fat" signals do not overload your front-end (i.e. headend) equipment, you probably don't want them going through the AGC'd strip amp and on into the system. They are just another carrier (or carriers), and they won't do your plant level control any good. *One* solution to this, in addition to the cavity-type filter, is a heterodyne processor that takes the 162.4/55 MHz signal down to i.f. (such as 10.7 MHz) where high selectivity is possible. Once at i.f. the signal can be brought back to a cable carriage frequency. It is possible (but often not *recommended*) to come in at say 162.4, convert to an i.f. of 10.7 MHz, process the signal, and then come back up to 162.4 MHz for cable carriage. This is done every day with TV channel carriage, but the "feedback" loop problem for a narrow-band heterodyne (same frequency in/out) processor is more delicate. Yet maintaining the cable signal on a frequency that is *directly compatible* with the readily available consumer receivers (i.e. not requiring *special* cable receivers) *is* a major consideration. At the present time, getting the receiver suppliers to produce a special cable-only receiver on some discrete cable frequency such as 119 MHz seems highly unlikely.

(2) The second headend problem is the multiplicity of signals that will *one day* be available on the three NOAA frequencies. At the present time the people at OTP have designated 162.40 and 162.475 and 162.55 MHz as "sacred" for the NOAA purposes. However, in some areas of the country where the NOAA broadcasts are *not* yet in operation, the FBI is co-sharing one or more of these assignments. As the number of transmitters increase, the old CATV problem "co-channel" will become an antenna-design problem. The problem can be tackled and solved with log-type antennas; it may not be solved as easily with yagi-type antennas. This suggests that anyone putting in an installation should *start off with* log antennas just as a form of protection against co-channel interference that will one day be present.

As previously noted, there are today 82 operating NOAA transmitters, with 17 additional ones due on the air during January and February. At the present time the NOAA people are evaluating a set of bids received late in November. Under the plans now in effect, a total of 331 transmitter sites will be activated over the next couple of years. They are being located in areas where population density and main highway arterials dictate coverage requirements. Even with the total 331 units installed and operating, there will still be very substantial areas of the country where direct home reception (even with outdoor antennas) will not be possible. Thus NOAA service in rural areas will, like television reception service, depend largely on whatever assists CATV can give the program.

Localized Weather For Cable

If there is a "fly" in the ointment for the *present* operational format for the NOAA broad- it is the regionalized approach to the weather information broadcast. Take Wichita, Kansas, for example. The broadcasts are *largely* concerned with weather conditions for the 60-mile service range NOAA feels they now cover to direct-in-home receivers. Yet most CATV systems surrounding Wichita are *outside* of the 60-mile radius.

In discussing this with people at NOAA, CATJ made the point that unless NOAA adapts to cable listener patterns in places such as Medicine Lodge, Ashland, or Great Bend (all outside the 60-mile normal-service range), the NOAA broadcasts will not be of optimum value to the "rural people." NOAA agrees with us that this is a present problem, but they also *offer hope* that *when* CATV coverage reaches some reasonable densities, their own broadcast information can and will be tailored to cover the CATV-served communities as well. This suggests strongly that as each system operator goes into this program he make it a point to let the NOAA station chief (for the station[s] he is carrying) *know about the new expanded CATV coverage*. Additionally, the CATV operator should *keep the* NOAA station chief advised of the growth of subscriber usage of the service. In this way, NOAA headquarters tells CATJ, the individual stations will be best able to judge how and when they will tailor their broadcast information to serve the needs of not *only* their primary service areas but *also* the rural areas where CATV makes service available.

A companion problem, perhaps most critical of all, is the coverage range for the *severe-weather warnings*. Even with the direct to home coverage radius of say 60 miles in all directions, the NOAA people have *some* problems *on their own*. The nature of tornadic storms is that they cover a small area at a time. NOAA seeks to protect its total service area, and therefore *will alert* with severe-storm warnings whenever a threatening storm moves into its 60-mile coverage radius. Obviously if the storm is at the far north end of the coverage and you are at the far south end, you could be 120 miles out of the affected region and still have your 3 a.m. slumber disturbed by the alarm. CATV compounds the problem. If CATV systems extend the NOAA coverage to 100- or 120-mile service radii, NOAA will react by providing expanded severe-storm warnings. And more people will be needlessly awakened from a full slumber.

One ultimate solution, difficult to control in non-CATV service areas, is *selective tone alerting*. Hundreds of tone-alerting codes are available, and at some future point in time specific codes for say Medicine Lodge, Kansas might be adopted; all CATV receivers in Medicine Lodge would react *only* when *their* "tone code" is sounded. CATV fits this format as long as the CATV system owns the receivers and controls the way each is tone-alert equipped. But other receivers, bought over the counter by the public,

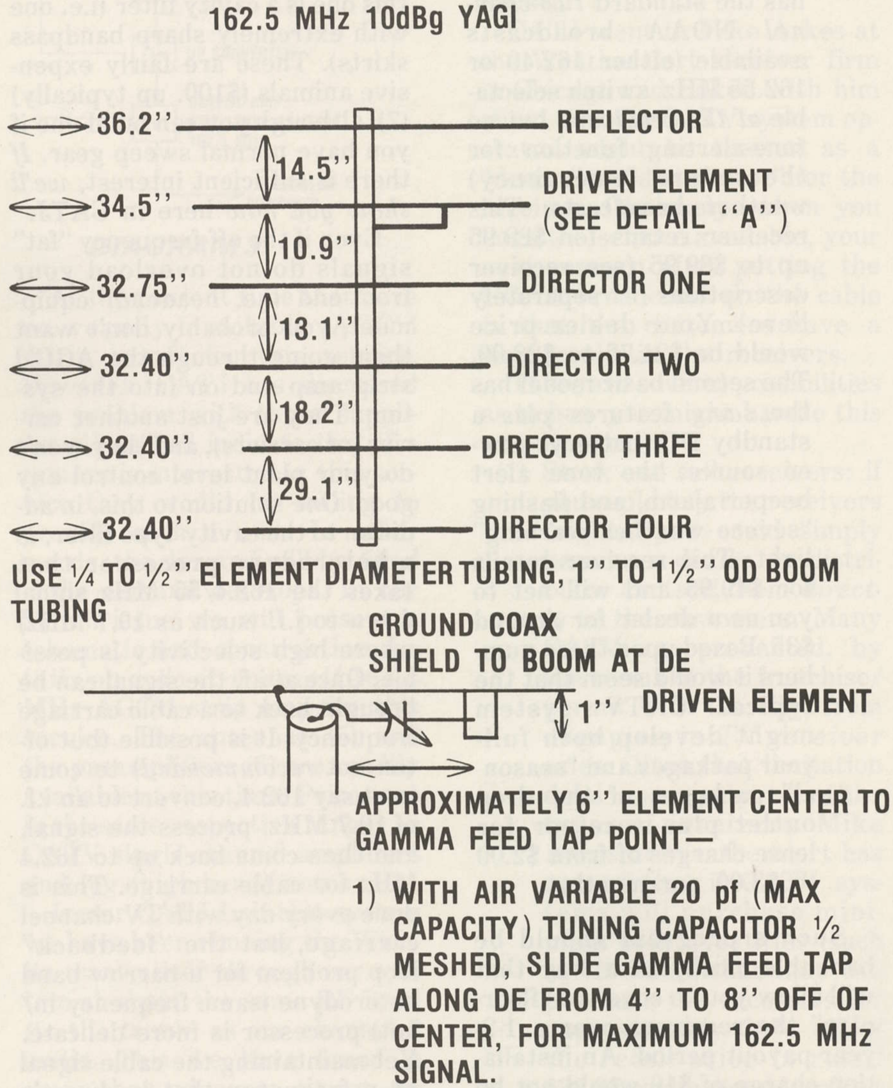


DIAGRAM 4

would not be as easily tone-alert adapted.

For now it remains a problem; with a *potential* long range solution.

Getting Started

The first logical step is to set up your own system to listen to the NOAA broadcasts. You may find they are something your community would like, or after listening, you may feel as a marketing decision that these broadcasts will do nothing for your business.

You may decide that the best place for you to use the service is as an audio companion to the present weather channel instrument display. Or if you like what you hear, you may decide that the full program with system-provided receivers is the way for you to go. Obviously, the first step is to listen yourself.

You can do this inexpensively by acquiring a receiver (8) and depending upon your location from the nearest transmitter, an antenna of modest size (9). Don't make the mistake of trying to press a high-band yagi (such as channel 7) into *temporary* service, flopped on its side for vertical polarization; unless you are within say 50 miles of the nearest NOAA transmitter. You could cut down a channel 6 consumer-type yagi, or you could build one in a few hours (Diagram 4).

If you are excited about the service, you may be tempted to "stick it on the weather channel modulator" with the instruments on a "temporary" basis. *Reconsider before you do that.* On one hand this is a fine way to *introduce* the service to your cable public. But *once* you have it on there for *free*, how difficult will it be to take it back off? If the public likes the service a lot, you may have egg on your face when you take it away from the free status and try to convert it to the "extra charge" status. You might consider running it on the weather channel *only for an hour each morning*, say from 7 to 8 a.m., as a regular *feature*. With an appropriate slide or card announcement telling viewers this special service is available 24 hours per day (with severe-weather warnings), this could be a very useful marketing tool for you.

(1) Hershel Tyler of the R.H. Tyler Company, Olney, Texas apparently was the first commercial supplier of the CATV weather-channel-format.

(2) The CEAS package is produced by CADCO, 2706 National Circle, Garland, Texas 75401.

(3) FM (band) audio modulators are available from Catel (1030 W. Evelyn, Sunnyvale, Ca. 94086) and Jerrold (200 Witmar Rd. Horsham, Pa. 19044) among others.

(4) Three potential sources for AGC'd 162.5 MHz strip amplifiers are Catel (see reference 3 here); Q-BIT Corporation (P.O. Box 2208, Melbourne, Fl. 32901); and Richey Development Company (1436 SW 44th Street, Oklahoma City, Oklahoma 73119).

(5) The Winegard Company (3000 Kirkwood, Burlington, Iowa) has a consumer-type 75 ohm 162.40/55 MHz yagi called the WS-75. It should be adequate for up to 80-90-mile ranges when mounted 200-400 feet above ground. U.S. Tower and Fabrication (P.O. Drawer S., Afton, Oklahoma 74331) has a special 162.40/55 MHz log antenna that mounts directly to tower legs up to 4 inches in diameter, 75 ohm coax feed, 12 dB gain (model WS1275).

(6) Preamplifiers for 162.40/55 MHz are available from Q-BIT Corporation and Richey Development Company (see reference 4 here).

(7) Decibel Products, Inc. (3184 Quebec Street, Dallas, Texas 75247) has three bandpass cavities covering the 162 MHz range available. Model DB-4001-1 is a single cavity with 20 dB down skirts +/— 5 MHz wide. Model DB-4001-2 is a dual cavity with 20 dB down skirts +/— 1.1 MHz. Model DB-4001-3 is a triple cavity with 20 dB down skirts +/— 0.5 MHz. These are all 50 ohm cavities. Prices range from $90 to $280 for the three units.

(8) Weatheralert receivers are available in single unit quantities from CATV Surplus Sales Company, P.O. Box 20335, Oklahoma City, Oklahoma 73120 as follows: Model TA3F (with beeper tone-alert alarm and signaling light) for $49.95; Model TA-4 (standard two-channel receiver, no tone-alert function) for $29.95.

(9) The Winegard WS-75 yagi should prove adequate for initial tests; see reference 5 here.

75/76 FCC MEASUREMENTS II
(Hum Mod Without Test Equipment And Much More)

As We Were Saying

In the December CATJ considerable space was devoted to the new measurement this year; checking the cable carriage frequency of any Class I channels (a class I channel is a signal originally broadcast through the air by a broadcast station, and carried on the cable channel on its original channel or on a new cable channel), when some form of frequency conversion is employed between the over-the-air transmitter and the CATV subscriber receiver input terminals. Readers not familiar with that particular treatment of frequency-measurement-channels are advised to obtain a copy of the December (1975) CATJ if they intend to follow the material outlined here in performing all of the required 1975/76 FCC tests (1).

A year prior, in the December 1974 issue of CATJ, the basic measurements required one year ago were covered in some detail. And truthfully, the measurements to be made this year are identical to those 74/75 measurements covered in the December 1974 CATJ; with the addition of the afore mentioned frequency measurements.

Seemingly, we could:

(A) Reprint in total, the December 1974 CATJ instructions, or,

(B) Simply refer you to that issue of CATJ for instructions.

We could, but we won't. We won't because during the past year some of the questionable techniques have been clarified by informal discussions with Commission personnel, and there have been dozens of talks between CATJ and users of the December 1974 instructions; aimed at our preparing a more comprehensive or field-useable set of instructions for 1975/76.

76.605 (a) (7) / Hum Mod

Section 76.605 (a) (7) states as follows:

"The peak-to-peak variation in visual signal level caused by undesired low frequency disturbances generated within the system or by inadequate low frequency response shall not exceed 5% of the visual signal level."

In plain English language, is there 60 cycles in the picture? Is there *sufficient* 60 cycles to cause *objectionable* picture degradation? Sixty cycle AC is present throughout the CATV plant; wherever there is AC powering and RF signals together on the same cable or in the same electronics box.

Now 5% hum modulation is the numerical equivalent of an "interfering signal" that is 26 dB *down* from the desired signal. That is, the signal strength of the hum (signal) is 5% of the signal strength of the RF signal.

There are several techniques for *measuring* hum mod, we will cover one of them here. There is *also* the subjective "eyeball test"; which, like the "subjective eyeball frequency - beating - test" described on pages 20-21 of the December 1975 CATJ can be performed by *anyone* with a receiver and 20-20 vision (corrected if necessary).

Last year (page 28, December 1974 CATJ) we said:

"Turn on a TV set at the test measurements point and switch through the channels. Do you see any 60 cycle hum bars in the picture? If you do, but they are very faint, you are well under 5%. If they are objectionable, you are approaching 5% or exceeding it."

This year we want to take that kind of "subjective testing" one step further, and we have prepared some off-the-screen photos to illustrate. There are two sets of photos (following pages) which demonstrate the following:

(1) If you check an unmodulated carrier (i.e. such as a standby carrier, a commercial TV signal during those infrequent split seconds when the screen goes blank, or a processor [strip or heterodyne] driven by a CW signal from a signal generator) at a testing location, you can determine with a fairly high accuracy the *apparent* percentage of hum mod present on the unmodulated carrier at that location.

(2) If you lack the facility or equipment or ability to inject a CW (un-modulated) carrier into a standard TV channel, on approximately the visual carrier frequency of the channel, you can with somewhat less accuracy observe the "effects" of hum mod on a modulated TV signal and estimate the percentage of hum mod present, or not being exceeded at that point.

To prove this point we took a channel 7 modulator, a 60 cycle source, a video source (local camera) and a Texscan VSM-2 spectrum analyzer and with the assistance of Steve Richey put together a system to purposefully inject from 1 to 10% hum modulation into the video-input spigot on the modulator. Coincidentally Larry Dolan of Mid State Communications was in town, and as a *somewhat* impartial observer (Mid State does not make a scope, and as a scope is required for the *other* measurement technique shown...) we produced the photographs shown within these pages. Dolan, being the super-engineer he is, was somewhat aghast at our approach to measuring hum-mod (the system we used to measure it was top drawer; Dolan wondered aloud about our showing how to do it with*out* test equipment by publishing photos for you to reference your own hum mod to). The results speak for themselves.

If this approach is not adequate for you, a technique to perform this test with test equipment follows the outline shown in diagrams 1 and 2.

In this sequence, any straight AØ (i.e. CW/continuous wave carrier that has no modulation content of its own present) may be injected at the headend. To be very sure of yourself, check the output of the signal generator for internal hum mod *before* plugging it into the headend (or if you have an AØ, CW carrier in the form of a pilot carrier already on the system; check it alone for hum mod content). This is done by simply following the detection/scope display technique outlined here, except, rather than plugging into the system for the tests, you plug directly into the pilot carrier/CW source before any *system* introduced

Continued page 24

(1) *General test requirements were discussed in the December 1975 issue of CATJ. A 1975/76 FCC Test Compliance Handbook is available from CATJ for $25.00 per copy; includes test-log forms for making each test required.*

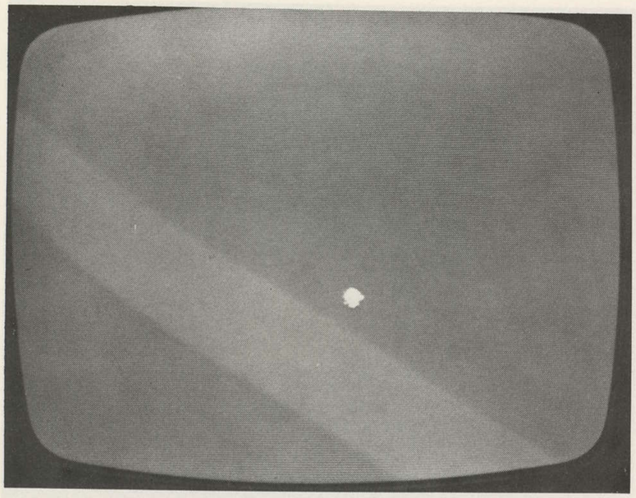


PHOTO ONE—Blank screen for reference. Diagonal line is result of focal plane camera shutter (see text) and white dot was caused by inept photo printer.

PHOTO THREE—3% hum mod shows evident 60 cycles.

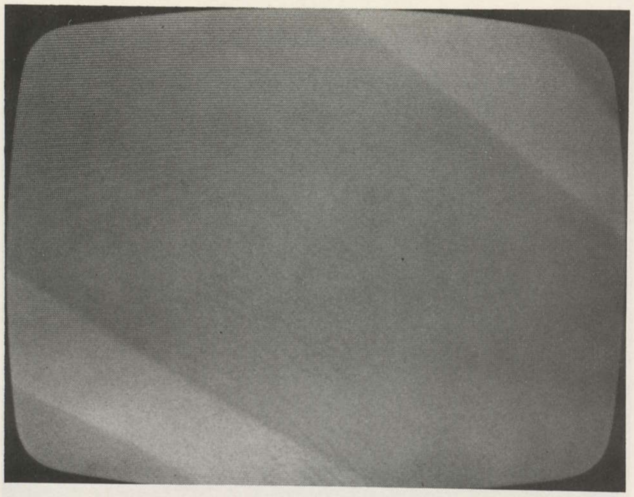


PHOTO TWO—2% hum mod shows ever-so-slight indication of lighter area across bottom 25% of screen.

PHOTO FOUR—4% hum mod has darker 60 cycles; bar had moved slightly shorter distance up screen resulting in greater percentage of black than white; i.e. photo 3.

SUBJECTIVE HUM-MOD TESTS

In an effort to bring home to smaller systems without scope measurement capabilities the reality of section 76.605 (a) (7), CATJ has prepared a set of picture tube photographs depicting the appearance of the CRT face with varying amounts of hum mod present.

These tests were set up using a Richey Development Company modulator on channel 7, and a ''mixed'' video input consisting of video drive from a camera and a controlled amount of 60 cycle AC. The modulator was ''modulated'' with the AC signal to correspond to various levels of hum mod between 3 and 10%. The tests were conducted by monitoring the indicated modulation percent with a Texscan VSM-2 spectrum analyzer.

The test photos shown here were taken from a black and white portable receiver adjusted to the channel 7 modulator for a reasonable contrast picture. The camera utilized unfortunately had a **focal-plane** shutter; a nice shutter for most applications but not the best choice for depicting a blank screen (or lightly modulated screen) TV picture tube. The focal plane shutter unfortunately functions in such a way that it leaves a diagonal bar, light against a grey or dark screen, dark against a light screen. Thus in the photos you see the focal plane **effect** running **diagonally** from upper left to lower right. This effect is **not** on the CRT screen itself; it is caused by the focal plane shutter in the camera chosen for this task. Ignore it, please.

We have received a few letters from readers asking how best to photograph a TV picture tube screen. The process is quite uncomplicated. If you have a fixed shutter camera, with no aperture or speed adjustments, use a fast TRI-X film. Use no flash, adjust the TV screen for slightly more contrast than you would normally find enjoyable and for slightly higher brightness also. Get close enough to frame the TV screen but no so close as to exceed the minimum focus distance of the camera. Any of the inexpensive Kodak cameras will do the job. Do not use color film.

For slightly better results, use a camera with adjustable speed and F stop, such as any of the popular 35mm cameras. Install TRI-X (ASA 400) film, and set the camera to 1/30th of a second exposure time. This corresponds to the frame rate of the TV receiver. Set the F stop opening to F4 / F5.6. Adjust the receiver for slightly higher contrast and slightly higher brightness than normal. Focus and shoot. The films may be developed in the standard way using normal drug-store commercial developer/printers.

It is worth noting in these photos that had we been **smarter** before we shot the pictures, we might have placed a white sheet of paper with a simple cross on it (one vertical line, one horizontal line) in front of the local camera. Then the dark bar from the hum would have had a white background to appear against, and, the integrity of the straight up and down vertical bar and the straight left and right horizontal bar would have been a measurement of sync integrity. We might have been smart to do that, **except**, you **never see such a picture** on commercial TV so we felt the **best** approach would be to simply let the local camera shoot across the room against a folding chair and a door frame. The top of the chair provides a horizontal line; the door frame provides a vertical line. This is not an award winning scene, but it comes closer to being a scene you might see on the commercial tube and that is where you will be running your own tests. (Richey tried to sneak a sign against the wall above the chair but we caught him at it; the sign advertised one of his products. We did invite Larry Dolan of Mid State to sit down in the chair for

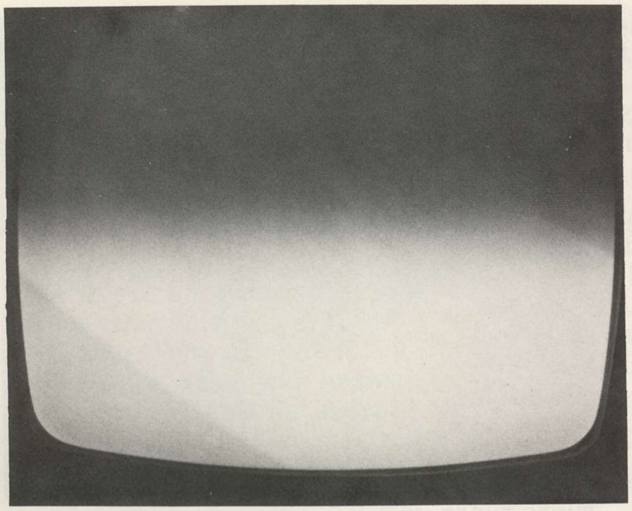


PHOTO FIVE—5% hum mod; the maximum viewer/spec tolerance level.

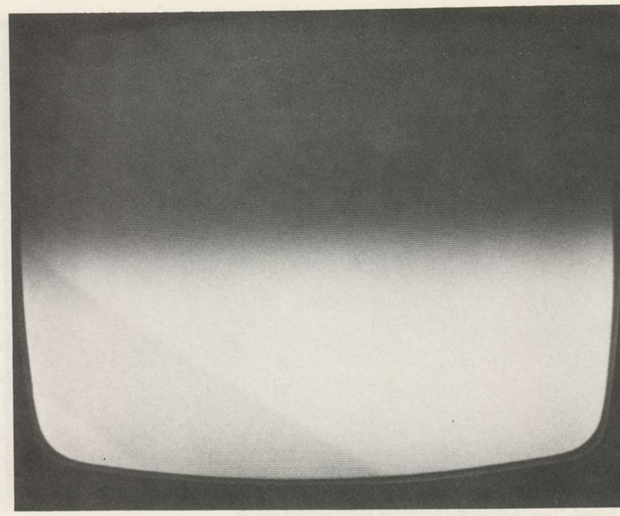


PHOTO SEVEN—7.5% hum mod; once you get black, getting blacker just doesn't look much different.

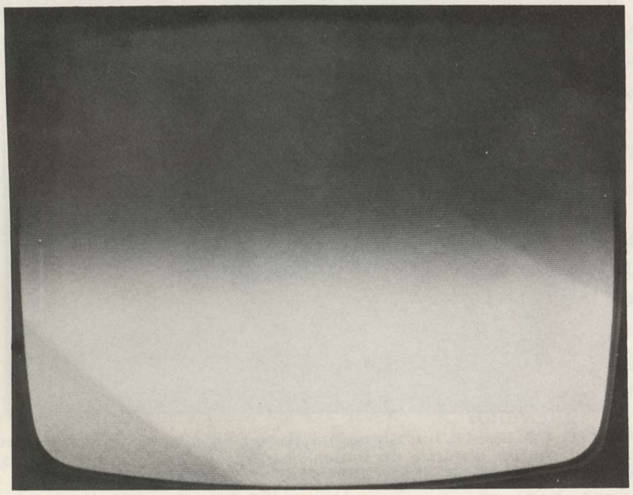


PHOTO SIX—6% hum mod; vertical lines in picture are now starting to tear (see text).

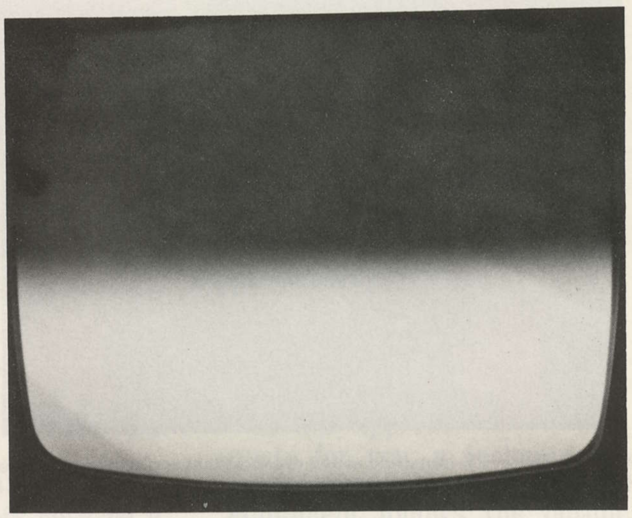


PHOTO EIGHT—10% hum mod. At this point every viewer in town is ready to run you out of town on a rail!

some flavor but he said people are already accusing him of being too friendly with us. Besides his wife thought he was in San Francisco that trip anyhow; **not OKC!**)

The photos begin at 0% for blank screen, go to 2% (if you look closely and if the printer does a good job with the magazine you **may** be able to see the bottom-4th of the screen is slightly lighter than the top 75%), then to 3% (now the hum mod on the blank screen is quite apparent) and so on up to 10%. The legal break-over point is 5%; photo 5.

Now on a blank screen (i.e. a carrier modulated only by the 60 cycles) the 60 cycles shows up pretty fast. This is why we suggest you take a channel on your system and strip it of any modulation at the headend; i.e. take a modulator and disable the video modulation source, terminating the video-in jack on the modulator in the process. However, on a screen with video modulation present, we have a different story.

In photo A-1 we have 3% hum mod mixed with the camera video. You would be hard pressed to tell there was 60 cycles there. You can ignore the slightly leaning door jam at the top of the screen; either Richey's local TV camera had a problem or Richey's carpenter forgot his T square.

In photo A-2 we have 4% hum mod mixed with the video. The lower approximately 1/3rd of the screen is darker than photo A-1; caused by the 60 cycle bar laying over the bottom of the screen at this point. Not terribly objectionable, but the contrast suffers because of its presence.

In photo A-3 we have 5% hum mod mixed with the video. The bottom 1/3rd of the screen has all but gone black; you can still tell the chair back is there but without photos A-1 or A-2 you would not be able to tell it was a chair back. Alternately, the white portion of the 60 cycles has overlaid the top portion of the screen and it looks unnaturally white as a result. Note however that aside from the funny distortion at the top of the door jam, the vertical door frame is still a **straight** line.

In photo A-4 we purposefully readjusted the receiver contrast control for the camera-scene photos so that the dark bar would be less prominent. We did this to **point up** what happens to the vertical door frame when you get to 7.5% hum mod. That nice straight door jam is now warped. Look just to the left of the door knob and compare the door frame with the door frame in the prior pictures. The hum mod at this point is severe enough that it is interfering with the sync circuit and picture **distortion** on **vertical** lines is evident. This actually **begins to show up at the 6% hum mod point**, although we don't show the photo here. So if you see the vertical lines in a picture warping, you can be reasonably assured that what you have in the way of hum mod is exceeding the 5% maximum allowed by the rules.

And perhaps if you get nothing else out of this short discussion but that fact (**vertical line distortion indicates hum mod in excess of 5%**), the time you have taken to read this through will have been worthwhile.

PHOTO A-1—3% hum mod with video modulation present. See text.

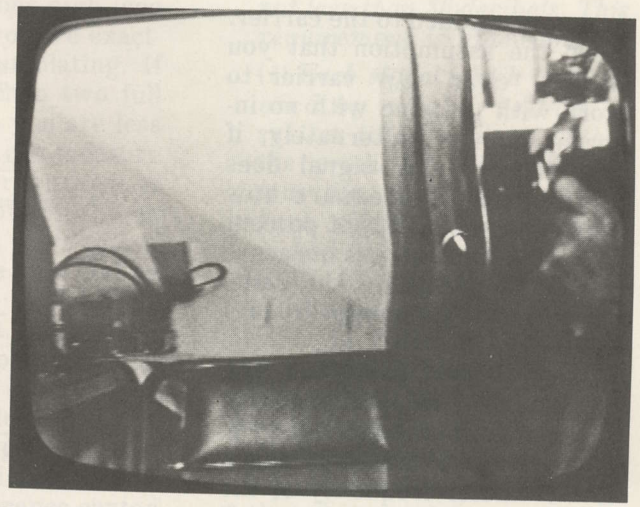


PHOTO A-4—7.5% hum mod with video present. Distortion of vertical lines is evident in door jam/frame just to left of door knob (center).

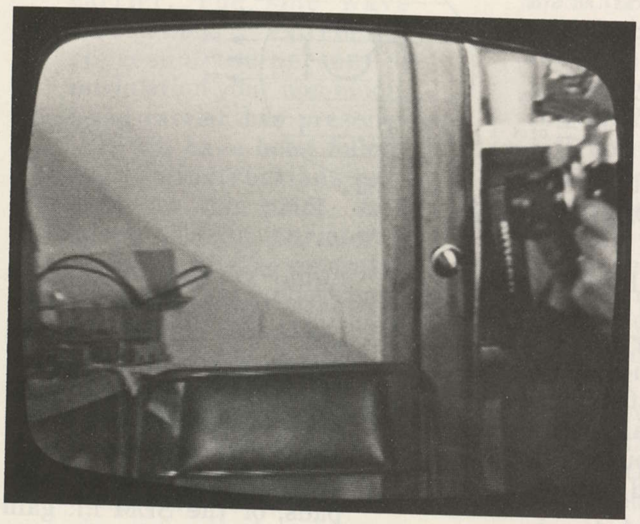


PHOTO A-2—4% hum mod with video modulation present. Note slight darkening of picture on bottom portion of screen, reference photo A-1.

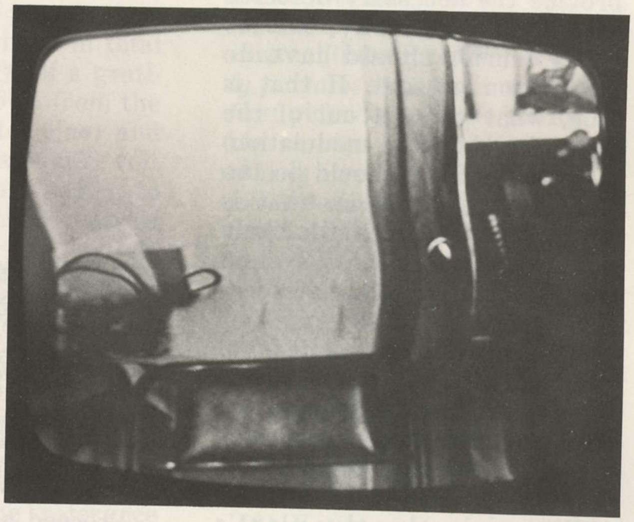


PHOTO A-5—10% hum mod. Vertical distortion is apparent throughout picture including the dark marks on Richey's wall (left, slightly lower than door knob).

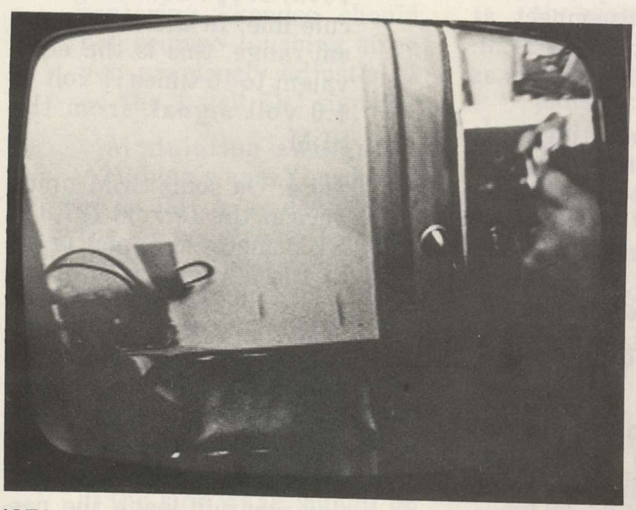


PHOTO A-3—5% hum mod with video modulation present. Bottom portion of screen is gone sufficiently dark than any detail is hardly noticeable.

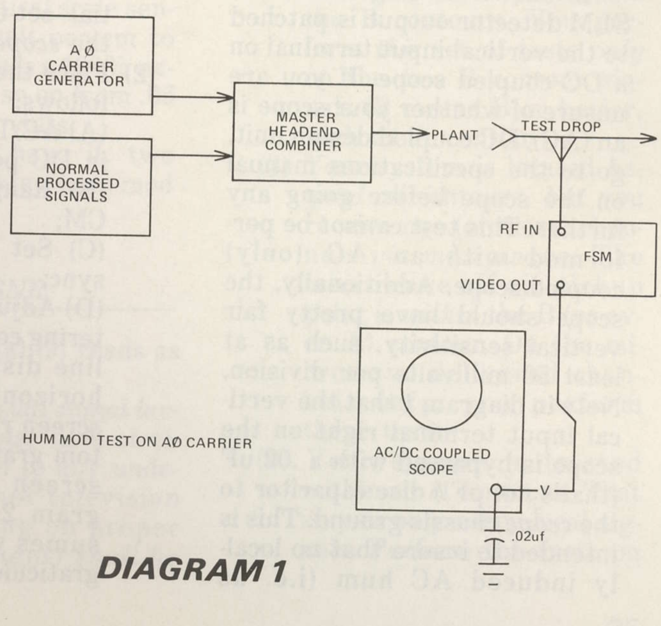


DIAGRAM 1

hum can be added to the carrier.

On the assumption that you have a "clean" CW carrier to work with (i.e. one with no inherent hum or, alternately, if you find the CW signal does have hum, you measure how much and subtract that percent from any amount you measure *within the plant* on the same carrier), we are ready to proceed.

At your test locations, the equipment is set up as shown in diagram 1. The frequency selective voltmeter (SLM) is tuned to the carrier frequency of the pilot/test (CW) carrier and peaked on the SLM. Any SLM with a video output jack will provide the necessary detected signal. Theoretically, the AØ (CW) carrier should have no modulation present. If that is true, what you get out of the video (i.e. detected modulation) jack on the SLM should be the equivalent of a carrier that is not modulated. Since it is likely that even in the best system there is going to be at least *some* (small hopefully) amount of "modulation" present from the plant's 60 cycle AC powering source, any modulation we read out of the video output jack should be the equivalent of the modulation added to the AØ (CW) carrier by the plant's (and/or headend's) 60 cycle powering circuits.

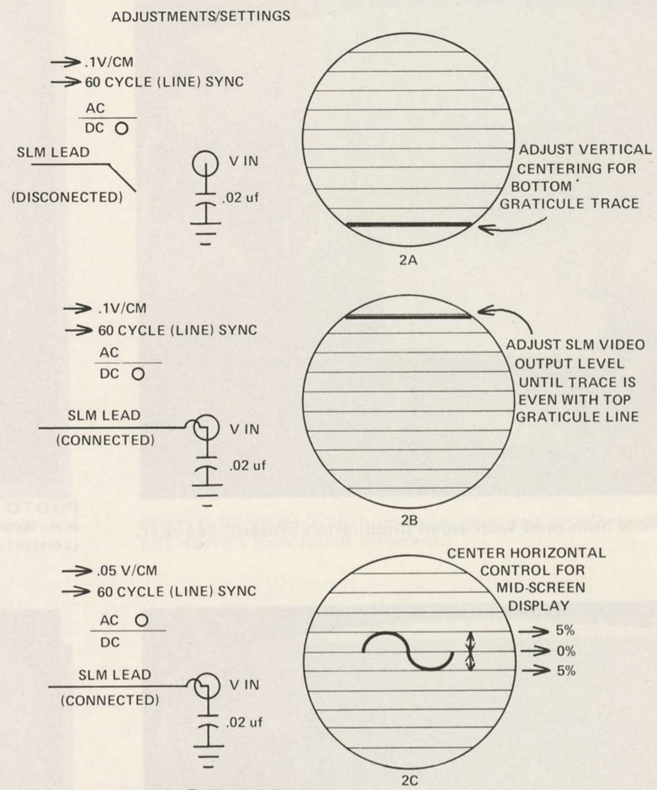


DIAGRAM 2

As shown in diagram 1, the SLM detector output is patched to the vertical input terminal on a DC coupled scope. If you are unsure of whether your scope is an (AC)/DC coupled design unit, go to the specifications manual on the scope before going any further. This test can*not* be performed with an AC (only) coupled scope. Additionally, the scope should have pretty fair vertical sensitivity, such as at least 50 millivolts per division. Note in diagram 1 that the vertical input terminal right on the scope is bypassed with a .02 uF (that's not pF!) disc capacitor to the *scope* chassis-ground. This is intended to insure that no locally induced AC hum (i.e. as picked up by the lead from the SLM to the scope) is coupled into the scope's vertical circuits. Finally, operate the SLM on the *internal* (DC) battery mode to be doubly sure that no AC from the SLM power source gets into the SLM detected output.

Proceed as follows:

(1) Disconnect the SLM detected output lead from the scope vertical input for initial set-up. Disconnect at the *scope*, not at the SLM.

(2) Place the scope controls as follows:
(A) AC/DC operating mode in DC position;
(B) Range to .1 volt per CM;
(C) Set to line (60 cycle) sync;
(D) Adjust the vertical centering control for a straight line display that is even horizontally across the screen right along the bottom graticule on the scope screen display (see diagram 2). *Note:* This assumes your scope-screen graticule is divided into 10 equal vertical segments with ten horizontal lines; the most common scope screen graticule format.

(3) Now re-connect the SLM detector output back to the scope's vertical input jack. Adjust the SLM switchable pads, or the SLM i.f. gain control so that the horizontal display line seen comes exactly to the top-most (i.e. 10th) scope screen graticule line, In the .1 volt per cm range, this is the equivalent to 10 times .1 volt or 1.0 volt signal, from the SLM.

Note: On some SLM units, such as the Jerrold 727, the SLM meter will peg or go to the far right side of the meter display when you adjust the video output voltage as just described to 1.0 volt output. Do not panic; no harm will come to the SLM meter movement during the relatively brief period you will leave the needle "pegged."

(4) Leaving everything as just

set, go to the scope and switch from the .1 v per cm range to the .05 volts per cm (50 millivolt scale) range. This should produce a display that loses the 1.0 volts of SLM signal off of the top of the screen (full screen height is now 0.5 volts). Now switch from the DC coupling position to the AC coupling position on the scope (usually a two-position slide switch). The display should be similar to that shown in diagram 2C. This sine wave is the detected 60 cycle modulation appearing on the originally un-modulated AØ (CW) carrier. The sine wave modulation extremities represent the percent of modulation your non-modulated carrier has present.

If you have been following the instructions precisely to this point, each scope screen horizontal graticule line is separated from the lines above and below it by 5% (you went from 10% *per division* to 5% per division when switching from .1 volt per CM to .05 volt per cm).

Adjust the horizontal centering control so the sine wave displayed is centered on the screen (do *not* touch the vertical gain control of the scope; vertical centering likewise should not require touching since you previously adjusted it on the 1 volt DC signal).

Modulation swings (in AM) both ways. You should go as far up as down from the scope screen "center" (reference) graticule. If you are no higher, and lower (i.e. no wider than) 1 full graticule division each side of center with the sine wave appearing, you are not exceeding 5% hum modulation. The *full height* of the sine wave should be no more than *two* graticule divisions. If you are exactly two full divisions high (see diagram 2C), you are exactly 5% hum modulating. If you are less than two full divisions high, you are less than 5%. You can measure the exact percentage of hum mod (you might as well go ahead with this if you have gone this far) as follows:

(5) Assuming you are not exceeding five percent, you can eye-ball the scope screen graticules down to a full division high (i.e. ½ a graticule division either side of the reference center line) with fair accuracy and at that 50% point you are 2.5% (or half of 5%) hum modulating. If you are less than a full division in total height (i.e. 50% of a graticule up and down from the reference center line) and your scope has a .025 volt per cm position, switch to it. With all other controls left alone each graticule *division* is now 50% of 5% or 2.5%. If you now read your hum mod sine wave to be 50% of a full graticule division, you are measuring 50% of 2.5% or 1.25% hum modulation. And so on. What you do each time you step below the reference original 1.0 volt (DC) scale-calibration level (back in step number 3) is to double the scope vertical scale sensitivity. 0.1 volt per cm to .05 volt per cm is a 100% expansion; and so on from .05 volts to .025 volts.

And there you have it, two approaches to making hum-mod measurements.

76.605 (a) (9) / SNR

Section 76.605 (a) (9) reads as follows:

"The ratio of visual signal level to system noise (and of visual signal level to any undesired co-channel television signal operating on proper offset assignment) *shall be not less than 36 decibels. This requirement is applicable to:*

(1) Each signal which is delivered by a cable television system to subscribers within the predicted Grade B contour for that signal, or (2) each signal which is first picked up within its predicted Grade B contour."

At the present time, only that portion in italics is applicable, the co-channel measurement is not applicable for systems grandfathered as of March 31, 1972. Only the signal-to-noise ratio portion affects such grandfathered systems.

Note that regardless of whether you are a grandfathered system or a newer system, measurement of SNR and/or co-channel (interference) levels *only pertains* to signals which are *first* picked up off-the-air for cable service at a pick up point that is *itself* located *within the predicted Grade B contour* of the station (i.e. channel) in question.

For example:

(1) You are not carrying any signals which place a B or better signal over your grandfathered CATV system or headend. *You* do *not* make *any* tests for section 76.605 (a) (9).

(2) Your system is located within two B contours, but you also carry six signals that are received beyond the B contours. You perform *this* set of tests *only* on the *two* B contour signals (B means B or better, such as A contour).

(3) Your system is located *beyond all* contours, *but* you receive one (or more) channels *via microwave*. The microwave off-air pickup point *is within* the B (or even A) contour. On the microwave delivered channels *only*, you perform these tests.

(4) Your system is located within all A contours. That is, you only carry local signals. Perform the tests on

all channels you carry.

With those conditions, the tests follow.

The measurement seeks to determine the ratio between *system noise* (including all sources internal to the system *and* external) and the *signal level* of the visual carrier being measured. See diagram 3.

The measurement instrument is an SLM. The tests can be performed with a spectrum analyzer as well, but because so few systems have access to an SA we will not cover that form of measurement here.

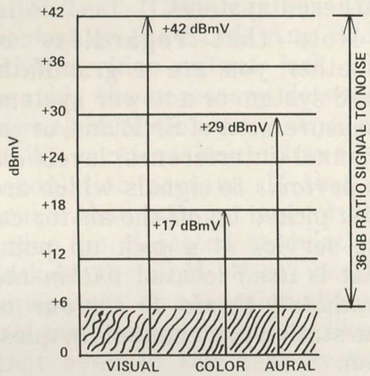


DIAGRAM 3

The SLM is inherently *measurement-limiting* in that it will *not* read accurately (or at all) with signal levels down below say —20/—30 dBmV. Therefore, it is always advisable to make this test at a high-signal-level source point. This means at the output test point tap on an amplifier, where the indicated level will be the line extender output minus the test point isolation (typically 20 dB). See diagram 4. The rules state that measurements must be made at real *or* simulated subscriber locations. However, *this measurement* can be made at the *output* of the line extender amplifier serving the *real* location because *after* this point there are no further active (i.e. amplifying) components in the system to change the relative voltage levels of noise and signal. Therefore the relationship between signal and noise established at the output of the line extender serving the drop itself (even if the drop is many hundreds of feet away from that point) will "hold" for the drop as well. This is because all loss after this point is *passive* and both signal and noise levels will attenuate *proportionately.*

To make this measurement, you should have an input level to the SLM of not less than +10 dBmV and ideally +20 dBmV. This means the line extender with a 20 dB "down" test point on the output should have an output level on the channel-to-be measured of from +30 dBmV (+10 added to the 20 dB isolation) to +40 dBmV (+20 added to the 20 dB isolation). You *might* get by with an *indicated* level as low as +3-5 dBmV on the SLM, and after the line extender test point *on low band,* but *not* on high band.

The equipment required is:
(1) SLM
(2) Step-pad (attenuator) with 1 dB step capability
(3) 75 ohm terminator

The procedure is as follows:

(A) Set the step attenuator for at least 50 dB through attenuation (note: you may have to series two step attenuators to get this high a value);

(B) Insert the attenuator(s) between the line extender output test point and the SLM (see diagram 4).

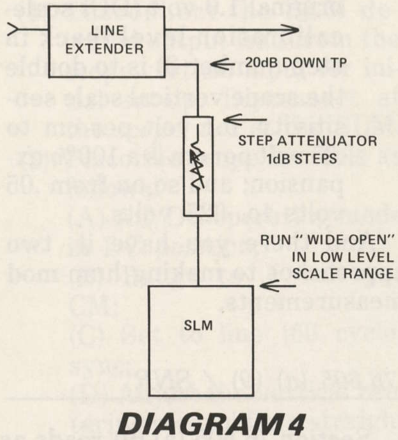


DIAGRAM 4

(C) Tune the SLM to the visual carrier of the channel being measured. Remove attenuation from *the SLM* until you have a *mid-scale* reading on whatever range happens to give you a mid scale reading with 50 dB of pad(s) ahead of the SLM. Set the SLM to read any convenient number such as "0" on a —10 to +10 meter scale "window."

(D) Call, radio, or otherwise signal the headend to have the input to the processor for that channel disabled and the input downline replaced with a 75 ohm terminator.

Note: If the processor automatically goes to a standby carrier mode when the input signal is removed, *disable the standby carrier* so that you have the processor running (i.e. operating) with*out* a standby carrier *and* with*out* any input signal present.

(E) Now at this point your SLM should indicate no signal level present. There *is* signal there, noise signal, but it is *below* the level you were previously measuring with the carrier present. Do not touch the controls on the SLM. Remove attenuation from the in-line step-pad (attenuator) until the SLM *reading noise now* comes back to the *same meter-scale-point* as the signal had originally indicated.

(F) When you have removed just enough attenuation from the external pad(s) to match up the meter scale readings between the carrier-signal and the noise-signal, calculate *how many dB* of pad you *took out of the external attenuators* to arrive at the matched meter-reading point. That number of dB is your preliminary signal to noise ratio.

Example: You placed 50 dB of external pad in to begin with. You adjusted the SLM attenuator controls to read 0 (center) on the —10 to +10 (numbers, not dB) scale. You had to take 38 dB of pad out after going from signal carrier to noise signal to arrive back at the same "0 reading" on the SLM meter face. Your preliminary signal to noise is, therefore, 38 dB, equal to the number of dB of pad you removed to make both readings coincide.

This is the practically universal approach to making this measurement. It is probably less than accurate, honestly. For one thing, the SLM bandwidth is *smaller* than the bandwidth of the TV channel. Therefore the 38 dB number in our above example must be *corrected* to relate to the narrower bandwidth of the SLM. When you *halve* the bandwidth of a receiver (an SLM is a receiver) you pick up a 3 dB *improvement* in indicated signal to noise ratio. I.e., there is less noise (by 3 dB) in a receiver i.f. 2.0 MHz wide than there is in a receiver i.f. 4.0 MHz wide.

Therefore, *whatever number you read* on your SLM must be corrected, inversely, to track or correspond to a real TV receiver i.f. bandwidth. The typical TV receiver is 4.0 MHz wide in the i.f. at 3 dB bandwidth points. The *typical* SLM is 600 kHz wide at the 3 dB points. Therefore for the *typical* SLM the correction factor is 4 divided by 2 = *3.0 dB* plus 2 divided by 1 = *3.0* dB (6 dB running) plus 1.0 divided by .6 = *2.5* dB (8.5 dB running). Therefore, to correct for a *typical* 600 kHz i.f. bandwidth of a *typical* SLM, the correction factor rightfully is 8.5 dB. This 8.5 dB must be *subtracted* from whatever signal to noise ratio you have read.

The FCC spec is 36 dB signal to noise. With a 600 kHz i.f. SLM, the readings you make should indicate 36 + 8.5 or 44.5 dB *SLM indicated* signal to noise or you are probably *not* meeting the FCC spec. Thus the reason for having 50 dB of *external* pad.

Most of the industry and the FCC accepts this approach to this measurement (the FCC talks about it in Measurements, 76.609 [e]). Rightfully, it is something less than *totally* accurate. For one thing, the noise figure of the processor plays a very large part in the result. The noise figure of the processor will *typically* be 10-14 dB. This is the "figure of merit" of the front end of the processor, and with a 75 ohm terminating resistor, this means the processor will be generating 10-14 dB of noise *above* the absolute noise floor of —59 dBmV for a 4.0 MHz bandwidth. Thus the front end of the channel, the processor in this case, is starting off at a point 10-14 dB (i.e. the noise figure of merit of the processor) *over* the noise floor (i.e. no noise) of —59 dBmV.

If you have a marginal kind of signal, the chances are excellent that you have a pre-amplifier. The pre-amplifier virtually always has a *lower* noise figure (i.e. lower amount of internal noise generated) than the processor. This is to help the relatively noisey processor establish a better signal to noise ratio.

When you terminate the processor, to make this test, you are *giving away* signal to noise ratio equivalency of the numerical *difference* between the noise figure of the pre-amp and the noise figure of the processor.

In round - kinds - of - numbers, if the processor noise figure is 12 dB and the pre-amp noise figure is 2 dB, you are giving away for the tests *some part of* 10 dB of signal to noise.

Therefore, the *right* way to make this test is to terminate not the processor but the pre-amplifier. This is not always possible *or practical,* because of the typical tower mounted pre-amp location. It follows then that *in addition to* the correction factor for the SLM i.f. bandwidth vs. the typical TV receiver 4.0 MHz i.f. bandwidth, that you should also correct for the measurement degradation you have purposefully allowed to creep into your measurements by starting at the processor with a termination rather than at the lower noise (tower mounted) pre-amplifier.

CATJ therefore *suggests* that if your equipment manual for your processor lists the noise figure as (say) 12.0 dB, and your equipment manual for your pre-amplifier states the pre-amp noise figure is (say) 2.0 dB, that you perform the tests as noted, making the subtractive correction for SLM i.f. bandwidth. Then, for your "bottom line" entry, make an "additive correction" for the difference in noise figure between your processor and your pre-amp. See diagram 5.

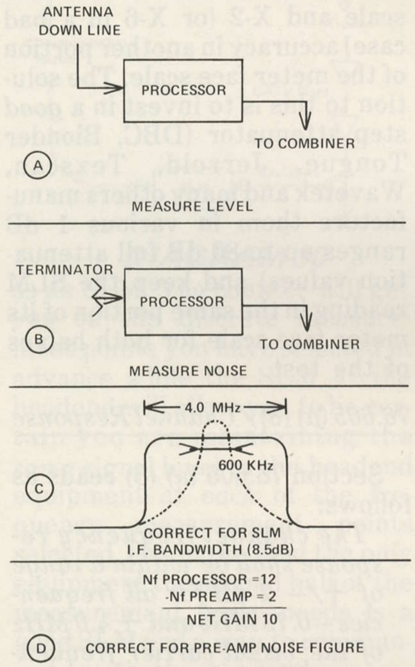


DIAGRAM 5

Example:

(1) SLM indicated signal to noise ratio at point SLM reads same level on meter with noise as on signal: 38.0 dB (as indicated by the amount of attenuator pad removed);

(2) Correction factor for 4.0 TV i.f. to 600 kHz SLM i.f.; subtract 8.5 dB, = 38.0 — 8.5 = 29.5 dB signal to noise.

(3) Correction factor for manual-listed processor Nf of 12.0 dB vs. manual-listed pre-amp Nf of 2.0 dB; add 10 dB to 29.5 dB for actual signal to noise of 39.5 dB. This is still not absolutely correct, but it is closer than *not* making any allowance

for the pre-amp at all.

Finally, you may wonder why we utilize an external pad vs. simply using the pads (attenuators) in the SLM. If you recall the thorough study performed by CATJ on SLM units in November-January of 1974/75, you already know the answer. The SLM has difficulty maintaining linearity over its meter *face* scale range. If you rely solely on the SLM, you will be reading with "X" percent accuracy in one portion of the meter face scale and X-2 (or X-6 in a bad case) accuracy in another portion of the meter face scale. The solution to this is to invest in a *good* step attenuator (DBC, Blonder Tongue, Jerrold, Texscan, Wavetek and many others manufacture them in various 1 dB ranges up to 80 dB full attenuation values) and keep the SLM reading in the same portion of its meter face scale for both halves of the test.

76.605 (a) (8) / Channel Response

Section 76.605 (a) (8) reads as follows:

"The channel frequency response shall be within a range of +/— 2 dB for all frequencies—0.75 MHz and + 4.0 MHz of the visual carrier frequency."

This pertains to all off-air signal (i.e. broadcast signals) channels as cable carried. If you have broadcast signals on 2, 3, 4, 6, 7, 9, 10 and 13; but locally originated or pay-cable or automated signals on 5, 8, 11 and 12 (or whatever other combination you may have), these tests relate *only* to the equipment and broadcast service delivered on 2, 3, 4, 6, 7, 9, 10 and 13 (or whatever).

Lacking summation-sweep equipment, there is no easy, quick, or convenient way to make this test. You *can* do it with any of the singular combinations of equipment to follow:

(1) Sweep generator, marker generator, SLM;
(2) Signal generator, (counter), SLM;
(3) 1/10 MHz (interval) marker generator, SLM;
(4) Sadelco 260-A broadband noise source, SLM or spectrum analyzer.

Additionally, a spectrum analyzer such as a VSM-1 may be substituted for the SLM in formats 2 and 3 as well.

The problem is shown in diagram 6. What you must ascertain is whether or not a response-flat input signal source, introduced at the input to the cable channel processing equipment, will come out at the test location flat to within +/— 2.0 dB over the frequency spread that begins 3/4 MHz below the visual carrier frequency and ends 4 MHz above the visual carrier frequency.

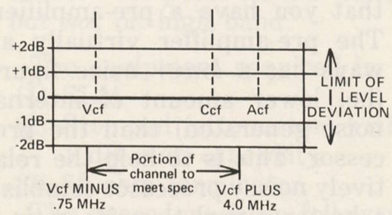


DIAGRAM 6

The response-flat input signal source should, *theoretically*, be introduced to the antenna from a radiating source in front of the antenna (diagram 7). That-is not possible, so in turn it should be introduced to the system at the output of the antenna (i.e. input to downline or pre-amp). This is also *not* practical, so the FCC has said informally to CATJ that you *may* begin this test at the input to the head end equipment *provided* you have manufacturer's data on the flatness (i.e. response) of the components ahead of the point where you start your measurements; and, when you have finished your measurements, you correct what you actually measured by adding or subtracting as the case may be the influences of the non-flat response to be *expected* with the antenna, the pre-amp, and any *other* equipment that may be ahead of your test-signal injection point.

As we said, there is no quick, easy, convenient way to make this test. And it must be repeated for all of the broadcast channels carried.

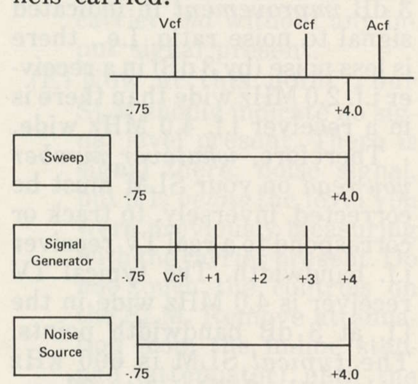


DIAGRAM 8

In diagram 8 we have the various input types which you might utilize for the test-signal source. You have a sweep input, a discrete (single) frequency signal generator input, and, a wide

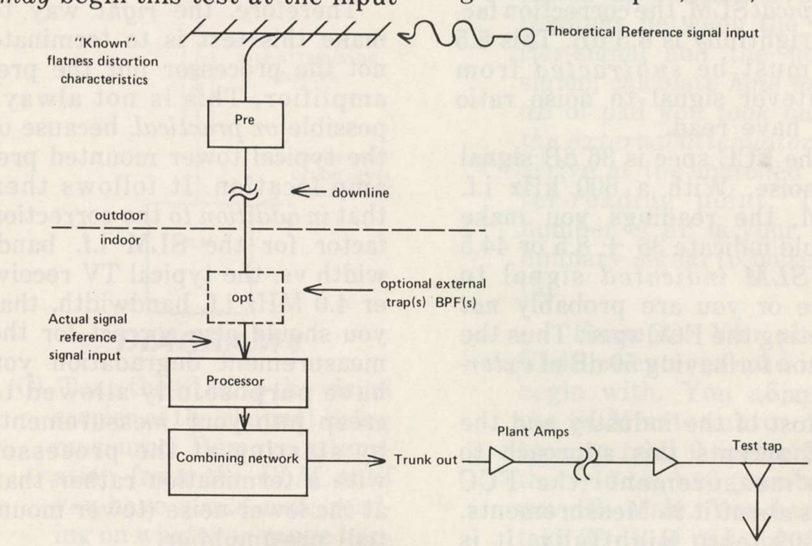


DIAGRAM 7

band noise source.

The sweep signal, assumed to be flat (*assumed* in the sense you have verified it is flat to within the sweep manufacturer's specifications in the 4.75 MHz wide range you are measuring on the signal channel), is introduced at the headend input test signal point. At some remote test-receiver location point, this sweep source signal is monitored on an SLM, or a sweep receiver for flatness; from visual carrier minus .75 MHz up to visual carrier +4.0 MHz. If the signal is flat going in, within the manufacturer's rated tolerances, and it is *not* flat at the receiving test location, the amount of non-flat you find is the amount of response deviation your headend plus plant equipment has introduced to the —.75 to +4 MHz span within the channel in question. Record that amount on your test log, and then go back after all tests are completed and correct whatever your read on location by the manufacturer's swept bandpass data for any equipment *ahead* of the sweep-injection test point.

Example: If the plot for the location appears as shown in diagram 9, and the antenna manufacturer shows his response to be as shown in diagram 9-A, while the pre-amp manufacturer shows his response to be as shown in diagram 9-B, then the cumulative response is as shown in diagram 9-C. Your test-log results, in table form or drawn-response form, should be similar to that shown in 9-C.

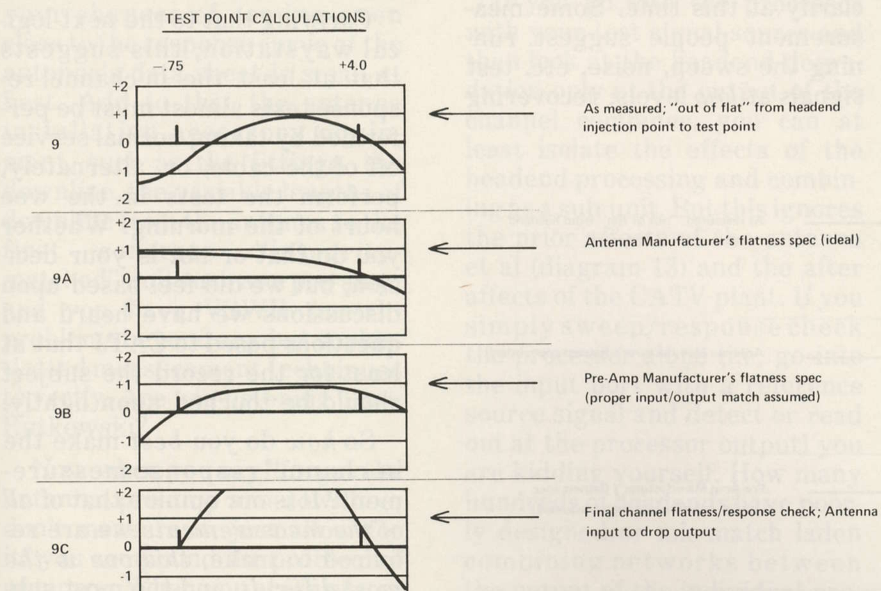
If your signal source at the headend test signal injection point is a tuneable signal generator, the only real problem you have is communicating between the headend and the field test location. And, being sure that when your test-signal (CW) generator is moved from one frequency to the other that (1) the receiving location operator knows what you have done and when you have done it, so he can follow, and, (2) that the frequencies you have adjusted the CW signal generator to, one at a time, through the sequence, cover the —.75 to +4 MHz region reference the visual carrier frequency.

If you set the equipment up as shown in diagram 10, you have a frequency counter on the CW generator at the headend as well as an SLM. The counter will get you on the discrete measurement points you have selected in advance while the SLM at the headend will allow you to be certain you are maintaining the *same* signal level to the headend equipment at *each* of the frequency - measurement - points selected. Out in the field the only equipment the second half of the measurement party needs is a good SLM and a way to communicate with the headend.

Typically, you place the signal generator in sequence on the following frequencies:

(1) Visual carrier frequency minus 1.0 MHz
(2) Visual carrier frequncy minus 0.75 MHz
(3) Visual carrier frequency
(4) Visual carrier frequency plus 2.0 MHz
(5) Visual carrier frequency plus 4.0 MHz

You might move in *1.0 MHz steps* above the visual carrier frequency, and you might go on up to Vcf plus 5 rather than 4 for the information it will give you. But it is not required for the test. *Neither* is the Vcf minus 1.0 MHz test, but that is excellent data to have on file when you are evaluating the impact of lower adjacent channel signals on your off-air processing capability.



Note: Plot indicates out of spec from +1 to +3.5 MHz by .1 to 1.0 dB.

AND— If an SLM is used in field to read "sweep," a CW Generator to mark -.75 and +4.0 must also be used. Additionally, the SLM could be grease-pencil marked in advance, although calibration would <u>not</u> hold.

DIAGRAM 9

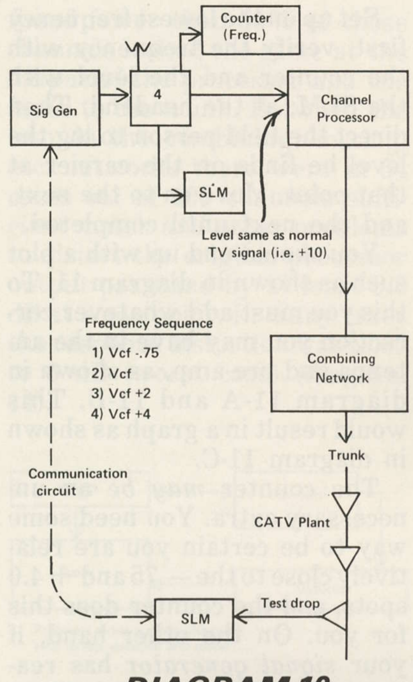


DIAGRAM 10

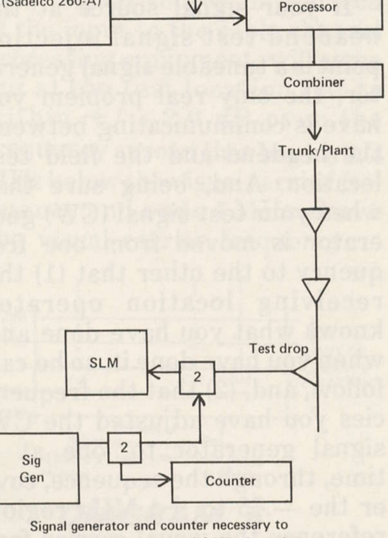
Set up on the lowest frequency first, verify the frequency with the counter and the level with the SLM; at the headend. Then direct the field person to log the level he finds on the carrier at that point. Move on to the next, and the next until completed.

You should end up with a plot such as shown in diagram 11. To this you must add whatever correction you may have in the antenna and pre-amp, as shown in diagram 11-A and 11-B. This would result in a graph as shown in diagram 11-C.

The counter *may be* an unnecessary extra. You need some way to be certain you are relatively close to the —.75 and + 4.0 spots, and the counter does this for you. On the other hand, if your *signal generator* has reasonably good frequency calibration, you can probably rely on it.

Then there is the wide band noise source. It, like a sweep source, suffers from the problem of identifying *where you are* within the channel in question. The wide band noise source (i.e. Sadelco 260-A) is an ideal machine for this purpose because it is quick and simple to use, and can be read (out) on a standard SLM.

But like the sweep source, you can't be positive where you are unless you have some field - verifiable - method of determining this with a tuneable SLM. The general discussion for making this measurement with a sweep source can be followed with the Sadelco 260-A; merely substitute the 260-A for the sweep at the headend (diagram 12).



Signal generator and counter necessary to ascertain Vcf -.75 and Vcf +4.0 MHz bounderies

DIAGRAM 12

There was some confusion about levels of test signals last year; which we will attempt to clarify at this time. Some measurement people suggest running the sweep, noise, etc. test signals at *low* levels; recovering

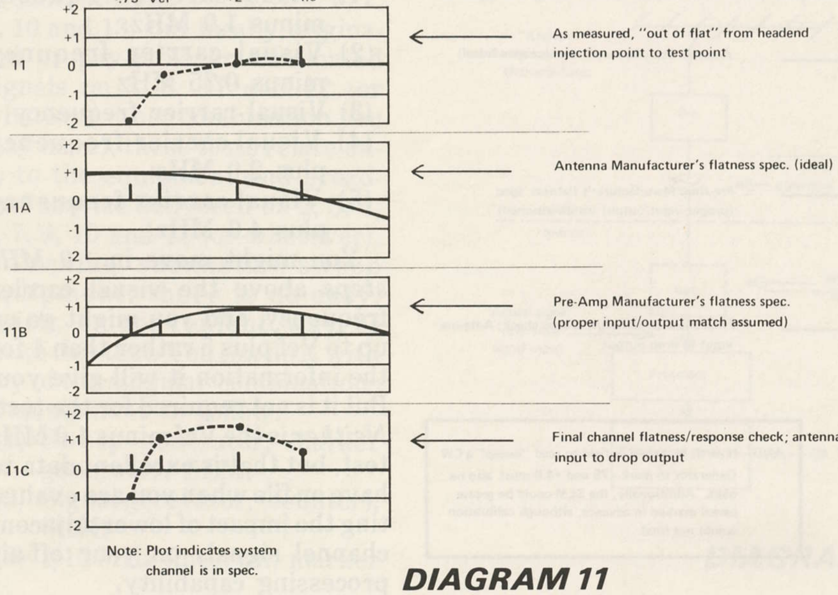


DIAGRAM 11

them with a spectrum analyzer or other machine which operates without degradation to the home viewer's pictures. This has logic, common sense and merit; but it is contrary to the language (if not the intent) of section 76.609 (a). Which says:

"Special signals inserted in a cable television channel for measurement purposes should be operated at levels approximating those used for normal operations. Pilot tones, auxilary or substitute signals, and non-television signals normally carried on the cable television system should be operated at normal levels to the extent possible."

In other words, test signals should be identical in level to normal (input) signals. That may *not* be the *best* way to conduct the tests, but that is the way the rules suggest the tests be conducted.

Without interpretation, following that statement literally, your input signals for in-channel response (flatness) for example should be of the same RF level as the normal antenna-supplied RF voltages applied to the processor input(s).

Carrying that to the next logical waystation, this suggests that at least the in-channel-response tests almost must be performed by taking normal service off of the cable; or, alternately, perform the tests in the wee hours of the morning. Whether you do that or not is your decision, but we did feel based upon discussions we have heard and questions posed to CATJ that at least for the record the subject should be touched upon lightly.

So *how* do you *best* make the in-channel response measurement? It is our opinion that of *all of the measurements* we are required to make, *this one is the most difficult*, and the most subject to operator error, of any test. It is, in fairness, perhaps the most important test of all from the viewer's point of view because distortion, phase delay, group delay and other visible types of picture impairments are pinpointed more quickly with this test (if properly performed) than any other singular test, or combination of tests.

We have no opinion at this time whether the +/— 2 dB spec is:

(1) *Too tight*, or
(2) *Too liberal*.

We do have *an opinion* as to the feasibility of producing the kind of error-free (or acceptable error) results required by the FCC. We think your chances of accurately measuring +/— 2 dB from antenna input to customer drop output is on the order to a million to one shot, even to a rather generous +/— 2.0 dB accuracy plot. First of all, the antenna and the pre-amplifier and anything else hanging out there *not measureable* is in the very best case going to be a much greater contributor to error than any manufacturer supplied data sheet will convey. The antenna, for example, cannot possibly be accurately analyzed simply because the manufacturer's data sheet (if honest and accurate) is for a *best-case* free-space kind of support environment. When you hang the antenna on your tower, your chances of coming even close to the response curve of the antenna's data sheet is small at best. Add to that the antenna installation accessory equipment, such as the fittings, the downline, the variable lengths of downline from the antenna to the first concrete "integrity-matched" unit such as a pre-amp; and you have VSWR (match) problems beyond any but sophisticated measurement techniques to verify. Are you listening Tony Rutkowski?

Now when you say "forget the antenna, pre-amp and downline; don't measure it, just allow for it" you compound the problem of accuracy. When you stack one or more bandpass filters or suck-out traps in ahead of the processor but after the pre-amp, the operator is faced with deliberate fudging or deliberately degrading the quality of his subscriber's picture by taking the passive selective unit out of the downline. He will always choose the former, figuring (rightfully) that a little bit of smear (i.e. mismatch) is much better than a little bit (or alot) of herringbone from a lower adjacent aural carrier.

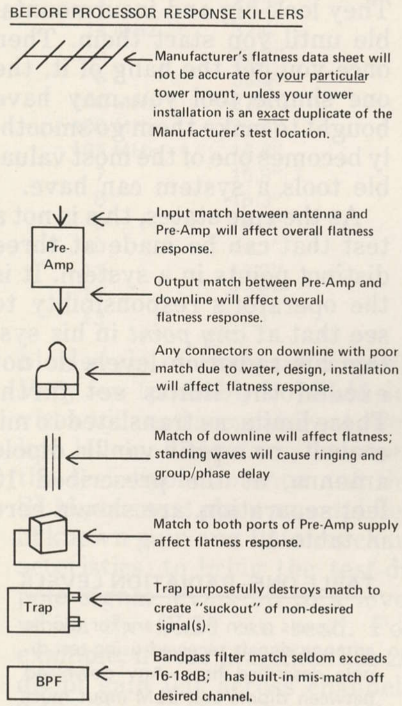


DIAGRAM 13

If you go into the processor with your test signal source and then look at the headend degradation only at the output of the channel combiner, you can at least isolate the effects of the headend processing and combining as a sub-unit. But this ignores the prior affects of the antenna et al (diagram 13) and the after affects of the CATV plant. If you simply sweep/response check the processor alone (i.e. go into the input port with a reference source signal and detect or read out at the processor output) you are kidding yourself. How many hundreds of headends have poorly designed or mis-match laden combining networks between the output of the individual processors and the input to the trunk line? Last year we took a CATJ test set into a dozen headends and looked at this specific problem, a total of just under 100 processed channels. And we found fewer than 50% of those channels looked the same at the *output* of the processor and the *input* to the trunk. Between the two, in the combining, mixing, etc. networks there were in 54 cases out of 100 channels sufficient match and other problems to distort the original processor output passband by at least 0.5 dB at some point. In many cases the response distortion was close to 6 dB (worst case) (diagram 14).

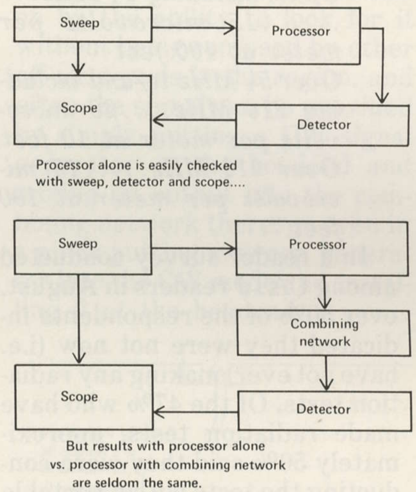


DIAGRAM 14

So *in our opinion*, as the technical/engineering voice of the industry, that what we have here *is a worthwhile measurement*, a necessary measurement, *but an impossible measurement*. We believe that the small cadre of technically oriented FCC cable people, such as Tony Rutkowski, would do well to take a *close look* at this particular problem; 76.605 (a) (8). Nobody has the equipment, or expertise to perform this measurement honestly and accurately. We believe the basic numbers need to be evaluated (i.e. is +/— 2 dB a relevant number, or is it somebody's dream number). And we believe that this whole measurement area needs to be stuck away on a block of ice until we know *what is* a relevent number, and, *how we can really measure it* accurately without lying through our teeth.

What do you think?

76.605 (a) (12) / Radiation

Section 76.605 (a) (12) reads as follows:

"As an exception to the general provision requiring measurements to be made at subscriber terminals, and without regard to the class of cable television channel involved, radiation from a cable television system shall be measured in accordance with procedures outlined in 76.609 (h) and shall be limited as follows:

Up to/including 54 MHz... ......15 microvolts per meter at 100 feet

Over 54 MHz to/and including 216 MHz....20 microvolts per meter at 10 feet

Over 216 MHz.....15 microvolts per meter at 100 feet."

In a reader survey conducted among CATJ readers in August, over 50% of the respondents indicated they were not now (i.e. have not ever) making any radiation tests. Of the 47% who have made radiation tests, approximately 50% said they were conducting the tests with a portable television receiver and an antenna, and the balance were utilizing some form of SLM with a test antenna.

The 53% who do not make radiation tests (and this included some very surprising large MSO firms!) are on very thin ice. If there is *one test* that makes sense, is logical, and is necessary, it is the radiation test.

One fellow told us, "I don't make the tests until I hear about somebody who is watching our weather channel on his home antenna, then I go look for a problem."

Another system operator told us "I bought the RD-1 Radiation Detector so I could conduct the test measurements accurately. Then my tech started using it on a routine basis. Just as a matter of course we drive out our plant on a planned schedule every month or two. The tech has gotten so good at using the RD-1 that he can now drive by a house and tell whether the house has a self-installed illegal second set outlet, or an improperly terminated drop line inside. I've paid for that unit several times in just the past year and I only have 500 subscribers."

Seemingly, radiation tests are mostly a matter of attitude. They look big and insurmountable until you start them. Then once you get the hang of it, the one simple tool you may have bought to make them go smoothly becomes one of the most valuable tools a system can have.

As the rule states, this is not a test that can be made at three distinct points in a system. It is the operator's responsibility to see that at *any point* in his system his radiation levels do not exceed the limits set forth. These limits, as translated to microvolts on a plain vanilla dipole antenna, at the prescribed 10 feet separation, are shown here in table 1.

TABLE ONE—RADIATION LEVELS

Levels given below are for dipole antenna signals received using test dipole described here. Any downlead between dipole and SLM input must be accounted for by subtracting its affect from the levels given here. See text for distance of measurement and technique.

Channel / Frequency	Microvolts	dBmV
2	15.65	−36
3	14.20	−37
4	12.90	−38
74 MHz	11.70	−39
5	11.20	−39
6	10.40	−40
100 MHz	8.65	−41
108 MHz	8.05	−42
165 MHz	5.25	−46
7	4.95	−46
8	4.80	−46
9	4.65	−47
10	4.50	−47
11	4.35	−47
12	4.22	−48
13	4.10	−48

As a practical matter, system radiation can take place virtually anyplace in the plant. Any trunk or feeder line can radiate. Radiation along a trunk or feeder line typically occurs where the integrity of the outer sheath of the cable is broken. Of all of the contributions the solid aluminum sheath, or braided shield, makes to the operating parameters of a piece of coaxial cable, egress and ingress protection is by far the most important. On rare occasions, the outer sheath of solid aluminum breaks or cracks. On frequent occasions, the braid shield on older types of trunk and feeder cable breaks down. In either case, signal egress follows rapidly and there is radiation.

However, far more often radiation from the cable occurs at a point where the cable is *purposefully* broken and inserted through a connector into a piece of electronic equipment. Rubbing, stress, incorrect fitting techniques, poor fitting weatherproofing all contribute to a break down of the mechanical integrity of the cable-connector mating. And there is radiation.

Generally speaking, the weaker the integrity of shielding and the higher the signal level, the greater the risk of radiation. Therefore, high signal level points (on the cable) are the most suspect and are where radiation usually first shows up from the trunk and feeder sections of the plant itself. For example, immediately after any amplifier, where levels are in the +36 to +48 dBmV level region is where you will spot it more quickly than immediately ahead of an amplifier where levels are in the +15 to +25 dBmV region. A power supply inserted immediately after an amplifier (i.e. where RF levels are high) is suspect simply because the power supply purposefully breaks the integrity of the solid sheath to insert AC power; and with high RF levels present the opportunity for the RF to jump, float or leak through AC power wiring into the immediate vicinity or to the AC power lines is good.

Customer drops are the *most frequent source* of RFI. Fortunately, drop levels are typically +6 to +12 dBmV at the entry to the drop cable. However drop cables are by nature braided-sheath shields and the protection of the braided shield is much lower than the protection provided by a solid sheath aluminum cable. So one balances the other, and where the levels are lower, so too, is the outer shield protection lower. Inspite of this, most of the customer drop radiation problems typically occur *inside* of the home where the customer "makes a few changes" and ends up radiating signal all over the neighborhood. One of the most frequently encountered situations is where a customer reconnects his outside antenna to his receiver's 300 ohm antenna terminals, in parallel (i.e. right along with his 300 ohm side of the cable-provided set matching transformer). The cable signal comes down the drop, through the transformer, and to the set terminals. And then right back up the customer's antenna downline to his antenna, where it radiates all over the place.

To find radiation sources you need a low (signal) level sensing device. Unless the radiation is very severe (i.e. high levels), finding the source usually requires a little sniffing around, probing and sleuthing.

Diagram 15 illustrates how a radiation-checking dipole can be constructed using commonly available parts. The dipole meets the "antenna requirements" as spelled out in 76/609 (h) (1-5). The length of the dipole 1/2 elements is given in table II here.

The legal-limit levels, shown in table I, indicate that we are dealing with very low permissible levels of radiated signal. Very few (probably no) SLM devices will read accurately at such low levels. Therefore, between the test-dipole antenna and the SLM you must place an amplifier of known gain and flatness characteristics, to bring the test-dipole signal levels up to a level which the SLM can read. For example, if your amplifier has 20 dB of gain flat across channels 2-13, then, rather than reading (or looking for) a —36 dBmV level on channel 2, you will be looking for a —36 plus 20 or —16 dBmV signal; on channel 2. Or rather than looking for a —48 dBmV level on channel 13, you would be looking for a —28 dBmV level (diagram 16).

The next problem is separating the cable radiation signal from off-air signal levels, local receiver oscillator radiation and so on. If your measurement area (i.e. system location) is inundated with off-air signals, chances are pretty good you will have to go to a mid or even super band frequency to make your radiation check. Obviously, you cannot look for radiation on any frequency that is occupied by a locally receiveable off-air signal. Some systems have gone to the injection of a special carrier, just for the radiation tests, at the headend. The frequency is chosen by the ability to look for it without being confused by other off-air signals in the region, and often the signal can be provided by simply putting a CW signal generator at the headend and mixing its output into the combining network there, or even in a pinch putting a sweep generator into the CW mode and installing it at the headend.

TABLE TWO – TEST DIPOLE

Reference is made to diagram 15; for distances A-B and C-D. Both are equal lengths, adjusted individually to conform to the lengths given here for each channel/frequency.

Channel	A-B/C-D
2	50.1″
3	45.2″
4	41.2″
74 MHz	37.4″
5	35.9″
6	33.3″
100 MHz	27.7″
108 MHz	25.6″
165 MHz	16.8″
7	15.8″
8	15.3″
9	14.8″
10	14.3″
11	13.9″
12	13.5″
13	13.1″

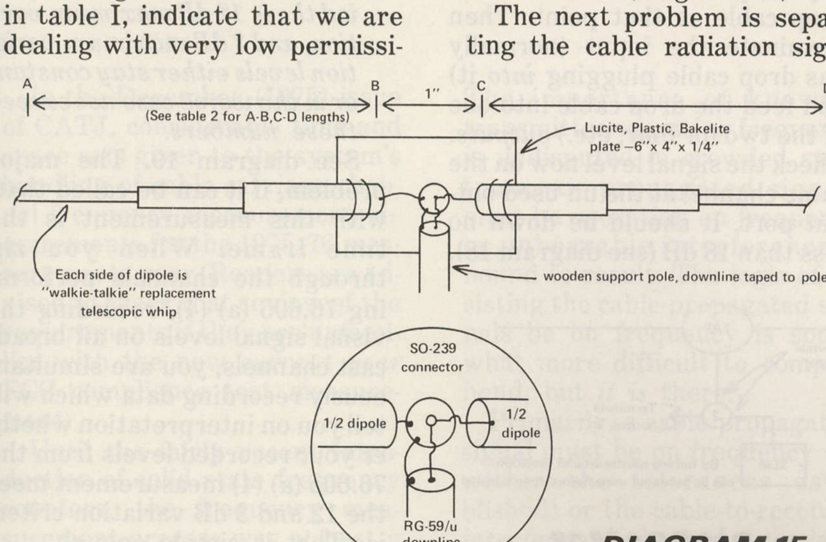


DIAGRAM 15

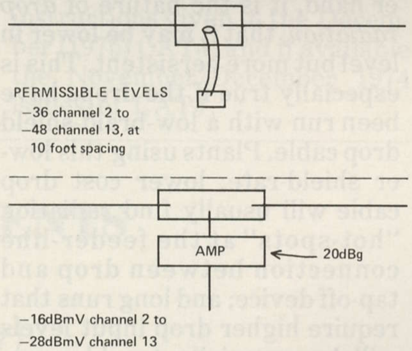


DIAGRAM 16

The dipole-test antenna is to be elevated to a height ten feet from (but parallel to) the cable lines being checked. This suggests a wooden or PVC handle for both elevating the dipole and insuring that if it should come in accidental contact with an AC line, the operator will be protected.

Now the 10 foot separation measurement is really the distance at which you measure to determine whether the level radiated is more or less than the levels permitted (table I). If you really want to check for radiation, you should be in "tighter" than ten feet to spot the stuff. Then when (or if) find any, you can stop, back off ten feet and do a real level measurement. Here, however, we are dealing *primarily* with the measurement to be legal.

When you spot radiation, mount the antenna at a height so it is ten feet from the cable line and parallel to the line. Rotate the dipole in a vertical axis (i.e. as if on an antenna rotor) for maximum signal. If there are other conductive materials (guy wires on pole, telco drops, etc.) in the immediate area where you find the radiation, try to re-position your test dipole so that the air region from CATV cable to the dipole is clear, and, there are no paralleling wires running the distance or direction towards the dipole.

It is the nature of *plant radiation* that if you have it, you will probably have it in large doses. That is, you won't have just little bits that are border line acceptable or not acceptable. On the other hand, it is the nature of *drop radiation*, that it may be lower in level but more persistent. This is especially true if the drops have been run with a low-braid-shield drop cable. Plants using this lower shield-rate, lower cost drop cable will usually find radiation "hot-spots" at the feeder-line connection between drop and tap-off device; and long runs that require higher drop input levels will be especially troublesome. The solution is to replace the drop cable with a better grade cable.

76.605 (a) (11) / Isolation

Section 76.605 (a) (11) reads as follows:

"The terminal isolation provided to each subscriber shall be not less than 18 decibels, but in any event, shall be sufficient to prevent reflections caused by open-circuited or short-circuited subscriber terminals from producing visible picture impairments at any other subscriber terminal."

See diagram 17. If you inject a signal, on purpose, at point "A", and go over to point "B", how strong is the test signal injected

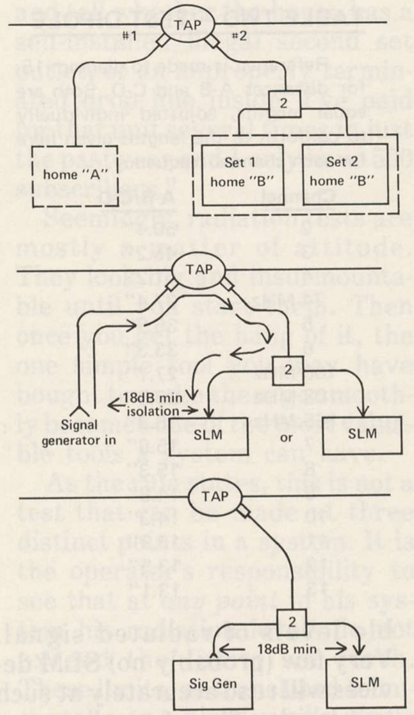


DIAGRAM 17

at "A"? One way to handle this is to simply disconnect the drop at "A" and "B" and stick a signal generator on "A" (or "B"). Then run over to "B" and with an SLM meaure the signal level from the generator. It should be attenuated by 18 dB minimum plus the cable loss from "A" to "B".

If you are measuring isolation between two sets in the same building (i.e. house), simply disconnect the fittings on the two-way (or four-way, etc.) splitter and measure the input level on any drop cable channel on the drop cable at that point. Then terminate the input (normally has drop cable plugging *into* it) and feed the drop cable into one of the two (or four, etc.) *outputs*. Check the signal level now on the same channel at the un-used output port. It should be down no less than 18 dB (see diagram 18).

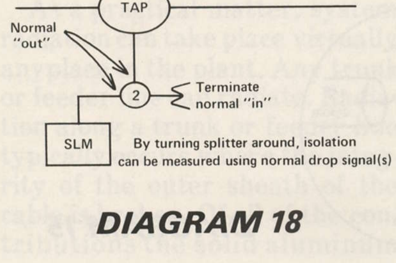


DIAGRAM 18

The SLM Measurements

There are three more measurements. All are quickly and relatively painlessly performed with nothing more than a calibrated SLM.

76.605 (a) (4)—*specifies that the visual signal level to the receiver on all broadcast-originating cable channels shall be not less than 0 dBmV (1,000 microvolts or 1 millivolt).*

Simply run through the channels involved with an SLM and make a notation of the levels encountered. This test is to be performed at the real or simulated subscriber drop location, so if you "simulate" remember to simulate with a section of drop cable that is as long as the real drop from DT or pressure tap port to the back of the set. If the house (subscriber) has multiple set outlets, allow for the flat loss effects of any splitters.

76.605 (a) (5)—*specifies that the signal variation between the lowest level cable channel (class I signal) delivered to the back of the set and the highest signal level cable channel (class I signal) shall be not more than 12 dB. And, that any two immediately adjacent channels (2, 3, 4; 5-6; 7-13 plus any adjacent mid and/or super band channels carrying broadcast signals) not vary by more than 3 dB channel to channel. And, that within a 24 hour period these 12 dB maximum variation, and 3 dB maximum variation levels either stay constant or in the worse case not exceed these numbers.*

See diagram 19. The major problem, if it can be called that, with this measurement is the time frame. When you zip through the channels performing 76.605 (a) (4), recording the visual signal levels on all broadcast channels, you are simultaneously recording data which will tell you on interpretation whether your recorded levels from the 76.605 (a) (4) measurement meet the 12 and 3 dB variation criteria. That is simple enough.

But the measurements you

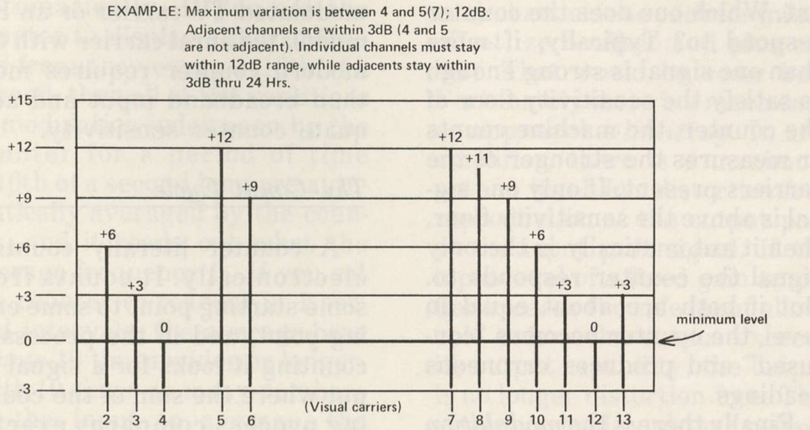


DIAGRAM 19

make must be sufficiently spread in time so that you are sure than within a 24 hour period these ratios do not change sufficiently to cause the drop levels to drift out of spec. The best way to tackle this is with multiple measurements. Many systems have adopted a three-time measurement cycle, checking the levels around 8 AM, 4 PM and midnight. The tests required by 76.605 (a) (4) and the next tests to be discussed, 76.605 (a) (6) are also performed three times during a 24 hour period at *each* of the test locations being chosen for the test procedures. Then the numbers are analyzed *after the fact* for compliance with 76.605 (a) (5).

76.605 (a) (6)—specifies that the ratio between the Class I channel visual carrier and the same channel's aural carrier, as measured at the test drop, shall be between 13 and 17 dB.

There are no particular problems associated with making this measurement. When you set up to perform the visual carrier level measurements in 76.605 (a) (4), simply provide room on the test log form to also log the aural carrier levels for each broadcast channel carried on your system. After the fact, analyze whether your measurements indicate that you have all aural carriers "down" from 13 to 17 dB as the rule section requires.

Summary

Step by step 1975/76 FCC test measurement guidance is available to system operators in the 1975/76 CATJ FCC Compliance Cookbook; available to systems from CATJ for $25.00 per copy (1).

Alternately, systems should be able to prepare their own test forms and instructions by following the data given in this article as well as carefully reading the instructions given in the December (1975) CATJ, and if available the November/December 1974 issues of CATJ.

FREQUENCY MEASUREMENTS MADE EASIER (Mid State SP-2 Review)

In the December (1975) issue of CATJ, considerable time and space was given to the system's handling of cable carriage channel frequency measurement requirements for the 1975/76 measurements year. Readers are advised to check that review of the requirements if they are unfamiliar with the new *current year* FCC compliance test measurement.

Until the fairly recent introduction of solid state frequency counters, the frequency measurement process was at best a tedious, error-filled exercise. The importance of knowing transmitter operating frequency is undisputed in crowded spectrum, air-propagated signals must be operating on frequency or unbearable interference is bound to result. The logic of insisting the cable-propagated signals be on frequency is somewhat more difficult to comprehend, but *it is* there.

Primarily, a cable propagated signal must be on frequency (or within the tolerances established) or the cable-to-receiver *interface* suffers. And secondarily, in a bad off-frequency situation, the multiplicity of cable-delivered signals might (or will) interfere with one another at the receiver interface point.

Until the modern counter device came along (early 60's), the only practical way to measure frequency was by comparison; a signal source (i.e. transmitter) of unknown frequency was compared with a signal source of known frequency. Any differences between the two had to be calculated, and the actual frequency measurement therefore became something of an educated "guesstimate" on the part of the individual making measurements. The counter ended all of that, simply because the counter does its own comparing and electronically calculates the difference between the known reference signal and the unknown signal.

Most frequency counter devices are designed to operate over a fairly wide frequency range (example: 1-500 MHz). They are further designed to be as automatic as possible, the logic being that if the machine is to perform its task automatically and with a minimum of error, there should be as few opportunities for the counter *operator* to screw things up as possible.

In making the machine broadband and automatic, there are a few compromises in the design. Ideally, the operator simply plugs in a piece of coaxial cable carrying the unknown frequency signal to the counter; and the counter responds by counting and then reading (indicating) the frequency of the signal. To achieve such automatic heaven, the counter must, like a CATV plant amplifier, be very broadband. And, like a CATV plant amplifier, broadband comes at the expense of sensitivity. Selectivity is the direct partner of sensitivity; broadband is the direct companion of insensitivity.

Therefore, the typical counter requires a fairly *high* input signal level to count; or, if the desired signal (i.e. to be measured) is weak, the operator must place an external pre-amplifier (usually with its own selectivity curve) on line in front of the counter to build the unknown signal voltage to a point where the sensitivity of the counter will allow the signal to be measured.

Then there is the *signal-multiplicity* problem. A counter responds to the input signal voltage. If there is *one* input signal voltage delivered to the counter, the counter has no problem counting, provided the voltage is strong enough to register with the counter's sensitivity floor. But suppose there are two or more input signal voltages present. Which one does the counter respond to? Typically, if more than one signal is strong enough to satisfy the sensitivity floor of the counter, the machine counts or measures the stronger of the carriers present. If only one signal is above the sensitivity floor, then it automatically is the only signal the counter responds to. But if both are about equal in level, the counter becomes "confused" and produces erroneous readings.

Finally there is the *modulation* problem. An amplitude modulated (AM) carrier consists of the main carrier and a multiplicity of modulation-sidebands. The sidebands contain energy, and in *some* situations are *nearly* equal in signal level to the main carrier itself. In a typical television signal, the sidebands re-occur in one form or another, 15.750 kHz either side of the main carrier, and those located closest to the main carrier can be very potent. A frequency modulated (FM) carrier is by nature "unstable" by virtue of the modulation present. Unmodulated AM and FM carriers have the same properties; that is, a single carrier stationary in frequency. A modulated AM carrier develops *sidebands* (i.e. modulation product sub-carriers), whereas a modulated FM carrier *shifts frequency* in direct relation to the frequency of the modulation material. An FM carrier modulated with a 2 kHz (2,000 cycle) audio tone, for example, will shift carrier frequency by +/— 2 kHz. The *carrier frequency itself deviates*, as the modulation frequency varies.

Therefore in measuring an AM carrier (such as a TV visual carrier signal) the counter device must decide *what* to count—the main carrier, a strong sideband, or a multiplicity of sidebands present. In measuring an FM carrier, the counter device sees one carrier + modulation index frequency one measurement cycle and *another* carrier + modulation index frequency the *next* measurement cycle.

Obviously measuring an AM modulated TV carrier or an FM modulated aural carrier with the modern counter requires more than broadband input and adequate counter sensitivity.

The Count Cycle

A counter literally counts—electronically. It counts from some starting point to some ending point, and in the process of counting it looks for a signal input where the sum of the counting process compares exactly with the input signal to the counter.

And regardless of the speed of the count (from start of count to end of count, such as starting at 1.000 MHz and counting up to 500.000 MHz in 1 kHz steps), there is some time lapse between the start and end of the count. Most modern counters allow the operator to adjust the *speed of the count* in terms of the period of time between read-out displays. For example, the counter may readout what it sees every 1/10th of a second, or alternately once per second, or alternately once every ten seconds. The reason behind having this kind of operator control is this: suppose you are measuring an FM signal, one which changes the actual indicated carrier frequency as a function of the modulation frequency. If your counter displayed everyone of the "indicated frequencies" each time the modulation index changed, the readout display would be a blur of changing numbers which would oscillate or vary each time a new modulation index frequency was present. *Assuming* the counter could clearly display each new frequency and *assuming* your eyeballs could respond to these rapid changes (*neither assumption is valid*) the readout result would be a high speed counting exercise. In the end, you would have to mentally average all of the numbers you saw to find the real-life carrier frequency. The counter, by varying the display-readout period (i.e. the intervals between displays), does all of this averaging for you automatically. If you set the counter to display a new indicated frequency every 1/10th of a second, then all of the variations in modulation index seen by the counter for a period of time 1/10th of a second long are automatically averaged by the counter, and it reads out what the average frequency is. If you set the counter to readout in 1 second intervals, the average-base is *now* 10 times wider or longer. With 10 times as many numbers on the input to average, the arithmetic *accuracy* of the 1 second averaging is going to be 10X better than the 1/10th second readout intervals.

Or, if the counter is adjusted to readout display once every *ten* seconds, now the counter looks at all of the individual frequencies measured for a ten second period, averages them, and then reads out *that average*. Only now we have 100X as many input numbers to average as we did in the 1/10th of a second display period, and the accuracy is therefore 100X better.

Therefore, in measuring an FM (frequency modulated) carrier, we want to have a measurement-period-timebase which is *long enough* to give us an accurate average of the modulation index frequencies present. It works out that the measurement period desireable to measure a TV audio (FM) carrier is 10 seconds.

The AM Problem

The AM carrier (i.e. video carrier) with sidebands (they are a natural product of amplitude modulation) presents a different problem. The frequency of interest (that is, the one to be measured) is the *main carrier frequency*, not the sidebands. Therefore to measure the main carrier, the sidebands must be deleted (to keep the counter from falsing on the sidebands by reading them). Technically, you *could* filter out the AM sidebands, but that would require some pretty hairy (read precise and expensive) filters, three for each channel (one each for minus offset, zero offset and plus offset). That would be *some* box! Fortunately there is a much easier approach—*limiting*. In any amplifier, there is a maximum output level for distortion-free reproduction at the output port of the input port signal. If the input level of a fixed gain amplifier *exceeds* the safe input allowable before the output exceeds its output capability, the output is no longer distortion free. This is the overload syndrome (we see it in CATV by running a line extender rated at +48 dBmV output for 12 channels at +56 dBmV output, for example). What happens to the amplifier when it is driven beyond its output capabilities is that the distortion created begins to self-limit. That is, the distortion products and the real-life products intermix and, as the output continues to increase, the distortion and real products end up in effect cancelling one another. If they cancel (i.e. *limit*) far enough, there is none of either left and the modulation sidebands (or modulation products) *disappear*.

Therefore the easiest way (i.e. easier than very hi-Q filters) to separate the main carrier from the sidebands is to feed the signal into an amplifier at a *pur-*

posefully too-hot level. Let the amplifier distort the signal, and, in the process, limit or strip the modulation sidebands from the carrier. When you get done, if you do it correctly, the only thing that comes out is the carrier itself. And the carrier alone then can be fed to a frequency counter and measured, without any detracting sidebands floating around and about.

The SP-2

To be able to measure CATV cable-carriage operating frequencies, or off-the-air signals, the CATV operator needs a method of limiting-out any AM sidebands and of separating the 4.5 MHz audio inter carrier from the video carrier.

The Mid State Communications Model SP-2 processor does both of these magic things. And it does them pretty much the way the prior discussion of what has to be done would indicate.

Reference is made to Diagram 1. The front end of the SP-2 is a standard type of 12 channel TV tuner. It has some measure of RF selectivity, an RF gain stage, a mixer and a local oscillator. The i.f. output of the front end is centered on 43.5 MHz, which in turn drives an i.f. IC gain stage (MC1350). This is followed by an MC1330 IC gain/limiter stage. The MC1330 has two built-in video (i.e. detected) outputs; that is part of that particular IC package. Mid State uses these to drive (1) an MC1550 4.5 MHz amplifier for the inter carrier measurement, and (2) a straight video output for hum mod measurements with a scope.

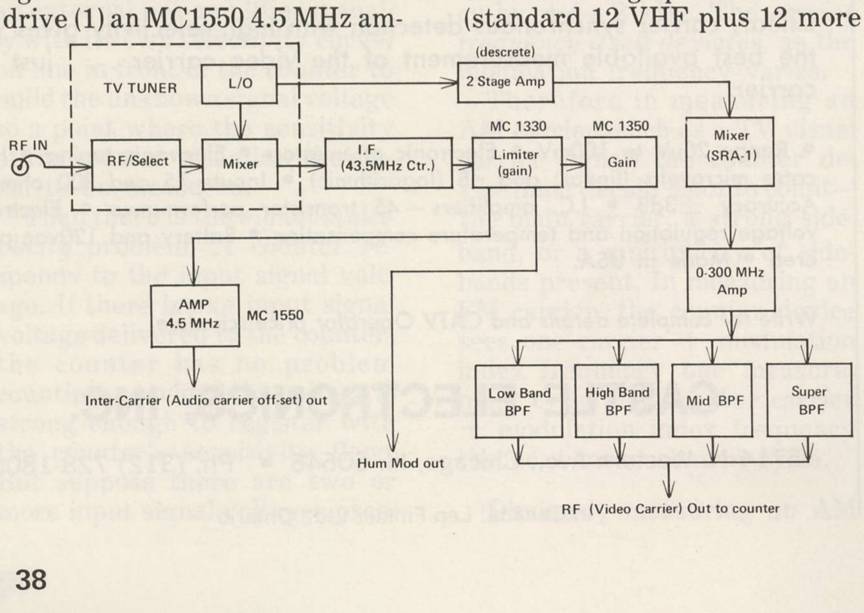
Back at the MC1330, it is followed at i.f. by another MC1350 which is purely for gain, to drive the double balanced SRA-1 mixer on the output of the i.f.. This SRA-1 receives looped-through local oscillator drive voltage from the local oscillator in the front end tuner, via a two stage descrete amplifier. Thus the L/O that takes the input signal down to i.f. for limiting is the same L/O that takes the i.f. signal after limiting back up to RF (this is the same approach utilized by on-channel heterodyne processors). Coming out of the SRA-1 up-conversion-mixer, the signal, *back on its original channel and frequency now*, sees a descrete (2N5197) broadband amplifier, followed by the pass-band filter "of its choice". There are four, one each for low band, mid band, high band and super band. At the output of the filter you have a limited, greatly amplified RF output on the *same carrier frequency* as the incoming signal. Only now it is devoid of modulation and clean enough for counting.

There were originally two models of the SP unit; an SP-1 and the present SP-2. The difference was that the SP-1 was strictly a 12 channel VHF standard format unit while the SP-2 was a 12 *plus* channel unit capable of handling up to 24 channels (standard 12 VHF plus 12 more of your choice on mid and/or super band).

Now there is only an SP-2. It has only 12 (standard) VHF channels as it comes from Mid State; but it has the capability of adding additional channels (up to 24 maximum) for $30.00 per extra channel added. This is accomplished by Mid State sticking in a second tuner module behind the knob that has no markings around it (left of 2-13 knob) on the front panel, and then equipping the plug-in tuner strips with the proper RF and L/O windings for the mid or super band channel(s) you have ordered. The additional tuner becomes part of the general scheme of things shown in Diagram one by simply replacing itself when selected with the tuner shown in Diagram one. Otherwise the package works in an identical manner as described.

SP-2 SPECIFICATIONS

Input Range—Any channel, 50-300 MHz (channels 2-13 standard)
Input Sensitivity—Rated output with +6 dBmV (to +60 dBmV)
Input Impedance—75 ohms, F connector
Video Carrier Output: 100 mV min/50 ohms; 150-200 mV typical
Inter Carrier Output: 100 mV min / 100K ohms
Powering: 12 VDC rechargeable battery, 8 hour use time; 117 VAC
Hum Mod Output: 2 volts video min
Options: After 12 standard VHF channels, additional channels $30.00 each
Price: $595.00
Manufacturer—
Mid State Communications, Inc.
40 N. Seventh Avenue
Beech Grove, In. 46107
(317/786-9537)



Little Things

The SP-2 has a number of "little design things" going for it that any prospective user should know about. For example:

(1) *AC Blocked Input*—just in case somebody forgets and plugs into the SP-2 with a cable line with AC cable powering on it, the input is AC blocked.

(2) *High Video Out/Hum Mod*—The video output jack for making hum mod tests has 2

volts of video present, with 20 microvolts of noise (this assumes an input in the +6 dBmV range to the SP-1). This should make hum-mod checks a little easier because you have more detected video voltage present (typical *SLM* detected outputs are *under* 1 volt.).

(3) *AC or DC*—The SP-2 operates from its own Gel-Cell batteries, rechargeable. Charge overnight, and use-time is then 8 hours.

(4) *Emergency Video Out*—The output video is of very decent quality; it is a very high impedance output, but if a fellow "stepped over" a 56K resistor in series with the video-output line, you could use the unit as an emergency video demod and be happy with the results.

(5) *High Output*—The RF level output to drive the counter is "at least" 100 mV across 50 ohms (the counters typically have a 50 ohm input). There are very few counters around that will not function properly with 100 mV drive. This is with +6 dBmV input to the SP-1.

CM-20M Counter

You can operate the SP-2 into any adequate-frequency range counter you may have or have access to (local two-way shop usually has one; it needs to go as high as 220 MHz, or higher if you have to measure superband).

The counter will need to have sensitivity of 100 mV or less (i.e. give stable readings with an RF input of 100 mV), and ideally, it should have a 50 ohm input *and* a high impedance input as well. Most counters are BNC connector equipped, so be prepared to look for some BNC to F adapters.

Or, Mid State has put together a companion counter for the SP-2 processor—the CM-20M. This is a digital counter, measuring frequencies from 5 Hz to 520 MHz. It is probably the *only* frequency counter that comes from the factory with F fittings on it!

The CM-20M operates from 110 VAC, but an accessory battery pack is available. It has an input sensitivity of 50 mV (RMS) and dual input impedances of 50 ohms (for video carrier tests) and 1 megohm (for aural carrier/intercarrier tests). The counting-time is switch adjustable from 1 mS to 10 seconds, which means it is suited for aural (FM) carrier averaging. The readout is a 6 digit LED display.

Operation

Using the SP-2 (with the CM-20M or any suitable counter) is about as complicated as running a typical SLM. Plug the input signal in, dial the preselector to the appropriate channel, turn one knob or, switch some pads (built in) to get the visual carrier level into the appropriate area on the meter face. Connect the output of the SP-2 (Video Carrier "out") to the counter and read the frequency. If you are at the headend or at a drop you can typically switch *through* the 12 VHF channels and record the carriage-frequencies with one drop input level to the SP-2, in about two minutes time, stopping for a few seconds to write down the numbers for each channel as you go by.

Checking the audio carrier frequency is a matter of setting to either the 1 or 10 second count-gate-rate, and switching the counter from 50 ohm input to the 1 megohm input position. You can read visual carrier and then aural carrier separation in about as much time as it takes to read this sentence.

The aural carrier is read *reference the video carrier;* that is, the counter displays the *difference frequency* between the visual carrier and the aural carrier. The rules require 4.500 MHz, +/— 1 kHz. Thus you end up watching the second 0 in .500 to see if it varies below 499 or above 501.

In our CATJ Lab we found a multitude of uses for the SP-2 and CM-20M package Mid State let us borrow for a few weeks time. In addition to checking carriage frequencies on our mini-cable system, we discovered some interesting things about off-air signals. One evening we watched in disbelief as a channel 12 station over in Missouri jumped around from 3-11 kHz off their assigned offset frequency for about an hour's time. There was some co-channel interference and we were certain the co-channel was making the counter jump around. But then suddenly the station left the air (it was off for nearly a day) so they obviously had a problem. On the 4.500 aural intercarrier position, we found a couple of stations that simply are not maintaining the +/— kHz specification. We wonder how the FCC would view this, and we suspect that if the station is causing the problem, the CATV system would be held harmless (i.e. not responsible).

Finally, in adjusting some oscillators in some UHF down converters, we found having the counter around (with the 520 MHz count capability) was one big assist. Employing a 1 GHz sweep to get a converter operating with a new crystal on a new channel has always been an hour-plus kind of job. Being able to read the L/O frequency (directly, or on the fundamental) is very convenient with the CM-20M, and a real time saver.

If there is something to fault Mid State on, it is this. The unit (SP-2) has no power-on-indicator light. Being battery operated, it sure is easy to turn it on, use it for awhile, and then walk away to come back the next day to a dead battery. An LED would certainly be nice to remind you there is power being drawn from the battery. Then there is the manual problem. The unit barely needs a manual for redundant operation, but it would help to have something to read just to know you have it plugged in correctly the first time you use it!

SP-2 Signal Processor set up for measuring visual carrier and aural inter carrier separation

CM-20M counter displaying out-of-spec 4.500 signal, as received off-air, indicating station is not maintaining proper tolerances required by FCC (identification of out-of-spec station available upon request!)

CM-20M counter displaying off-air channel 12 signal

FULL 20 ISSUE INDEX TO CATJ PAST ARTICLES

This is something which CATJ should have done for reader convenience last year. Now, in laboring over the project one year too late, we wish we had done it a year ago!

By topic matter, we are providing this listing of material appearing in past issues (the first 20) of CATJ. This covers all features appearing in CATJ to date, plus, where features had follow-up reports, letters with updating material (in Technical Topics), etc., we have provided those references as well.

It is worth noting that we are seriously considering grouping most of the articles referenced here by topic matter into a CATJ ANTHOLOGY which would include by topic matter the original articles appearing in the first 17 issues of CATJ (through and including September 1975). Grouped by subject matter as shown below, this would provide users with a handy one-stop reference to these topics. Your comments on the usefulness of such a project would be appreciated.

A similar listing will appear in the December 1976 issue of CATJ, listing all articles published to date at that time.

FCC RULES AND FCC HISTORY

FIELD STRENGTH METERS / AND RELATED TECHNOLOGY

HEADENDS — MISCELLANEOUS

HEADEND RECEIVING SITUATIONS

MEASUREMENTS

Note: CATJ is contemplating preparing an ANTHOLOGY of the material appearing in the first 17 issues of CATJ. Your comments as a reader as to the utility of such a single reference source, with material grouped by topic matter, would be appreciated.

TECHNICAL TOPICS

Western Show Report

Technically speaking, the Western Cable Television Show and Convention (Anaheim, California—November 12-15) offered the industry its first look at a couple of new technical innovations. One may change the way CATV systems of the future are designed and function, the other may change the quality of pictures some systems deliver to their subscribers.

Considerable interest was shown in the new "Smart Tap" or "Addressable Tap." Delta-Benco-Cascade displayed the first of this new generation of customer service devices; others were being openly discussed by Pro-Com, Arvin, and others. TOCOM wondered what all of the fuss was about because they had shown their version of the same concept more than 18 months previously.

The DBC version was the center of attention, and was demonstrated at their floor display booth to hundreds of operators. The DBC version is being produced under license from **Stern Communications**; but inspite of its showing in Anaheim it will apparently not be available for delivery until mid-1976.

The basic "smart/addressable tap" concept is as shown in diagram one. The whole idea is to give the system operator a "handle" or "method of controlling" just which subscribers receive what channels.

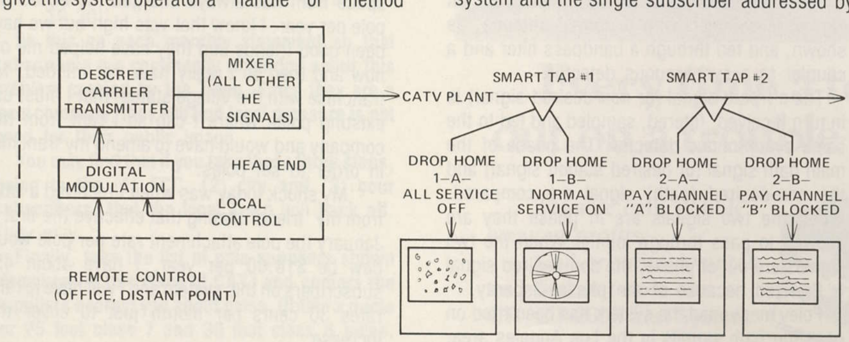


DIAGRAM 1

A descrete frequency cable-transmitter is located at the headend. The transmitter can be combined with your present pilot carrier, or it may be a new transmitter RF source. The frequency of the transmitter is not critical, as long as it is chosen so as to not interfere with other cable services. The transmitter is modulated by digital techniques; at a 25 kilobit rate (in digital modulation, the kilobit **rate** refers to the amount of descrete digital signals transmitted in a given period of time). The modulation source is a terminal located either at the headend, at your system office, or virtually anyplace in the world as long as the terminal can be interconnected with the CATV headend either via landline, cable or radio link.

Each subscriber on the system has a singular **"address code."** This code is punched up on a small terminal (the DBC demonstration used a small $100.00 math calculator to generate the signals; slightly—but not substantially modified—for this purpose). The code is then interconnected to the headend via whatever method is being employed, and it in turn modulates the descrete frequency transmitter located at the headend. The RF carrier goes throughout the system and the single subscriber addressed by the code gets the "message."

Now the "message" can tell the smart tap to do one of several things:

(1) **Turn off** all of the subscriber's service.

In this situation the code received by the single tap-outlet addressed goes through a receiving process at the addressed tap (see diagram 2) and it activates a diode switching assembly which dis-connects any service to that drop. The customer sees pictures one instant, and the next instant, he gets nothing but snow. Developer Joe Stern speaking at Anaheim called this the "ultimate collection weapon," pointing out that if a customer refused to pay, he would be disconnected at the completion of a final "collection telephone call" in less time than it takes the customer to hang up his telephone.

(2) **Eliminate reception** on a descrete channel;

Each smart/addressable tap has the provision (it costs extra) for the CATV operator to make it impossible for the customer to watch the programming (or listen to it) on **up to two** separate channels. Therefore, if the customer is a regular subscriber, but **not a pay-cable subscriber,** the code goes out to that customer's addressable tap and tells the tap to make it impossible for the customer to watch "that channel." All other channels are left alone, they continue to function normally.

This works because inside of the smart/addressable tap enclosure there is a small "transmitter" located more or less on the RF carrier frequency of the pay (etc.) channel. When the proper code is punched into the system, the smart/addressable tap **turns on that transmitter** on that **single** drop and the customer experiences a bad case of co-channel interference. The pay TV channel signal stays on the drop; it is obliterated by the very-local on-channel transmitter. To make the audio more difficult to decipher, the co-channel transmitter is modulated with an audio tone and the net result is a "whine" in the audio, and severe co-channel layering of the video. At the Anaheim demonstration, nobody indicated they could still watch the affected channel after the code was addressed to the machine.

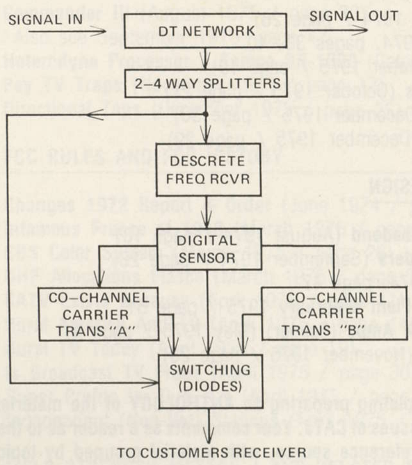


DIAGRAM 2

(3) This descrete **channel elimination** facility, via co-channeling of the system channel, will initially be available **on up to two** separate system channels.

What happens if the power fails? If the power failure is momentary (not defined at Anaheim), the power return finds all previously addressed smart/addressable taps functioning as they were before the power quit. If the power failure is longer term (also not defined), when the system comes back on all of the smart/addressable taps come back on in an **unlocked-**state. That is, every tap on the system receives every signal on the system. To put everyone back even again where they should be, the system operator takes his magnetic tape or punched tape and runs it back through his "tape reader/player" and all of the stored digital data goes out over the system re-setting every smart/addressable tap back the way it was before the power failure hit. This is not an expensive "addressing" system, necessarily, since all of the subscriber addressing records can be stored on a simple cassette tape and played back on a $30.00 cassette tape player at any time.

The smart-tap system conversion requires two sub-groups of equipment. One is the terminal equipment required to address the codes to the system. CATJ heard numbers like $3,000-$5,000.00 per system kicked around. We also saw the converted $100.00 desk calculator the $30.00 cassette tape recorder and thought to ourselves about re-trofitting both from Radio Shack to do the job for a whole bunch less than $3,000.00. On the receiving side, there are the taps themselves, (about the size of a conventional extender). What you are getting here is a 2 or 4 (or 8) way directional tap, which has all of the usual tap functions and features inside of it. It **also** has the modularized guts for the descrete receiver, demodulator, switching diodes and 1 or 2 on-channel co-channel RF carrier sources (with modulation); see diagram 2. DBC was quoting prices of from $40.00 to $50.00 for the **basic** unit; this one switches customers on and off remotely. And, prices of $80.00 to $100.00 for the basic unit **plus** the two pay-cable co-channel generator interference devices.

If you **overlook** the cost of the command/control package, the cost begins to look like this:

(1) For **basic** subscriber control (i.e. on/off function), **$10.00 per outlet** at the $40.00 per four-way tap price;

(2) For basic subscriber control **plus** pay-channels control, **$20.00 per outlet** at the $80.00 per four-way tap price.

Since you are replacing your own regular four-way outlet tap in the process, you need to think about the total cost as a function of what you are replacing. Developer Joe Stern pointed out that you are doing **more** than replacing equipment; you are also making it possible to run the system **from the office,** greatly cutting back on service expenses for running out to disconnect and re-connect customers, installing traps and pulling them out for pay channels, and so on.

The foregoing was intended to be a **basic** conceptual **report,** and when there is sufficient technical data available from one or more of the manufacturers in this field, CATJ will present that data as a feature article report.

Automatic Co-Channel Eliminator

CATV engineer Jack Foley of Theta-Cable (Los Angeles) presented a **brief** paper on a new technique for the elimination of co-channel (or ghosting); this system being totally automatic.

According to Foley some of the Los Angeles area systems plagued with multiple-path signals are now testing a system developed jointly by Theta Cable and American Nucleonics of Woodland Hills, California. The system, which Foley did not describe except in the very basic conceptual terms, functions as shown in diagram 3 here.

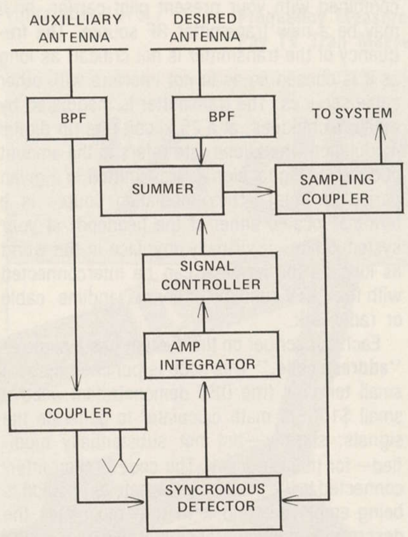


DIAGRAM 3

The main path signal (or the desired station signal) is sampled with a normal antenna, as shown, and fed through a bandpass filter and a coupler to a synchronous detector.

The off-path signal (or non-desired signal) is in turn received, filtered, sampled and fed to the same synchronous detector. The phase of the main path signal (or desired station signal) and the non-desired (path) signal are compared. When the two signals are in phase they are allowed to pass through jointly. When the two signals are out of phase, the non-desired signal is rejected because of the phase disparity.

Foley mentioned the system has been tried on ghosting path signals in the Los Angeles area, and he mentioned it has also been tried with a receiving system on Long Island where a channel 7 signal had a 4 inch ghost displacement on the screen. According to Foley, the system totally eliminated the ghost from the picture.

The system is totally automatic, and tracks (it is reported) for phase changes. The non-desired path or signal is constantly compared for phase balance with the desired signal, and rejected when it does not agree in phase with the desired station signal. Although no "firm prices" were heard for the system, the system is understood to be targeted for the $2,000.00 per channel" region.

Filters/Traps

"Just finished reading your Volume 2, Number 11 November issue—Great!" I like your new format and the excellent technical coverage of your topics.

"I would like to add a little to the subject of filters. Since filters do affect adjacent channels, and since the FCC Report And Order Subpart K Technical Standards of 76.605 (a) applies to Class I signals, it is advisable **not** to carry Class I (broadcast) signals on channels adjacent to a trapped pay-cable channel. Compliance with FCC 76.605 (a) provisions may be destroyed in the following characteristics with drops that have pay-cable single channel traps on them:

1. 76.605 (a) (4) Visual signal level
2. 76.605 (a) (5) Visual signal level variations
3. 76.605 (a) (6) RMS voltage of the aural signal relative to the associated visual carrier level
4. 76.605 (a) (8) Channel frequency response

"Additionally, some state-regulatory agencies have rules which would be 'violated' by the use of pay-cable single channel traps."

Alex Azalickis
Morton Grove, IL 60053

Reader Azalickis is correct. A trap that sucks-out (i.e. knocks down) any portion of an adjacent channel may well render that channel less than spec-adequate at that drop. If the adjacent channel is used for carrying off-air (i.e. Class I) signals, the system may not be able to make proof-spec at those drops. You can't win for losing!

Pole Kickback

"I am a member of CATA and find that it helps me a great deal. However I had quite a shock today and hope that you can help me overcome it. I have been reading trade press articles about pole rate increases for quite sometime with mild interest. A local telephone company which I rent space from has always charged me $6.00 per pole per year. I knew that was high but we have been good friends and they have helped me out now and then so I really have not minded. My franchise with the Village states, that I must use existing poles where I can so I rent from this company and would have to amend my franchise in order to set poles.

"My shock today was when I received a letter from my 'friend' stating that effective the first of January the pole attachment rate per pole would now be $10.00 per year. I have about 450 subscribers on this system and I will have to raise rates 30 cents per month just to cover this increase.

"Can you give me any help as to what approach I can take on this problem? I need some information and facts.''

Robert P. Reed
Stamford Video Co.
Stamford, N.Y. 12167

Mr. Reed—

If it means anything, the $10.00 rate you report is probably the highest rate currently being ''demanded'' by any utility in the United States today.

There are two suggestions, as follows:

(1) See attached letter copy from Mr. David Kinley, Chief Cable Television Bureau, to Boyd H. Todd, operator of an independent telephone company in Forest City, Pa.

We suggest you write a letter to Mr. Kinley, reporting to him as you have to us, exactly what is happening in your town. And ask Chief-Kinley to write a similar letter to your local telephone company.

This MAY help. But understand that the FCC has no formal jurisdiction in this matter, and if the local telephone company does back off on you, it will be because they are not 'smart enough' to recognize that the FCC lacks authority over pole rates.

(2) Go to your town council and explain your problem. Ask the city to modify your existing franchise so that you can set poles if you have to do so.

If your franchise requires city approval before you raise your rates, ask for permission at this time to put into effect a ''temporary 30 cent rate increase effective immediately to cover the extra pole charges created by the local telco''.

Send a letter to your subscribers explaining to them that your system has been paying $6.00 per pole per year for many years; explain that this pole attachment rate is among the 4% highest pole rate charges in the United States today and that the local telephone company, not satisfied with being in the top 4% in charges, now wants to be the 'highest rate charger' in all of the U.S. today. Tell your subscribers that nobody on the local, state or federal level regulates pole attachment rates, and that your only recourse is to either shut the system off, or, move off of utility poles onto your own poles. Explain that you have asked the city for permission to do this, and if you get this permission, you will, as quickly as possible, get off of the Telco poles. But, in the interim, you must continue to rent space from the local Telco because they have the TOWN AT THEIR MERCY IN THIS MATTER. Consequently, the extra 30 cent a month charge for as long as you are on their poles.

Then on your monthly billing show your regular rate, and under it show a new addition as follows:

''Temporary (name of Telco) sur-charge. . . . . . .$0.30''

Do this on each monthly statement so that subscribers are continually reminded about this problem created by the Telco. Since they are a local company, they will find local pressure is not good for their public image.

You may find that if you take these three steps, going to the (1) FCC, (2) city and (3) your subscribers, that the local Telco will back off. They may . . .

Finally, take the list of pole suppliers shown elsewhere in this issue of CATJ and contact the suppliers nearest you about poles. Obtain a quote for 25 foot class 7 and 30 foot class 6 poles, either full-class status or utility type poles. Compile your own thorough analysis of what it will cost you to set your own total pole plant and take that information to the town council. Use the format shown in the November CATJ (page 39) to develop your own numbers for a cost-per-pole set into the ground. Then divide that cost by the utility industry standard 27.5 year depreciation base for a cost to you per pole per year. Show that number to your city and explain that is what it will cost you per pole per year, spread over the same 27.5 year depreciation schedule the Telco uses, to buy and install your pole. Compare that number (typically under $2.00 per pole per year) against the $10.00 figure the local Telco wants from you. That should drive home to the town fathers how ridiculous the Telco rate raise request it.

More Pole Kickbacks

''Thank you for the names of pole suppliers which you gave to me on the telephone after I read the November issue. I thought you might be interested in knowing how the prices compare.

(1) F. Bowie Smith Company, Baltimore will sell me 150 poles in a load for $24.30 per pole delivered.

(2) Dickson Treating Company, Canton, Ms. will sell me 100 poles in a load for $28.00 a piece delivered.

(3) Southern Wood Piedmont will ship me poles from their Gulf, N.C. yard in a 120 pole load for $17.20 each plus $300.00 load freight. That works out to $19.70 per pole delivered.

The waiting time for the Southern Wood Co. poles is 45 days. I have just ordered a load, because for the second time I have refused to sign the power company (Appalachia Power) contract. The bill I received today for last year's rental came to $1012.00. Believe you me, I am getting off of all power and telephone poles as quickly as possible!''

David Fox
Fox TV Cable Company
Gilbert, W. Va. 25621

Editor's Note—

Other systems may wish to contact pole sup-

pliers directly. These are companies referenced in the CATJ November issue dealing extensively with purchasing and setting your own poles.

1. **Maryland**—F. Bowie Smith Company, 4500 E. Lombard Street, Baltimore, Md. (301-276-1000 / Martin Hauser)
2. **North & South Carolina**—Southern Wood Piedmont, Box 5447, Spartanburg, S.C. 29304 (803-576-7660 / Dan West)
3. **Arkansas**—Weyerhauser Company, P.O. Box 1060, Hot Springs, Arkansas 71901 (501-624-8000 / Vernon Eudy)
4. **Mississippi**—Dickson Treating Co., Box 61, Canton, Ms. 39046 (601-859-1135 / Edith Branigin)
5. **Wyoming**—Cowboy Timber Treating Company, Manderson, Wy. (307-568-2792 / Bob Cullison)
6. **Minnesota**—Bell Lumber and Pole Co., Box 2786, New Brighton, Mn. 55112 (612-633-4334 / Jim Eastman)
7. **Arizona**—Southwest Forest Industries, Box 1268, Prescott, Az. (602-445-3200 / L.S. Ridennoure)
8. **Washington**—Cascade Pole Co., Box 1496, Tacoma, Wa. 98401 (206-383-4477 / Dale Hoffman); and, Oeser Cedar Co., Box 156, Bellingham, Wa. 98225 (206-734-1480 / Leland Lloyd)

CATJ would appreciate knowing other pole sources from readers so they may be passed along to the industry.

LIKED SATELLITE REPORT

''Your editorial coverage on pages 19-36 of the October issue of CATJ, relating to CATV use of satellites, is as comprehensive a 'round-up' as I have ever seen in any trade press publication. You are to be congratulated for a really superb job. And yes, Western Union folks share your opinion that at long last a new day is really dawning for community antenna television.

''Please note in our most recent press kit that the photo of a Sony monitor in New York shows a crystal-clear video signal spanning the continent from Theta Cable Television in Los Angeles. This is the sort of satellite-hook up which will revolutionize 'local programming'.

Peter B. Young
Western Union Corporation
Mahwah, N.J. 07430

Peter—

Our October report did generate alot of comments. Such as the fellow in the west who was inspired by the report to jump in with both feet into a program of installing his own terminal from which he plans to lease reception service to other nearby system operators. This particular fellow is not a CATV system operator, but plans to operate the terminal strictly for fun and profit.

Next month CATJ will take a phase-two look at how satellite use by CATV is emerging, including a hard look at an operating terminal.

Wavetek 1050 Sweep

Editor:

The May issue of CATJ contained an equipment review of the 1050 sweep. The CATV industry has shown a great deal of interest in the box inspite of the fact that it was designed as a general sweeper for aerospace, communications and lab applications.

Many suggestions have been made concerning the 1050, and CATV, CATJ made several in its review. As a result we have made a few minor (although we feel important) modifications or production changes in the 1050, and the **1051 CATV version** was introduced this past September.

Here are the changes we made:

1) 75 ohm output is now standard
2) Calibration (in dBmV) of both the step and variable attenuator is now included; from +57 dBmV to −13 dBmV
3) Type ''F'' connectors have been added throughout, replacing the BNC connectors
4) We have added a built-in RF detector (with DC blocking);
5) We have added DC blocking to the RF output connector.

As you suggested in your review, we looked at the possibility of providing an ''external'' jack so the unit could be powered from a line amplifier. This consideration was dropped since external DC cannot be used, because the sweep drive and scope horizontal drive are derived from the 60 Hz AC input. Also, variations in the AC voltages available on various plants (plus within a single plant) are such that we would have to completely redesign the power supply to power the 1051 from the CATV plant's AC power bus source.

After taking the 1051 CATV version into the field for weeks on end, and talking with operators, we have discovered that there are additional options already available within our other product lines of sweepers which can be added to the 1051 series. As a matter of fact, these additional modifications can be added to virtually any of our CATV sweepers. They include:

1) Tilt of RF output (for setting amplifiers)
2) 2 identical RF outputs (dual trunk systems)
3) 5 pulse type i.f. markers (for processors)
4) Removal of the sweep signal during the frequency interval occupied by the pilot carrier signal(s)
5) Division of the sweep rate on ''LINE'' lock sweepers from 60 to 30 to 15 Hz, eliminating scan-loss problems.

Accordingly, we are sending down one of the 1051 units to the CATJ Lab for a second evaluation; and it will be equipped with many of the new options so you can put the unit through the paces again. We profited from the first time through by having a more versatile, thorough unit on the market, hopefully we will have the same experience again!

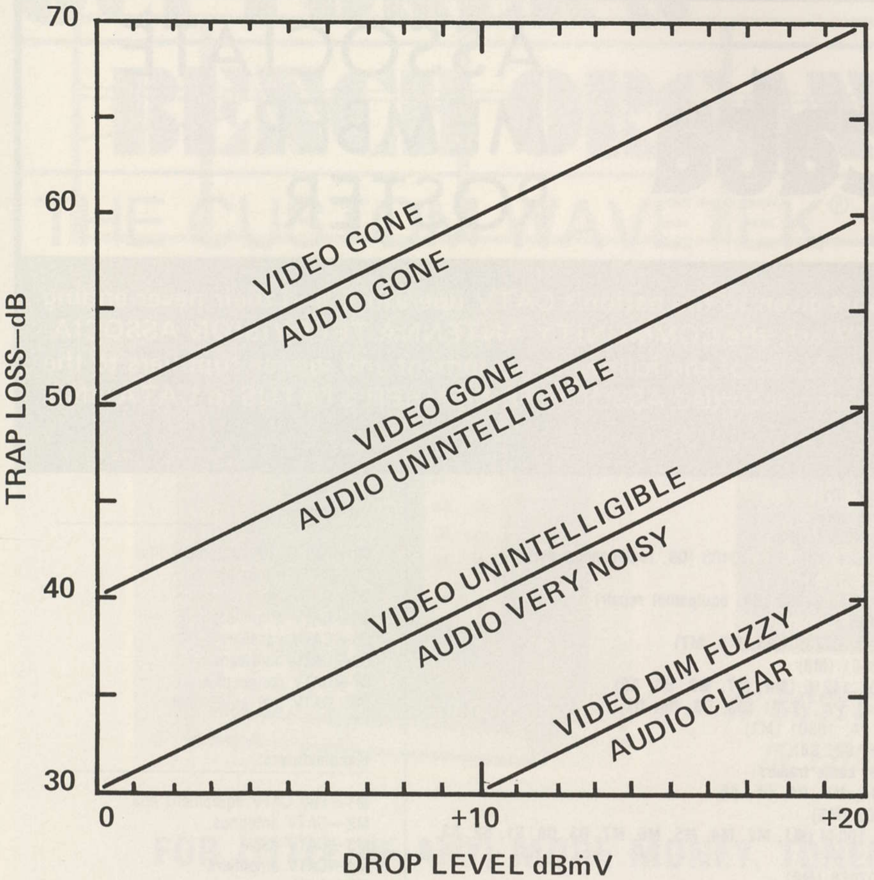
WAVETEK INDIANA, Inc.
Bob Welsh
CATV Sales Manager
Beech Grove, Indiana 46107

Bob:

Our original comments regarding the 1050 were simply that it offered a basic sweep machine at a basic kind of price, and that it should help many systems who have avoided getting sweeping capabilities to date off the dime and into the more modern approaches to CATV maintenance. We have scheduled a Lab Review of the 1051 with options for our February issue, and coincidentally will give away a new basic 1051 Sweep in our February CATJ Reader Contest!

Handy Trap Table

''I was much pleased with the November issue treatment on trapping. Perhaps the pure gold nugget for operators was the report you gave on pages 22 and 26. Up until now, no definitive decision data had been available. I have boiled down these CATJ tests, and Dan Pike's remarks,



into the attached graph. Note that the graph is for the so-called 'average' receiver.''

Glyn Bostick
Chief Engineer
Microwave Filter Company
East Syracuse, New York 13057

Glyn's handy-dandy table is shown here.

Regarding FCC Tests

The first year of FCC inspections of CATV systems is winding up, so CATJ went to a couple of representative FCC Field Offices to learn what the field inspectors think of their initial inspections and associations with CATV.

One southern office said ''We have inspected around 45 systems to date; there are around 270 systems in our district.'' Another office reported ''I am not sure of the exact number visited to date, but it would appear to be around 15% of the total in our district.''

Normally CATV inspection visits are conducted during a **routine** field trip into the region by one of the FCC Field Engineers. The FCC **routinely** inspects broadcast facilities and while they are in your region, you might expect them to single you out for an initial CATV visit as well. To date, we can report no CATV systems receiving **more than** a single FCC inspection.

''We generally find the CATV operators helpful and friendly'' reported one field engineer. ''I ran into one office where the local office gal would not let me into the office because her boss was gone,'' noted another.

At the present time the field inspections continue to concentrate on the following:

(1) A copy of the annualized tests (the Engineer will ask you to make him a copy of same to take with him)
(2) An office listing of channels being carried, and an office copy of the current Part 76

Some field offices are asking to see more, but these are the essential ingredients.

The copy of your tests (**the most recent year** is the one copied) goes with the engineer to his office. There he makes out a report form of his visit, and together with a copy of your tests for the most recent year the package is sent back to the Cable Television Bureau.

''I believe that the test-copies received to date are to be evaluated for the test results and to try to determine if some specific rules need to be adopted to detail testing procedures,'' one engineer told us. In cross-checking that in Washington, we could find no one at the Cable Bureau who would **admit** that **new** rules are being drafted to specify precise testing methods.

One operator who has visited late in November was concerned that his system was visited primarily because he had attended a recent regional cable meeting where **he spoke out** before an FCC

CARS BAND RENEWALS

Approximately 400 CARS (Cable Television Relay Service) licenses expire on February 1, 1976. Applications to renew these licenses must be prepared and filed with the Commission prior to that date.

The Cable Television Bureau has recently developed a **new** form (FCC form 327) which is intended for use in all CARS applications, including renewals. The new form is designed, it is said, to ''elicit all of the information required in a comprehensive single package.'' The present FCC form 402 does **not** contain all of the information required.

In the interim, **no** applications for renewals should be filed on FCC form 402; if you have a CARS band license with a renewal due on February 1, and you have **not** to date received a copy of the new FCC form 327, you are instructed to contact the Cable Television Bureau, Federal Communications Commission, Washington, D.C. 20554 promptly so that your license renewal is filed on the proper form.

Those who have seen copies of the new 327 form report say it is exceedingly complex and will probably win few friends for the Commission.

ASSOCIATE MEMBER ROSTER

cata

In recognition of the untiring support given to the nation's CATV operators, and their never-ending quest for advancement of the CATV art, the COMMUNITY ANTENNA TELEVISION ASSOCIATION recognizes with gratitude the efforts of the following equipment and service suppliers to the cable television industry, who have been accorded ASSOCIATE MEMBER STATUS in CATA, INC. for 1975.

Anixter-Pruzan, Inc., 1963 First Ave. S., Seattle, WA. 98134 **(D1)**
Avantek, Inc., 3175 Bowers Avenue, Santa Clara, CA. 95051 **(M8)**
Belden Corp., Electronic Division, Box 1327, Richmond, IN. 47374 **(M3)**
BROADBAND ENGINEERING, INC., 850 Old Dixie Highway Lake Park, FL. 33403 **(D9, replacement parts)**
Burnup & Sims, Box 2431, W. Palm Beach, FL. 33401 **(S2, S7, S8)**
Cable Dynamics Inc., 501 Forbes Blvd., So. San Francisco, CA. 94080 **(S8, equipment repair)**
CABLE NEWS, 2828 N. 36th Street, Phoenix, AZ. 85008 **(S6)**
Cerro Communication Products, Halls Mill Road, Freehold, NJ. 07729 **(M3, M5, M7)**
COMM/SCOPE COMPANY, P.O. Box 2406, Hickory, NC. 28601 **(M3)**
DELTA BENCO CASCADE INC., 40 Comet Ave., Buffalo, N.Y. 14216 **(M4, M7, M8, D3, S8)**
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, AR. 72501 **(D1, S1, S2, S8)**
DEVINES Trailers & Accessories, Grantville, PA. 17028 **(M9, cable trailers)**
ENTRON, Inc., 70-31 84th Street, Glendale, NY. 11227 **(M4, M5, D4, D5, S8)**
GAMCO INDUSTRIES, INC., 317 Cox St., Roselle, NJ. 07203 **(M5)**
JERROLD Electronics Corp., 200 Witmer Road, Horsham, PA. 19044 **(M1, M2, M4, M5, M6, M7, D3, D8, S1, S2, S3, S8)**
Kay Elemetrics Corp., 12 Maple Avenue, Pine Brook, NJ. 07058 **(M8)**
Microwave Filter Co., 6743 Kinne St., Box 103, E. Syracuse, NY. 13057 **(M5, bandpass filters)**
MID STATE Communications, Inc., P.O. Box 203, Beech Grove, IN. 46107 **(M8)**
Pro-Com Electronics, P.O. Box 427, Poughkeepsie, NY. 12601 **(M5)**
QE Manufacturing Co., Box 227, New Berlin, PA., 17855 **(M9, tools & equipment)**
RMS CATV Division, 50 Antin Place, Bronx, NY. 10462 **(M5, M7)**
Sadelco, Inc., 299 Park Avenue, Weehawken, N.J. 07087 **(M8)**
Systems Wire and Cable, Inc., P.O. Box 21007, Phoenix, Az. 85036 **(M3)**
TEXSCAN Corp., 2446 N. Shadeland Ave., Indianapolis, IN. 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)**
Tocom, Inc., P.O. Box 47066, Dallas, Texas 75247 **(M1, M4, M5, Converters)**
TONER Cable Equipment, Inc., 418 Caredean Drive, Horsham, PA. 19044 **(D2, D3, D4, D5, D6, D7)**
Van Ladder, Inc., P.O. Box 709, Spencer, Iowa 51301 **(M9, automated ladder equipment)**
WAVETEK Indiana, 66 N. First Ave., Beech Grove, IN. 46107 **(M8)**
Western Communication Service, Box 347, San Angelo, Texas 76901 **(M2, Towers)**

NOTE: Associates listed in bold face are Charter Members.

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

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

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

Commissioner **against** FCC involvement in CATV. "I spoke my mind and I'm glad I did," the operator told us. "However, within ten days I had a visit from an engineer; and in checking with all of the radio stations in my county I found none that had been visited," the operator noted.

We asked the engineer who made the inspection about this. "I was going to (name of city) to conduct some Amateur and Radiotelephone exams" the engineer explained, "and I took a small detour to visit this system along the way," the engineer noted. "It was sort of a special trip," he admitted. He also said he visited no other systems or any broadcast facilities on that trip.

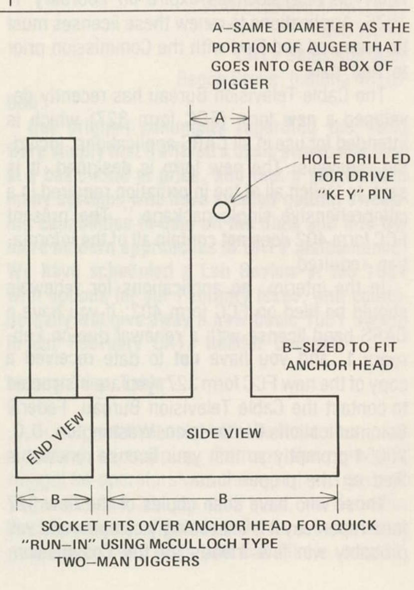
It should be noted that if your system has no copying equipment available, the FCC will take your current year test results with them to copy in their home office; returning same to you the next day. The Commission field personnel are authorized to spend up to ten cents per page copied for copies while in the field, should you care to charge them for the copy they request.

Anchoring Pole Guys

"I enjoyed your report in the November issue on setting poles. However, I failed to see any information on guying poles. Turning an anchor into the ground with a piece of pipe (for leverage) is a man and time killer. If any systems are using a McCulloch type auger, a trip to the welding shop to have a 'socket' made that fits an anchor head will be a real time/money saver. Having used such an attachment in the 60's, I can vouch for it being a real man saver. Also, an excellent guide to setting poles on your own can be found in many war surplus dealers lists. Look for TM 11-2262-2 entitled 'Outside Plant and Pole Line Construction and Maintenance'. Keep up the excellent work in CATJ!

Horace T. Downs
Decatur Television
Bainbridge, Ga. 31717

Mr. Downs' auger attachment appears here.

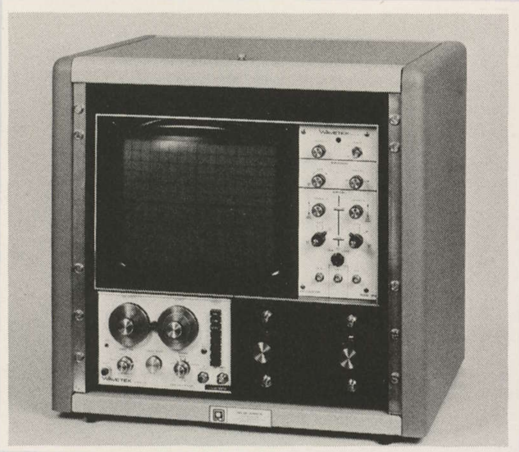


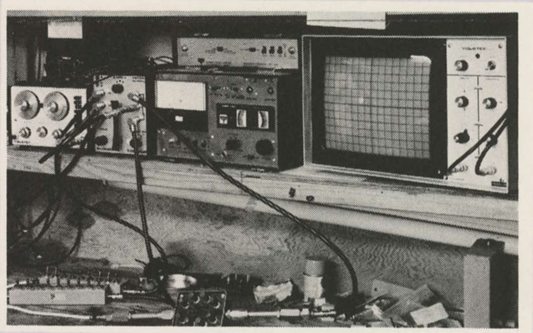
SOCKET FITS OVER ANCHOR HEAD FOR QUICK "RUN-IN" USING McCULLOCH TYPE TWO-MAN DIGGERS

Get TONER'S

BENCH ORGANIZER...

THE CUSTOM WAVETEK® SWEEP SETUP





IT COSTS LESS THAN THE MESS IN PRODUCTIVE TIME SAVED

FOR LITTLE (IF ANY) MORE MONEY, TONER WILL SUPPLY YOU THE MAKINGS FOR A NEAT, EFFICIENT TEST BENCH.

CHECK THIS:

- Wavetek Sweep Generator of Your Choice
- Wavetek Display 'Scope of Your Choice
- Two Wavetek Variable Attenuators with d.c. blocked inputs and outputs
- Handsomely (and Neatly) Racked in a Premier Steel Cabinet for Your Bench

YOU KNOW:

- A rat's-nest test setup costs you a lot of maintenance efficiency
- Dropping and damaging loose test equipment is expensive
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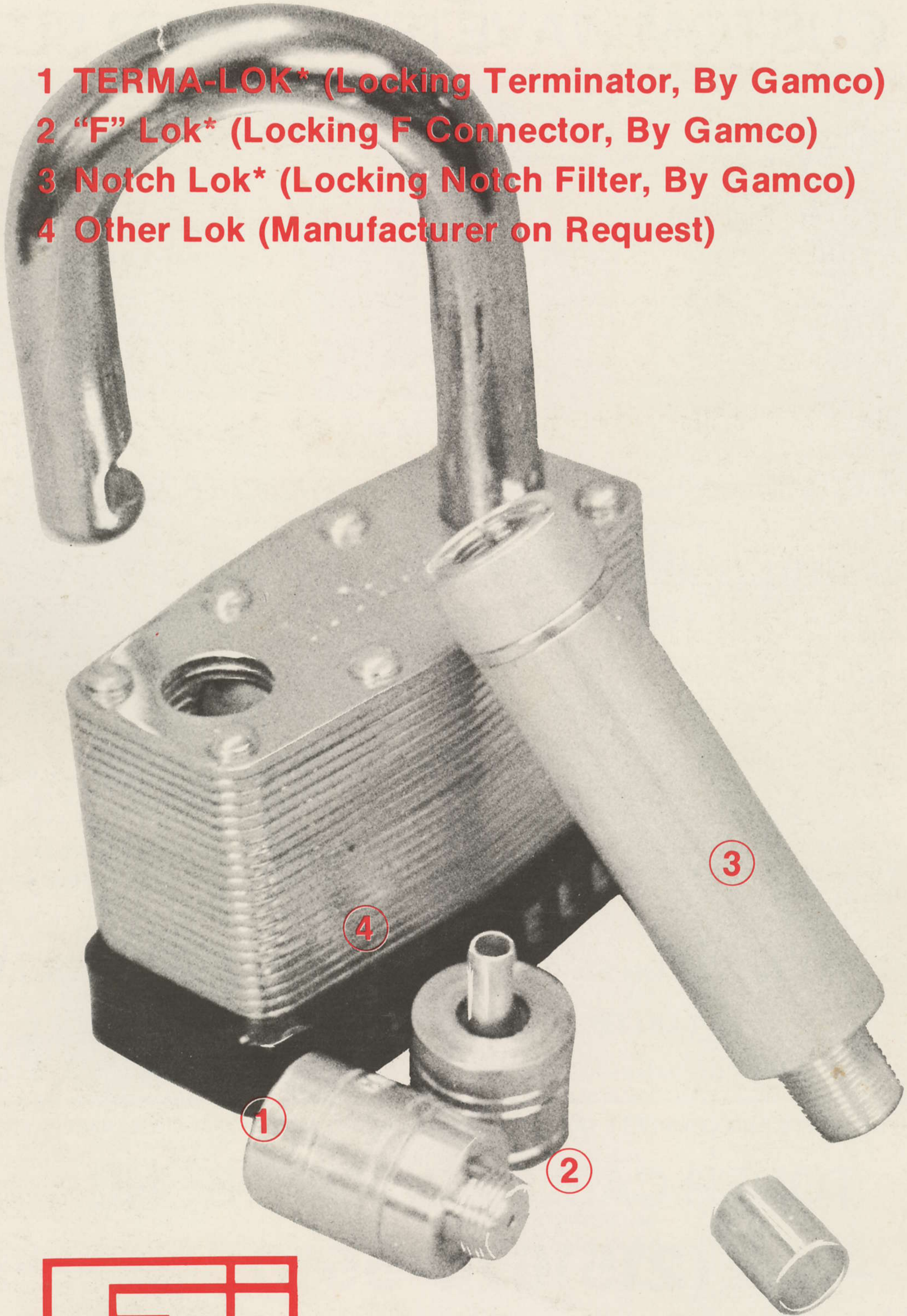
4 Other Lok (Manufacturer on Request)



*Patent No. 3861770
Additional Patents Pend.

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