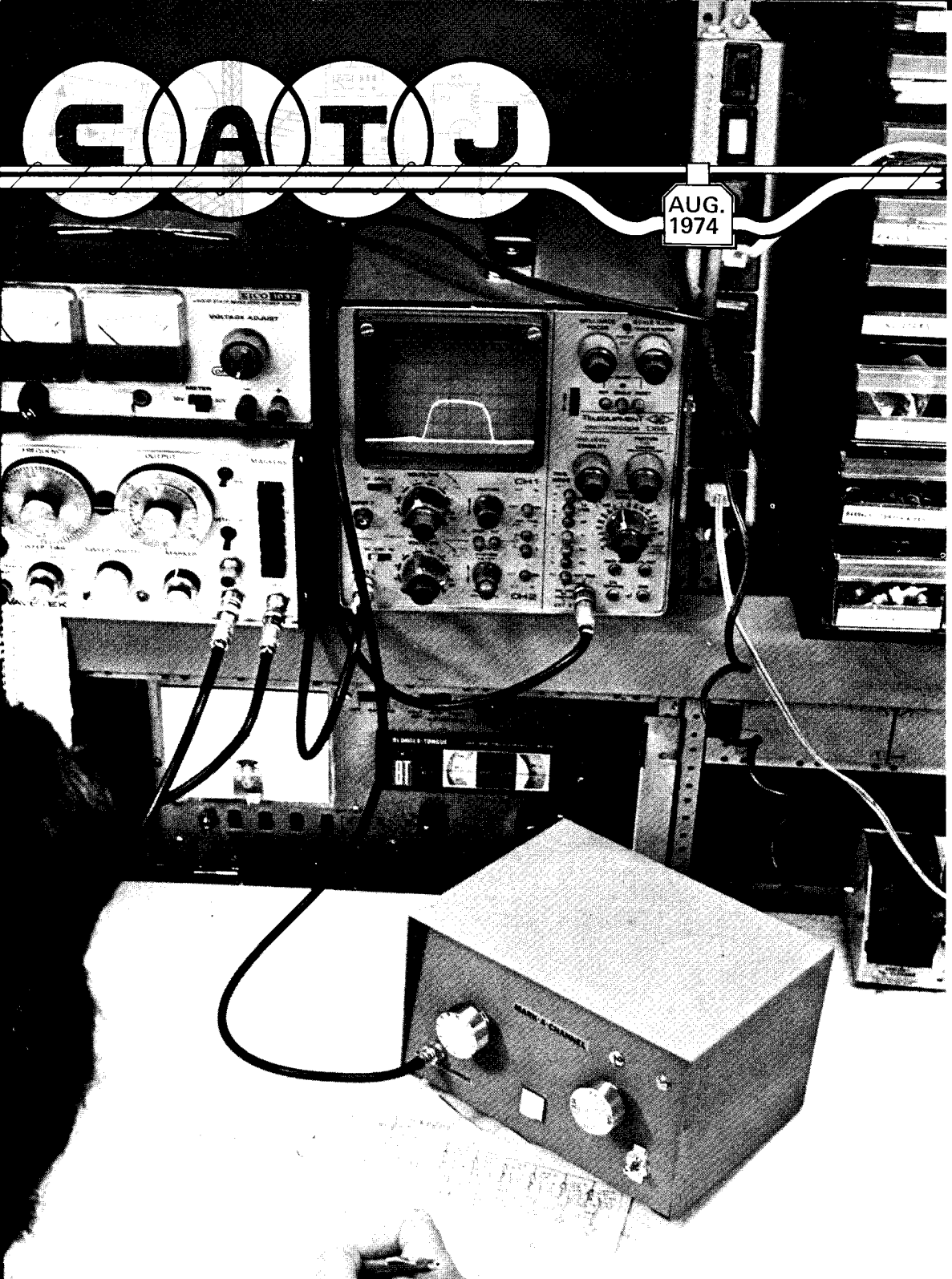
# CATJ

AUG. 1974

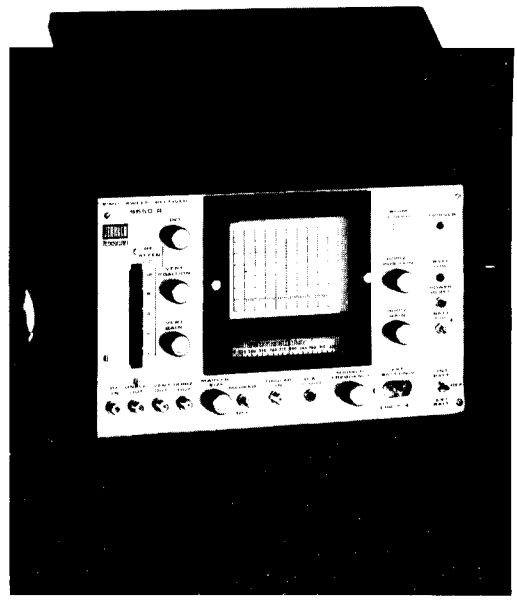


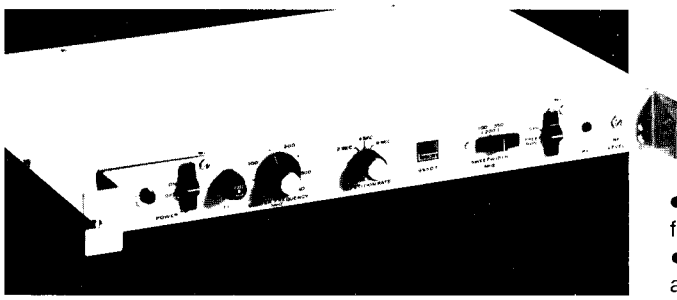
COMMUNITY ANTENNA TELEVISION JOURNAL

# SLEEP, don't sweep tonight.

## The Jerrold/Texscan "Sleep-Saver" system lets you *sweep* your system at your convenience!

**This economical Sleep-Saver simultaneous sweep system provides sweep analysis at *any time* with minimal interference at your subscriber's set. Sweep duration is only *3 milliseconds*. No need to lose sleep or pay overtime!**





Here's what the Sleep-Saver has going for you:

• Economy—Sleep-Saver can pay for itself by eliminating overtime. • Compatibility—works with any CATV system. • Minimal accessories—display built into receiver. • Remote keying—barrier strip provides input for keying transmitter. • External trigger input—front panel provision on receiver. • Parallel scope drive—receiver has output to drive storage scope. • AND battery-operated—for maximum convenience. Contact Your Man from Jerrold. Or write for details.

74-36

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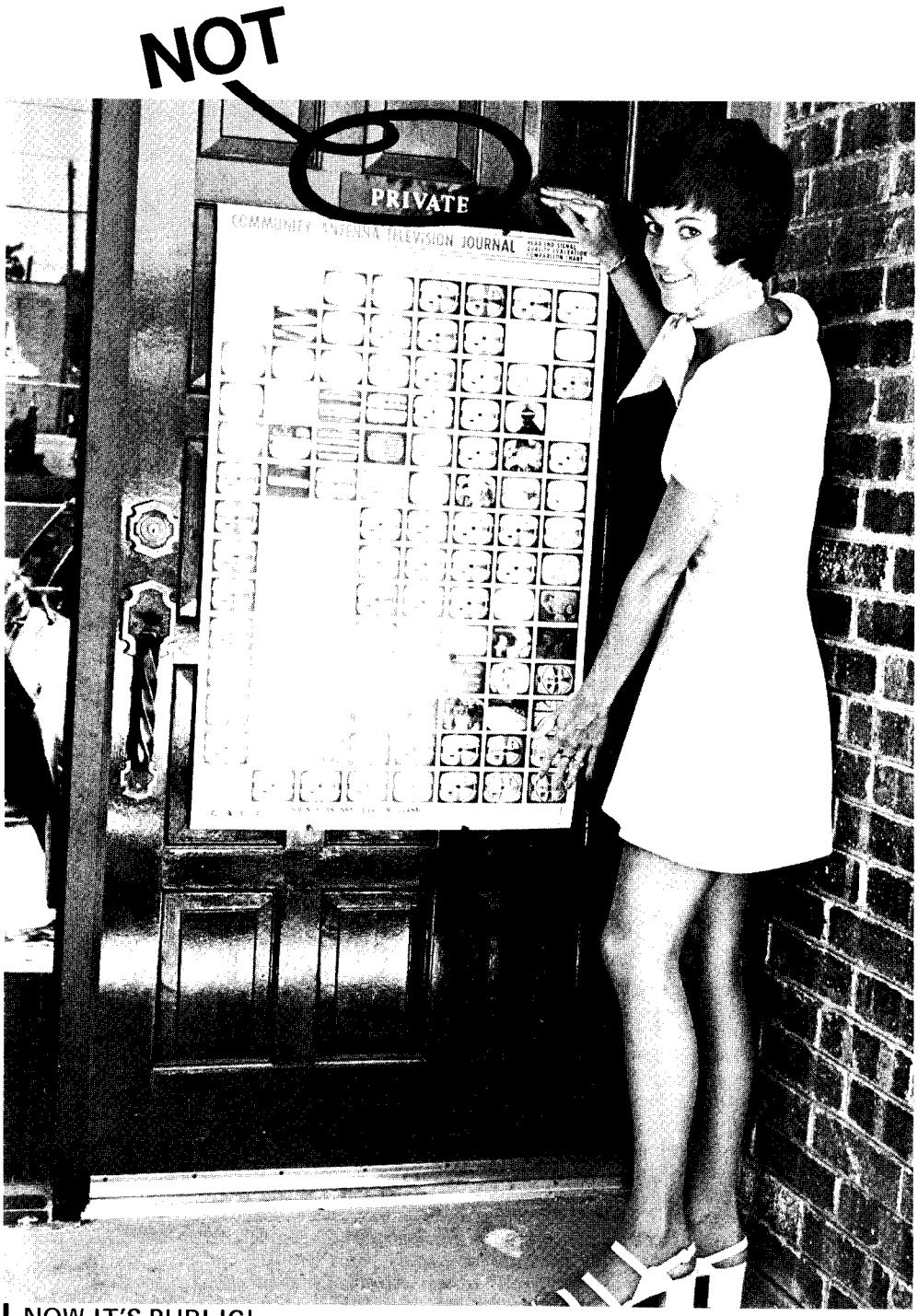


## NOW IT'S PUBLIC!

The CATJ Head End Signal Quality Comparison Wall Chart unlocks the secrets of lousy looking head end pictures for all to see. More than 90 off-the-screen photos, with interference sources identified. The best CATV office display ever (it shows your public what you have to go through to make perfect pictures!). The best technician training tool ever (identify the interference from the photos, read what causes it, and fix it!). Two-color, heavy enamel stock, measures a big 25" X 38" (never mind what Heather measures!) and is shipped to you rolled in a tough mailing tube. And, quantity discounts available. Single charts only $5.00 each from CATJ.Use handy order card between Pages 8 and 9, or Pages 40 and 41, of this issue.

# CATJ

# AUGUST 1974

VOLUME 1
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## —CONTENTS—



**OUR COVER**

CATJ's **Mark-A-Channel** described in theory and construction detail last month is completed in this month's issue with a set of detailed photographs that may help you build this handy test unit.

# CATA –TORIAL

KYLE D. MOORE, President of CATA, INC.

## UNFETTERED INDUSTRY

During the course of the annual convention of the Canadian Cable Television Association in Montreal, Canadian Prime Minister Trudeau addressed the group and urged the CATV industry in Canada to ever greater accomplishments.

**"You are not hindered by being fettered by history",** the prime Minister told the group.

The Canadian CATV story is similar, but not identical by any means, to that of the U.S. Broadcast television did not arrive in Canada until the 1952 debut of a Toronto station. Broadcasting in Canada has traditionally been a strange (to Americans) mixture of government subsidized broadcasters and private enterprise, a plan also found in Australia and elsewhere. The plan has always been to allow the government subsidized stations (the CBC) to open up a region, and then after the broadcaster was established and the receivers in place, allow commercial private enterprise to build and operate stations in the market.

Because television began in Canada some six years after it began in the U.S. (even after it began in 1952, it grew very slowly until the late 60's), there has been only a limited number of outlets in any given region. With the vast majority of the Canadian citizens living within 100 miles of the U.S./Canadian border, the Canadians as a lot have been rather involved in our own broadcasting scheme here. It was the slow start of home-grown television and the appetite for television programming that pushed Canadian CATV so far in advance of U.S. CATV during the 50's/60's and now the 70's

Now the Canadians are concerned they may be losing their "lead".

Few in the United States have paid much real interest to the Canadian CATV operators, or been exposed to what is basically a **higher level** of transportation-by-cable **technology.** But the facts are there if you care to look at them: better attention to head end design and location; better attention to signal processing techniques; and technicians (and yes installers!) who **actually understand** and work with things like automatic slope control, amplifier cascades and signal to noise ratios.

Recently the Canadians have been concerned about the apparent inability of their CRTC (roughly equivalent to our FCC) to grasp the real problems facing the industry. Canadian operators complain (and with justification we believe) about long strings of red tape to get "official sanction" for such things as moving a head end location. **Yes, moving a head end location.** In Canada the regulations are so complete and so tight that a cable operator cannot move or relocate his head end without CRTC approval. A number of the more influential and talented leaders in the Canadian CATV industry complained, during this year's CCTA convention, that dealing with regulatory problems has become so time consuming that they find themselves unable to deal effectively with the bigger problems of making Canadian CATV systems responsive to the real needs and desires of the viewers.

A number of Canadian provinces (notably Manitoba and Ontario) are making loud noises about setting up their own regulatory agencies for cable (not unlike the New York state program in the U.S.).

I believe the Canadian leaders have clearly identified the biggest threat facing the cable industry today, whether it be Canadian or American. That is, the high degree of probability that **as we go further and further into the quicksand of local/state and federal regulation,** that **more and more of our industry talent is being consumed,** chewed up and spit out **by the regulatory scheme itself.** Our talents to make systems work, and work well for the benefit of our subscribers, are evaporating day by day and hour by hour as we are forced to spend more and more of our 24 hour work day dealing with this agency or that agency.

In the end we will accomplish two things:

(1) We will degrade our services to the point where we cannot offer anything approaching our true potential to the nation's viewers.

(2) We will burn out most, if not all, of the truly talented and capable people in the industry, leaving it in the hands of less experienced and less talented "store minders".

**Not to realize our potential** is the sin we now face.

# CABLE CAPTIONS

**A very unusual case involving non-duplication protection** in West Virginia becomes more interesting by the day. **Bill Turner,** veteran CATV operator in Welch, West Virginia, has been carrying on a running battle with Bluefield's WHIS-TV for several years. Turner's low band carriage system included WHIS-TV (6) and WSAZ-TV (3). Both stations are NBC affiliates.Turner originally received a request from WHIS-TV for elimination of the WSAZ signal in 1967. A Commission show-cause order issued shortly thereafter resulted in Welch Antenna and WHIS reaching a "private agreement". In April of this year, WHIS charged Welch was not living up to the agreement and asked for a cease and desist order against the cable company. Bill Turner went through a May 24th FCC pre-hearing conference and waived his rights to a full hearing, reserving the right to file a written statement. On May 20th Turner submitted the statement and provided financial and technical data to substantiate his claim that his system of fewer than 1,200 subscribers could not meet the terms of the private agreement. The Commission consequently ruled on July 2nd that Welch Antenna must within two days provide non-duplication protection for WHIS from WSAZ.

Whereupon the situation got more interesting. The City of Welch came to Turner and requested that he lease to them (the city) a channel. They asked that he lease to them channel 3 on the cable during those periods when WSAZ was to be eliminated because of non-duplication protection. The cable is prohibited by Commission rules from censoring material run on a leased channel, and is compelled by Commission rules to lease channels when it has them available.

The Mayor of Welch then announced that **during those periods of the day when WSAZ is to be "shut down" for system compliance with 76.91, the City will operate as a lessor channel 3 on the cable and it (the City!) will carry WSAZ as its leased channel programming!**

Operator Turner reports he has entered into the lease agreement with the City ("reluctantly" he adds) and the **change over** was to be effective with the effective date of the cease and desist order from the Commission. A spokesman at the Commission, who already had knowledge of the arrangement, told **CATJ** "we are sending a letter to Mayor of Welch with a copy to Mr. Turner advising them that the Commission will not allow such subversion of the non-duplication rules".

**Regulation? Re-regulation? De-regulation!!!** At least one knowledgeable insider at the Commission admits that the cable rules may be so hopelessly confusing and patch-work-quilt designed that he would look with some enthusiasm at throwing **all of the rules out** and starting all over again—from scratch. With the Commission now back to a full seven man level, there are three brand new Commissioners who have very little cable background. At least one of these reports to be favorably disposed to "looking at" such a de-regulation and starting all over again.

**Seven dockets for seven months.** Those seven dockets reported in detail in the **June CATJ** (see page 41 for June) which were announced by the Commission as "clarification rule makings" have drawn (in some cases) unusual quantities of responses from the cable industry, broadcasters, and the public. Especially surprising to many at the Commission were the number of responses from cities and towns who objected (along with states) to the pre-emption of regulation in a number of key areas by the FCC and the removal of authority except at the Federal level in areas such as pay TV rates and programming. "Don't expect any official consideration of these rule making proposals before late (very late) 1974", **CATJ** has been told.

**Better put a string on this issue of CATJ.** We went through and eliminated nearly 3,000 addresses (the big part of our free sample list) this month. All of those fellows around the office who have been getting these extra copies will be trying to borrow yours. May we suggest that you tell them to utilize the subscription card between pages 8-9 or 40-41 and subscribe to their own copy! After all, you paid for **your** subscription.

**Our first article on solid-state-theory** (May issue **CATJ** on Single Ended Line Extenders) apparently struck an extremely responsive cord with many system chief techs. Numerous ones wrote us to urge that we continue the series. One noted "the clear, concise, straight to the point explanation of how a single ended line extender worked made my one day line extender training session for two new techs a snap", and he concluded with "even I understand it better now, and I learned a few things". This month the series continues with a piece on push-pull line extenders.

**Quote of the Month:** Former Cable Bureau Chief, Sol Schildhause, speaking before the New England Cable Television Convention in July, expressed his knowledgeable fears about the quality of Senate Bill S. 1361 (copyright). Sol told the cable operators, **"If there has to be a copyright, this is probably not the right bill. I'm very uneasy about the opportunities built into the bill for bushwhacking and if I were a system owner I'd be asking, 'who the hell got me into this' ".** Schildhause noted that the 1/2% copyright fees are set by law for only six months time, and that they can be raised by a tribunal as they choose after that period. We know **who** got us into this, Sol. Now, can **you** help get us out!

# ONE-WAY ALARM SIGNALING

*WORTHY OBJECTIVES*

Part of the blue-sky description for the cable system of the future talks about all of the wonderful spectrum space available within a piece of coaxial cable, and the *ability* of the cable itself to transmit messages two ways simultaneously.

As we are all aware, the wide-spectrum capability of the cable itself is not much more than a carrot dangling out there on a string, because while the cable-is-capable, very little else is capable of the kind of sophisticated system the blue-sky people have been talking about all of these years.

Still, the cable *is* there, and if our active electronics *and* passives typically pass 50-220 MHz (which is true in all but low-band only situations), then our actual *use* of the available spectrum, even in a 12 channel plus FM operational plant, is only about 50% of the efficiency we could expect.

Twelve channels of TV bandwidth occupy 72 MHz of spectrum space (12 x 6 MHz = 72 MHz), and 88.0 to 108.0 MHz FM is another 20 MHz of spectrum space. That leaves us with unused cable ability from 50-55.25 MHz, 72-74 MHz, 108-175.25 MHz and 216-220 MHz.

Many have worked out schemes to fill some or all of this spectrum with various signals which would (or could) add additional revenue to the CATV system. Mid-band has been extensively used for additional TV channels, where it will work with converters, and some experimentation has been done with "secure" audio or data channels just below channel 2 (50-55.25 MHz) and just above the FM band (108.0 MHz up to around 120 MHz).

What we are going to talk about in this series are various schemes to make some *present productive use* of the unused cable spectrum in your CATV plant, some of which *may* suggest additional revenue sources for you, but most of which will merely suggest more efficient ways for you to run your own CATV business by *signaling yourself*, remotely, when certain types of malfunctions occur at various points in your CATV plant.

*TRANSMITTER/RECEIVER*

To communicate from point "A" to point "B", we need something called a transmitter at "A" and something called a receiver at "B". "A" sends some type of message and "B" receives that message.

In normal wireless communication systems, the transmitter operates on a discrete frequency, and couples its transmitted energy from the transmitter to the "air" with an antenna. At the other end of the line ("B") the receiver extracts some of that transmitted signal from the air with an antenna, and decodes the transmission as received with a receiving system functioning on the same discrete frequency as the transmitter at "A".

A one-way signaling system for a CATV system operates pretty much the same way, with one major exception. The transmitter at "A" is coupled not into an antenna, but into the cable system itself. And the receiver at "B" receives its energy from the transmitter at "A", not through its own receiving antenna, but from the cable system which has transported the signal from "A" to "B".

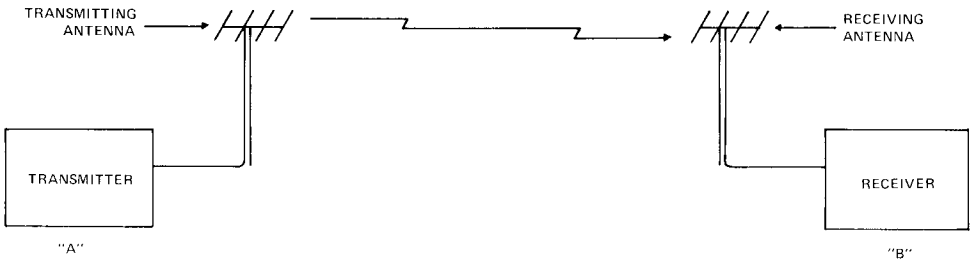



***DIAGRAM ONE***

The advantages to this kind of signaling transmission system are pretty evident:

(A) The transmitter *does not radiate* signals into the air, so *no license is required* for its operation (from the FCC or other local authority).

(B) Without a licensing requirement, the transmitter can function without the long list of requirements which normally go along with licensed transmitters, such as station call letters, specific equipment type approval or acceptance, limitations on who can operate (or turn on and off) the transmitter, and limits on what type of intelligence (if in fact any intelligence at all) is transmitted by the transmitter.

So a cable television system operator, if he has or can find a need to one-way signal himself, has an advantage that no other type of local businessman (with the possible exception of the telephone company) has. *He can communicate with himself* by using his own system, free of all of the rules and regulations with which the fellow delivering pizza or hauling concrete must contend.

*WHY COMMUNICATE?*

For the early sessions in this series we will limit our discussions to one-way signaling. *Two-way,* which is not as complicated as many try to make it, *will come later.*

If you cannot (or will not) communicate back *and* forth (two-way), what practical value does one-way signaling have?

Let's look at the limitations of one-way signaling in a CATV system. As Diagram 2 shows, everything normally starts out at our head end. At any point in, on or along our CATV distribution system after the head end, if we *plug into* the CATV system, we will be able to intercept any signals that leave the head end on the cable by merely utilizing the proper type of receiver.

Energy flows in one direction, always away from the head end. If we want to add additional signal(s) to the distribution plant after the signals have left the head end, we can do so at any point along the distribution (and here we mean trunk *and* feeder) which we desire. However, if we add it at point "1" on Diagram 2 then only that portion of the plant after point "1" will be able to receive the signal added at point "1". If we add the signal(s) at point "2", only that portion of of the CATV plant after point "2" will be able to receive the signals, and so on. . .

Theoretically, we can add signal(s) (that is, *new signals*) to the distribution plant right up to the end of the longest line, but if there is no one beyond that point on the CATV system, there is no one to receive the signals we have added at the end (remember the old argument about shouting to yourself in the middle of a deep woods?).

So if we wish to add any kind of signals to the normal TV and FM radio fare, and we need to be able to "cable-receive" the additional signals at any subscriber point within the system, we had better do it at the head end itself, or before any subscribers are hooked to the system (1).

On the other hand, if we have some additional signal which we wish to add to the system at point "2" in Diagram 2, but we are not required to be able to receive that signal at any points on the system except those appearing *after* point "2", then we can just as well add that additional signal at "2" as way back at the head end itself.

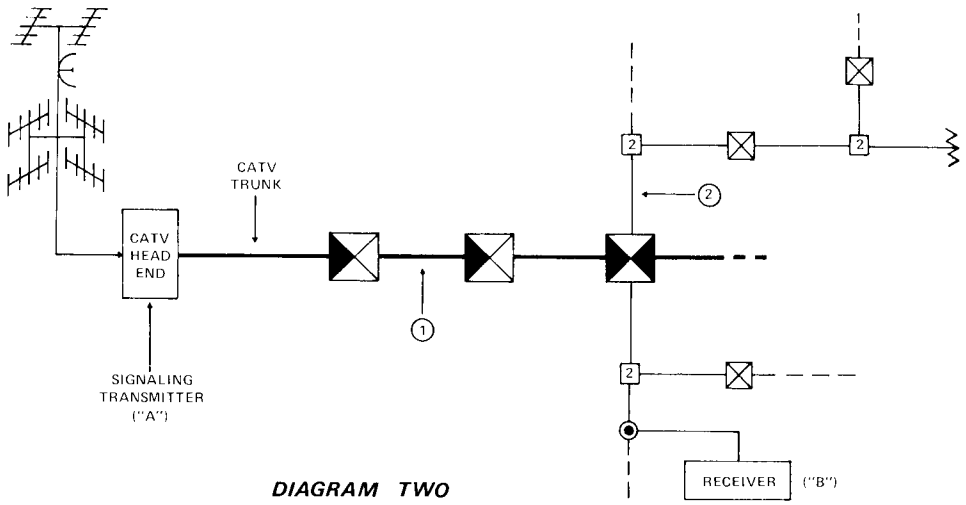



***DIAGRAM TWO***

One-way signaling objectives are not really all that complicated as long as you have the intended transmission point and all of the intended receiving points clearly in mind when you set out to plan your addition of signal(s). As long as the receiving points *come after* the transmission (i.e. insertion) point(s) on the cable plant that flows outward from the head end, you are in business.

*INTELLIGENCE?*

What is intelligence? A door buzzer is intelligence, because when it buzzes you know someone is standing outside the door wishing to enter.

So too is a ringing telephone, even before you answer it. You know when the telephone rings that someplace out there in the big world someone has dialed your number.

Stretching intelligence just a little bit further, rain beating on the roof or against the window pane is intelligence. You hear the sound, and from your past experience you associate the sound with rain.

Intelligence does not have to be a spoken word or even a stream of high speed data-bits. Just the knowledge that something is happening or has happened is intelligence, and often it is very important intelligence.

Many of the companies which operate two-way radio services have a little electronic attachment which fits on either a car two-way unit or on a pocket pager. When the transmitter in this type of system sends out a signal, the attachment to the basic radio *receiver* turns on a light or a buzzer. This light remains on, or the buzzer continues to buzz, after the transmitter has ceased transmitting, as a form of intelligence to the user of the receiver. It tells the receiver user that he has been called by his associated transmitter, and while he may have been away from his receiver when the call came in, upon returning to his receiver and finding the light on or the buzzer buzzing, he should take some sort of action.

In effect, the transmitter leaves a *"you have been called"* bit of intelligence, which remains in effect until the receiver operator returns to his receiver and receives the delayed message.

However, for this system to function, the receiver must be continually operating so as to intercept the transmitted message whenever it occurs. *Or,* the transmitter can be operated continuously but the receiver checks in every now and again to see if it is being called.

*ELEMENTARY HEAD END SIGNALING*

The devious human mind can conceive any number of spectacular things to signal from the head end outward into the CATV plant. Let's start with just a handful of practical *down-to-earth situations* and leave the mind bogglers to the blue-sky proponents.

If your head end is located out of the way, and is not within arms reach of the local law or frequent passers-by, then you have a potential security problem.

# TELL CATJ WHAT YOU THINK!

CATJ TWO-WAY TALK BACK DATA CARD

(1) **About CATJ**
(2) **The State Of The CATV Industry Today**

We, like you, have a natural dislike for filling out forms. Yet man has probably never come up with a better way (short of personal interviews) to extract large amounts of data from a diverse data-base. We make it very easy on you . . . simply fill out as much or as little as you care to complete. All information will be kept confidential by our staff, and it will help us deal more effectively with future issues of CATJ. Thank you.

Please complete where you feel you have an opinion. Leave blank those questions which simply do not concern you. Your name and address on the reverse side is optional!

**ABOUT CATJ as a publication:**

(1) I rate CATJ . . . . Excellent . . . . Good . . . . Fair . . . . Poor overall.
(2) In rating CATV publications, I rate:
(A) **Best for me:** . . . . CATJ . . . . TV & C . . . . BM/E . . . .Cable News . . . .CATV Weekly
(B) **Worst by me:** . . . CATJ . . . . TV & C . . . . BM/E . . . .Cable News . . . .CATV Weekly
(C) I read: (in addition to CATJ)

| | | |
|---|---|---|
| **TV & C** | . . . .and I read it . . . . | cover to cover . . . . flip through |
| **BM/E** | . . . .and I read it . . . . | cover to cover . . . . flip through |
| **Cable News** | . . . .and I read it . . . . | cover to cover . . . . flip through |
| **CATV Weekly** | . . . .and I read it . . . . | cover to cover . . . . flip through |
| _____ | . . . .and I read it . . . . | cover to cover . . . . flip through |
| _____ | . . . .and I read it . . . . | cover to cover . . . . flip through |

(3) For me . . .
CATJ is . . . . too technical . . . . not technical enough . . . . just right
CATJ is . . . . physically a good size . . . . too small
CATJ is . . . . has too much material . . . .has too little material
. . . . is alright as it is
CATJ in-depth treatment of material is . . . .appreciated . . . . not appreciated
(4) The best article CATJ has run to date was _____
(5) The worst article CATJ has run to date was _____
(6) I would like to see **more articles** dealing with:
(A)_____
(B)_____
(C)_____
(7) I would like to see **fewer articles** dealing with:
(A)_____
(B)_____
(C)_____
(8) I . . . . am . . . . am not interested in building my own test equipment.
(9) I . . . . have seen the CATJ Head End Wall Chart, and I rate it:
. . . . Excellent . . . . Good . . . .Fair . . . . Poor
(10) I think CATJ should do wall charts on:
(1)_____
(2)_____
(3)_____
(11) I subscribe to CATJ:
. . . . Through my company
. . . . For myself personally

**(OVER - PLEASE)**

CATJ TWO-WAY TALK BACK DATA CARD

# PLANNED FOR

# SEPTEMBER CATJ:

(1) **Building your own bandpass filters and traps** . . . . may not be as complicated as you suspect!

(2) **Cascading Line Extenders for serving small towns** with no trunk or bridger amplifiers . . . . up to ten line extenders deep! It can be done.

(3) **Field Strength Meters** . . . . surprising as it is, many people do not understand how they work, or how to work them!

(4) **The ATS-6 receiving terminal** . . . . you CAN build it.

And much more, naturally.

**TWO-WAY TALK BACK CARD** - continued:

**ABOUT THE INDUSTRY today:**

(1) The biggest single problem this industry has today is:

_____

(2) After that problem, the next biggest is:

_____

(3) I am:

. . . .happy with the Copyright Bill reported out of the full Senate Committee (See July CATJ CATA-torial)

. . . .unhappy with the Copyright Bill

. . . .could care less whether we pay copyright or not

(4) In my opinion, the FCC Cable Bureau is:

. . . .doing a good job

. . . .trying hard, but failing

. . . . _____

(5) In my opinion, I think the seven FCC Commissioners:

. . . .have a good enough understanding of CATV to regulate us

. . . .lack sufficient understanding of CATV to regulate us

. . . . _____

(6) The CATV supplier I am happiest with at the moment is: _____

(7) The CATV supplier I am unhappiest with at the moment is: _____

(8) In the present state of the industry, I am:

. . . .going ahead with expansions, rebuilds

. . . .sitting tight and waiting to see what happens

. . . . _____

**ABOUT ME:**

(1) I am:

. . . . installer . . . . tech . . . . engineer . . . . manager . . . . owner

. . . . _____

(2) The system I am connected with:

has approximately _____ subscribers; carries _____ channels

(3) (Optional)

Name _____

Address _____

City _____ State _____

——**Please Mail To CATJ**——

Attention: Heather Pennington

**CATJ - Community Antenna Television Journal**

4209 N.W. 23rd. St. Suite 106

Oklahoma City, Oklahoma 73107

It would be helpful for you to know:

(A) When someone *goes in the door* of the head end building

(B) Whether the person entering was an *authorized-entry* person

(C) If you were not at some remote "receiver location" that in fact someone (not authorized) had indeed *been* into the building

It possibly would also be helpful for you to know:

(A) Whether the temperature inside of your head end building is either too hot (above some limit you set), or too cold (below some limit which you have set)

(B) Merely that the air conditioner (or heater) had indeed come on, as either the timer or thermostat told it to do

(C) Whether the tower lights have come on

(D) When power quits at the head end itself

These are not very complicated signaling functions, and they can all be handled by "ringing a door bell", with the exception of (C) above, which requires some method of knowing that the "door bell has been rung" while you were away from the receiver.

Because there is at present no *CATV plug in one-way signaling equipment* available at modest cost, our approach to the *doing* (vs. the theory) is going to be one of adapting equipment originally intended for other communication services to our CATV situation. This will hold the initial costs down, and it will also allow the newcomer to one-way signaling technology to address himself to the basic signaling lesson involved without having to get deeply involved in transmitter and receiver design criteria right off the bat.

This series of articles on one-way signaling (and eventually two-way practical systems) is all based upon *things you can do today*, modestly, without elaborate equipment or high expenditures. It is intended that this will allow you to receive immediate practical benefits from one-way signaling add-ons to your system, while you are becoming more familiar with the concepts and techniques involved.

## *A PRACTICAL RECEIVER*

The most practical receiver going for initial one-way signaling situations is one that you can buy locally, or close by, for a modest amount of money, take it home, plug it in, and have it work.

There are a number such units on the market and the majority of these have a very nice "scanning" feature, which we shall investigate shortly.

Our example shall be the *Regency Model ACT-R10H/L/U*, manufactured by Regency Electronics, 7900 Pendleton Pike, Indianapolis, Indiana 46226. This receiver is a "10 channel" FM receiver that comes from the factory ready to cover any 10 VHF or UHF frequencies in the 30-54, 144-174 and 450-470 MHz regions. This is a crystal controlled receiver, and the user selects the up to 10 channels by purchasing the proper receive frequency crystals and inserting them into the crystal holders.

All 10 channels can be in the 30-54 MHz range, in the 144-174 MHz range, in the 450-470 MHz range, or any combination thereof.

We said this is a "scanning" type of receiver. What this means is that there is an *electronic scanning circuit* built into the receiver that automatically makes the receiver scan (*sense*) each of the (up to) 10 channels in the radio, in sequence, approximately once per second. Whenever a signal appears on one of the (up to) 10 channels in the receiver, the scanner stops scanning, and the *receiver stays on that channel* or frequency until the carrier that appears on that frequency is no longer received.

Push buttons on the receiver front panel allow the user to select which of the (up to) 10 channels he wishes scanned, eliminating any that are not desired in the scanning mode for the moment.

The receiver is a double conversion super heterodyne, and at the nominal 50 ohm input impedance on its coaxial input jack from 0.5 to 0.6 microvolt of signal will provide 20 db of quieting. In CATV language a 1 microvolt signal is -60 dbmv, so a 0.5-0.6 microvolt signal is darned little receiver antenna terminal voltage required to make the receiver function properly.

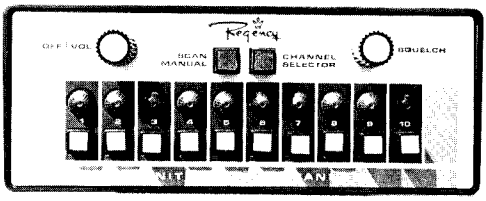
There are a number of other receivers available on the market which do essentially the same thing. Some are low band only (30 -50 MHz they claim but 30-55 is no problem), some are high band only, and some are low and high band, but not UHF. In most cases you can "crystal" the receivers to suit your needs, so even if the receiver is a low, high and UHF version like the Regency 10 channel receiver just discussed, you can crystal to use the portion you wish.

Most receivers, like the Regency, operate from either 117 VAC or 12-14 VDC. A few operate only from 12-14 volts DC. Some are exceedingly small and compact to the point that a few 2-6 channel units fit down into a shirt pocket. This is an interesting feature which we will explore later in this series.

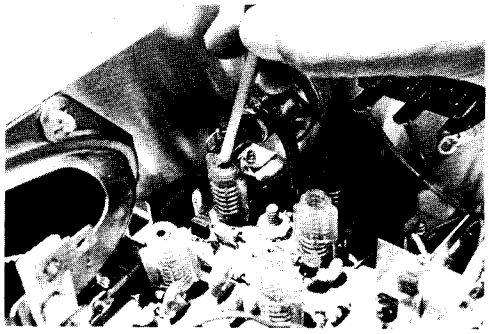
If the receiver is capable of "scanning" several frequencies, and the scanning function repeats every second or so, then we have an instant method of *constantly monitoring* up to as many transmitter functions as the receiver has crystal positions (10 in the case of the ACT-R10 H/L/U).

**TUNING SCANNER RECEIVERS**

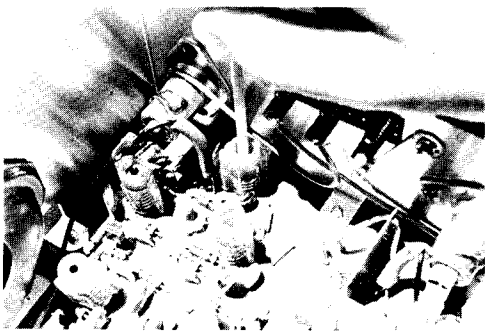
Scanning type receivers on the market are advertised as covering 30-50 MHz low band, 148-174 MHz high band, and so on. However, they are easily "tweeked up" in the 50-55.25 MHz region and in the 170-175.25 MHz region.




The Regency ACT-R10H/L/U shown here has separate (RF) front ends on each of the three bands covered by the receiver. Our interest is with low band, high band, or low and high band, but **not** UHF.



The photo here shows tuning controls for "tweeking" the low band front end for maximum sensitivity in the region just below channel 2.



This photo shows the location of "tweeking controls" for high band. In either case, the receiver should be tweeked by placing a variable attenuator in line between the receiver and the transmitter source(s); take out as much pad attenuation as you must to hear the transmitter carrier on the receiver. Tweek as shown, adding in more and more pad as receiver sensitivity improves.

The coax plug on the back of the receiver is for a so-called **Motorola** plug **(Cinch Jones No. 13B).** An astute cable person would drill a 3/8 inch hole next to this trashy plug and install a good "F" fitting.

It should be noted that the scanning type receivers include a row of front panel lights which light up one at a time as each receive channel is "scanned". When no carriers are being received, the entire row lights up from left to right, one at a time, as the receiver scans the channels. The lights (each one corresponds to a specific receive channel) stay

lit (and the scanning action stops) as soon as a signal shows up on one of the scanned channels.

Some receivers in this family have priority scan channels. That is, the receiver scans all channels and will *lock up on the first channel* that is occupied. Even while it is locked on an occupied channel, it constantly keeps "an ear on" a channel in the group which you have designated a *priority channel,* and as soon as a signal appears on the priority channel, it switches to that channel and locks there.

With the receiver problem solved quite easily, let's look into the transmitter sources available.

## *PRACTICAL TRANSMITTERS*

The transmitter requirements for a one-way signaling circuit that makes use of a CATV distribution plant for the transmission medium are minimal. The most important qualifications are:

(1) Transmitter stability *(crystal control is a must)*
(2) Transmitter reliability

**TRANSMITTER SOURCES**

Crystal controlled oscillators are perhaps the best low cost one-way signaling transmitters. A number of companies offer ready to operate transistor oscillators that function either directly or on overtone crystals into the VHF region.

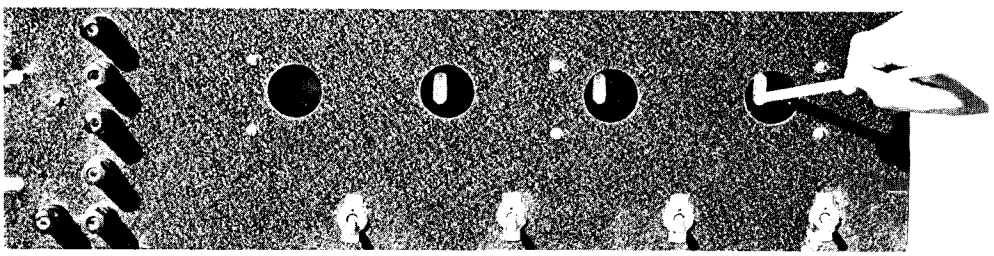
**International Crystal Manufacturing Co., Inc.** (1) offers an OX Oscillator that functions directly in the 20 MHz to 60 MHz region for $2.95, less crystal. The same company offers **Type EX Series** crystals in the 3 to 60 MHz region, which plug into the OX oscillators at $3.95 each.

Another company offering similar products is **Sentry Manufacturing Company. (2)**

Other sets of oscillators are also available from these companies for higher frequency ranges.

The International OX series oscillator, with the EX series of crystals, has a frequency accuracy of 0.02%, or 10 kHz at 50 MHz. This is adequate for the system we are dealing with, since the oscillator can be "walked" slightly with the tuning adjustment on the OX oscillator to zero with the receive crystal in the receiver. As they stand, these oscillators will prove adequate for use in the 50-55.25 MHz region. These frequencies are below channel 2, but within the CATV plant amplifier passband in most cases.

Should you choose to use the high band region, such as the range from 170-175.25 MHz (direcly below channel 7), you will either have to purchase slightly more expensive versions of the ready-built oscillators, or use modified two-way transmitters.



Any of the crystals utilized beyond approximately 10 MHz function on something called **overtones** or multiples of the actual crystal operating frequency. Crystals in the 10-60 MHz region, for example, **operate** on the third overtone. This means that if you are operating a 60 MHz oscillator, the crystal is functioning at 20 MHz but **overtoning** (x 3) to 60 MHz. At high band (directly below channel 7) the **overtone factor** is higher. We bring this to your attention since oscillators that produce their signals via an overtone oscillation tend to have additional outputs at frequencies other than the **single** desired frequency. That is, a third overtone crystal developing an output at 54.00 MHz is also likely to have reduced output at 5 times the actual crystal working frequency, or 90.00 MHz in this case. It may be desirable to place a bandpass filter between the output of the oscillator/transmitter and the input to either the pad or combiner to insure that the **only RF energy** coupled out of the transmitter and into the cable plant is **the one frequency you want** for your one-way signaling transmitter. Simple bandpass filter circuits will be covered later in this series.

(1) **International Crystal Mfg. Co., Inc.,** 10 North Lee, Oklahoma City, Oklahoma 73102
(2) **Sentry Manufacturing Company,** Crystal Park, Chicasha, Oklahoma 73018

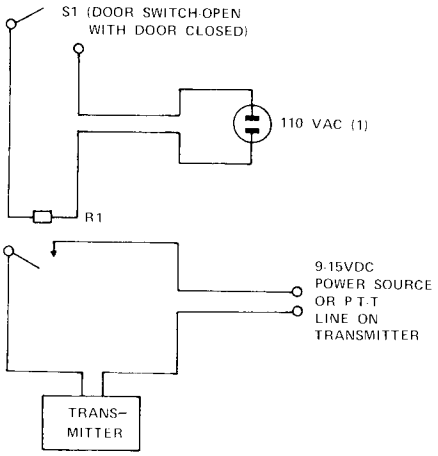



***DIAGRAM THREE***

disadvantages are that they have much more power available (even in the lower-level driver stages) than you want or can use, and you are going to have to reduce power output by either padding or detuning the stages, or both.

*SIMPLE CONTROL CIRCUITS*

Go back now to the section here on *elementary head end signaling.* The first function described was *alerting you* (at your remote receiver) *that the door to the head end has been opened.* See Diagram 3. This is nothing more than a simple switch that activates a relay. When the door is closed, switch S1 is open and no power flows to the relay, which in turn stays open so the transmitter is *not* keyed on. When the door opens, switch S1 supplies 110 VAC to the relay which closes the relay. This in turn keys the transmitter on by either providing DC voltage to the VHF crystal controlled oscillator or completing the push-to-talk circuit on the salvaged two-way transmitter. This puts the AØ carrier on the line and this in turn tells you that the door is open.

But that is only good if you catch the door-open alarm *when the door is open.* A very quick intruder might open the door, go inside, and close the door while you were reading this sentence in CATJ!

A more practical circuit is shown in Diagram 4. Here the 110 VAC source for the control relay is switched on when the door opens and the relay closes. This switches the transmitter on (either an operating voltage is applied to the VHF crystal controlled oscillator or a push-to-talk switching circuit on the modified two-way transmitter is closed). All of this happens without an unaware intruder even being told that he has been reported. However, a system employee, aware of what it is he has just done, immediately throws a switch (S2) which breaks the transmitter control line on the relay switching network. The switch (S2) also controls a warning light mounted in the head end that *reminds* the person in the building that before he leaves he must return the switch (S2) to its "off" position. This restores the door-activated switch (S1) control over the remote on-off controlling of the transmitter.

This still leaves something to be desired, however, as a person could slip into the building and quickly shut the door behind them, and the brief door-open period during which the transmitter would *fire on* as an alarm might go unnoticed by the remote receiver operator. Something more foolproof is required.

Additionally, note that each time the door is opened the switch supplies voltage to the relay which in turn closes the relay that controls the one-way signaling transmitter. Opening the door and going in activates the transmitter. Shutting the door once inside shuts the transmitter off.

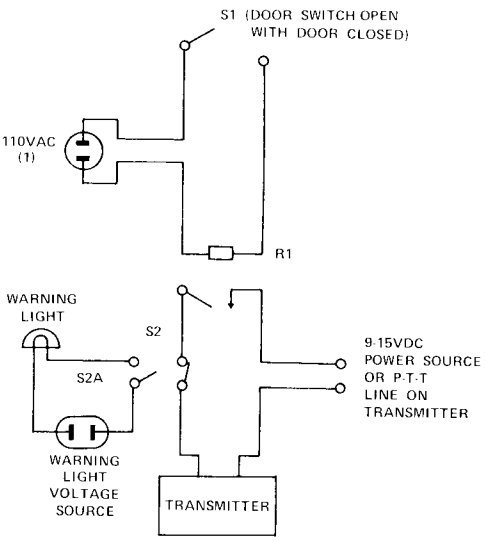



***DIAGRAM FOUR***

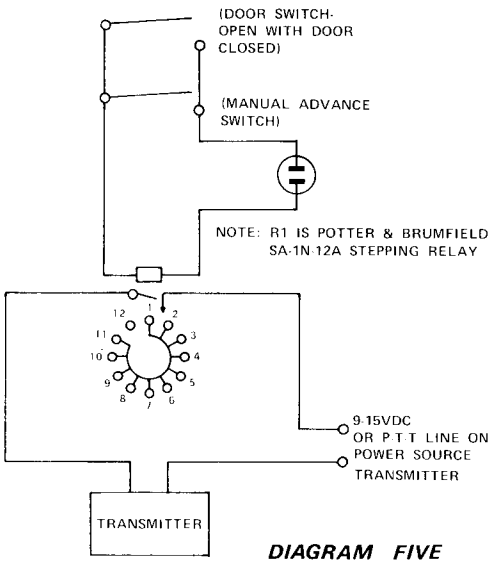



***DIAGRAM FIVE***

See Diagram 5. Here we use a low-cost 12 position stepping relay designed originally for TV remote control units. Each time the voltage is applied the relay steps forward. If the system is wired as shown, the relay will step forward each time the door is opened and closed, but on only one of the 12 positions will it come to rest where it will not activate the transmitter. Moving the step relay to that position is the first thing any authorized personnel would do when entering the building, by operating switch S2. But repeated openings and closings of the door by an unwary person would simply step it forward and leave the transmitter keyed (except in number 12 position).

Finally, there is the latching relay system shown in Diagram 6. This relay has two coils. One activates the set latch and the second activates the release latch. The set latch is turned on whenever anyone comes in the door, operating switch S1. The relay is thus turned on, and it stays on until someone with direct knowledge of the system manually operates switch S2, which operates the second coil that unlatches the relay. Thus no matter how long the door stays open, or how many times it is opened and closed after initially being operated, the relay stays latched (and the transmitter stays keyed on) until some-

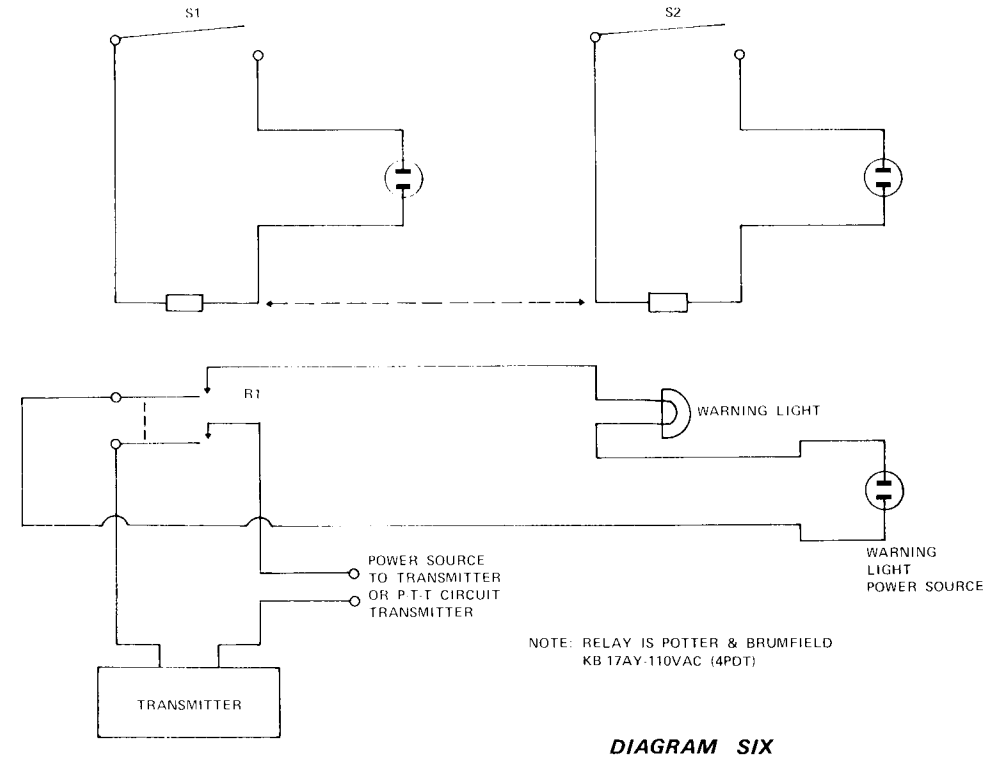
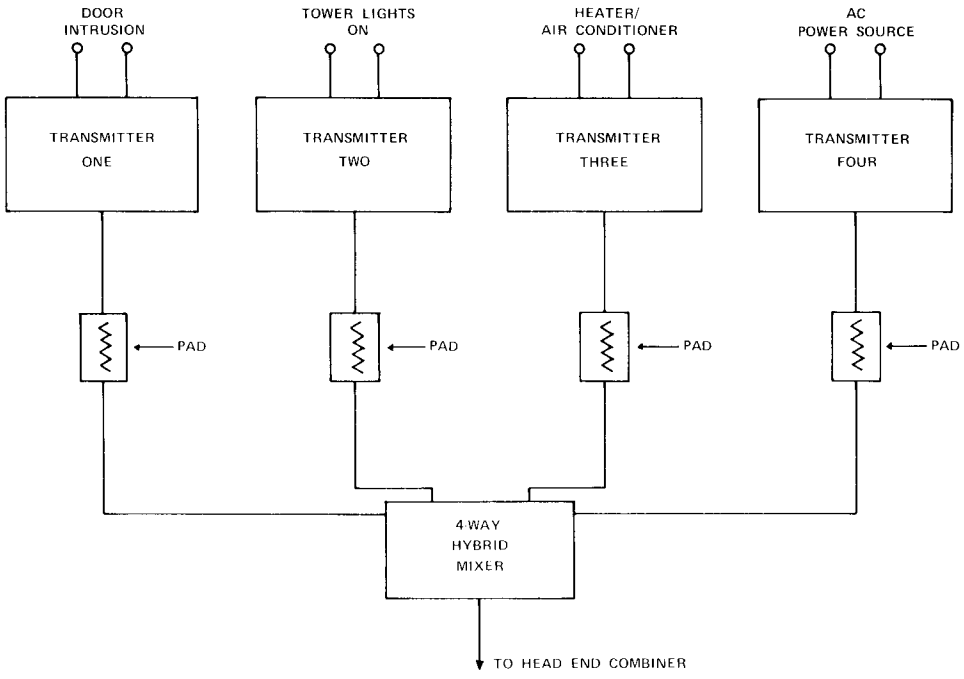



***DIAGRAM SIX***




PAD ADJUSTS LEVELS OF INDIVIDUAL TRANSMITTERS TO 4-WAY HYBRID MIXER (COMBINER) AND FORCES MATCH TO 75 Ω

***DIAGRAM SEVEN***

## PREPARING TRANSMITTER ASSEMBLIES

Diagram 7 illustrates the general wiring technique for installing one or more one-way signaling transmitters at the head end.

The individual transmitters have their operating voltage supplied by the particular transmitter keying circuit (see diagrams 3-6, 8 and 9). VHF crystal oscillators such as the OX oscillators from International Crystal Mfg. Co., Inc. should operate on 9-15 VDC (preferably around 10 volts DC, zener regulated).

The transmitter output is coaxial cable coupled (RG-59/U) to an in-line attenuator or fixed pad; the exact value of the pad or attenuator will have to be determined by experimentation. The output of the pad is coupled through more RG-59/U to a two/four way hybrid splitter, connected backwards so that its input becomes it output, and the two (or four) outputs become input-spigots for the transmitter sources.

The output of the hybrid is coupled through another RG-59/U jumper to your master combining system for your CATV head end. Treat the combined transmitter output as if it were a high band channel (if you use 170-175.25 MHz) or a low band channel (if you use 50-55.25 MHz).

What about levels? Recall that the normal scanning receiver has fairly high sensitivity; 0.5 to 0.6 microvolt of RF signal will provide 20 db of quieting. If you run the one-way signal transmitters **below** channel 2 (50-55.25 MHz), adjust the pads between each transmitter and the hybrid transmitter combiner to a point where the transmitter signal levels on the line are **25-30 db below** channel 2 visual. If you operate just below channel 7 (170-175.25 MHz), adjust the transmitter line levels to a point where they are 25-30 db below channel 7 visual level.

If you operate (or plan to) more than one transmitter at the head end, it will be wise to select frequencies for the transmitter (and the associated receiver[s] ) which are fairly close together. For example, if your plant is (**you know**) good down to 53.0 MHz throughout the whole plant (before low end roll off starts), assign your transmitters to 53.1, 53.3, 53.5 and 53.7 MHz. This is 200 kHz spacing, and this is more than enough to keep the receiver from falsely alarming you from an adjacent channel transmitter source. On the other hand, at high band, you will probably want to stay away from 170.75 since that is channel 7 visual frequency **minus** 4.5 MHz (175.25 – 4.5 MHz), and this could cause beats. At the low levels that you will be operating with, assigning yourself 172.1, 172.3, 172.5 and 172.7 should work out alright.

one operates switch S2 which unlatches the relay. If the technician does this when entering the head end, he would have to reset the switch (S2) each time he opened the door after initially setting the switch (S2) for unlatching of the relay. To keep everyone aware of what has been done a control indicator light comes on when the initial latching operation takes place. This reminds anyone in authority entering the building to reset the unlatching switch (S2).

Diagram 6, with the latching relay, satisfies several of our original objectives:

(1) It tells us when someone has gone into the building.

(2) By latching into an "on" position, we know whether the entry was authorized (it will unlatch shortly) or unauthorized (it will stay latched on).

(3) By staying latched, the transmitter would stay on, telling us even after they had left that someone had been into the building (either a sloppy system employee that forgot to unlatch the relay, or an authorized person that was unfamiliar with the system).

Now how about some of the other control functions? For example, suppose we wanted to be signaled if (2) the temperature varied outside of a predetermined range (say 50° - 80°F). To do this we need something that will activate a switch when the temperature drops below 50° or goes above 80°. Or, we want to know that the air conditioner (or heater) at the head end is running, the tower lights are on, or that the power has gone off at the head end.

The first question to be answered is do we want a different transmitter for each one-way signaling function? That is, one for the door security, one for the temperature, one for the tower lights and so on. Chances are we do, since the receiver has multiple receive channels and, without some form of modulation to identify which trouble source is "calling" or signaling, we must rely on the different transmitter frequencies to do the job for us, with the receiver identifying the

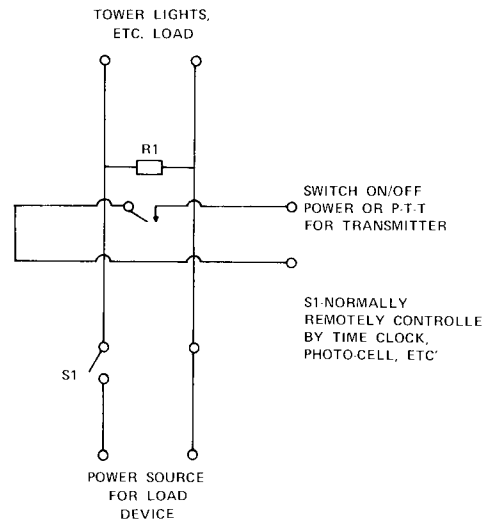



***DIAGRAM EIGHT***

source by identifying the transmitter being received.

Multiple transmitters can be mixed together for insertion into the trunk of the system as described separately here.

Any source that utilizes 110 VAC (or 220 VAC such as some tower light systems) for *positive*-operation (i.e. turning *on* the lights, etc.) can be "tapped" for a relay powering function as shown in Diagram 8. Simply insert the primary coil of the relay parallel with the AC voltage operating the air conditioner, lights, etc., and when the device turns on, the relay will also turn on, switching on the transmitter activated by the relay secondary switching contacts.

A temperature sensitive switch (i.e. one that reacts when the temperature drops below or goes above the desired range) will be treated in a later edition of this series.

Now if the power fails at the head end. . . naturally the head end signals disappear from the system. However, from a remote location you do not know at that point if the power failure is *at the head end*, or at *some point along the line*. Many times the head end functions from an entirely different power feed than the plant, perhaps even a different power company.

Seemingly the failure of power at the head end would shut down the one-way

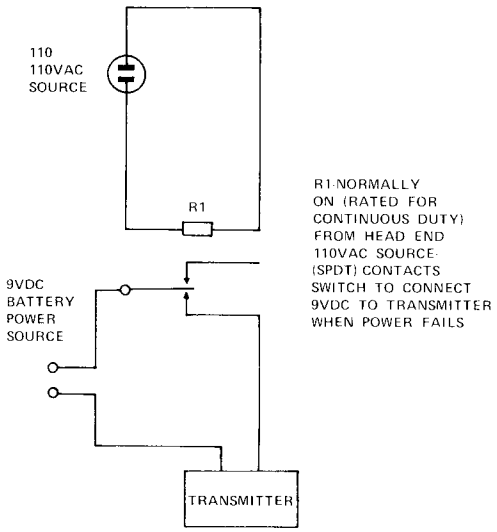



***DIAGRAM NINE***

signaling transmitter. However, if you chose the small VHF crystal controlled oscillator for your transmitter source, it could easily be powered from a small 9 volt battery for several hours time. If the battery only turned the transmitter for that trouble source *on* when the commercial power failed, you would have an instant indicator of commercial power failure on your remote cable connected receiver. See Diagram 9.

The 110 VAC relay stays plugged in and is switched *on* at all times when there is commercial power (the relay must be *continuous duty rated).* As soon as commercial power fails, the relay switches off, which in turn activates the battery source to power the transmitter. As long as the power failure is at the head end and is independent of any plant power supply failures, the trouble-indicator transmitter will get through the plant to your receiver. This should save you valuable time when you start out to locate your problem, when the cable quits.

This series will continue with a discussion of more sophisticated one-way signaling techniques including adding forms of modulation to the AØ carrier as additional intelligence requirements develop.

**SOURCES FOR USED TWO–WAY TRANSMITTERS**

Two-way transmitters abound wherever you look; however, knowing where to look will save some time.

You can purchase "removed-from-service" wide band (i.e. 50/25 kHz deviation **if modulated)** low band and high band transmitters from a number of sources. These are available as transmitter strips, or as complete transceivers. Most are from **mobile service** and will have to have 6 or 12 volts DC to operate. The actual current requirements in **our service** will be fairly low since we are going to remove purposefully the output power amplifier stages (10-90 watts of RF into our cable system hardly seems wise!).

Here are a few sources:

(1) **DuPage FM, Inc.,** P.O. Box 1, Lombard, Ill. 60148

(2) **Mann Communications & Electronics,** 28710 Canwood St., Agoura, Ca. 91301

(3) **Gregory Electronics Corp.,** 239 Rt.46, Saddle Brook, N.J. 07662.

If you have difficulty finding a service manual on a particular piece of used two-way gear, you might contact **S. Wolf, Box 535, Lexington, Ma. 02173** with your model number and ask about the **FM Schematic Digest** available.

What you are looking for is a transmitter which is as solid state as possible, up to the final amplifier stage(s). You will remove the amplifier from service and terminate the driver amplifier in a respectable "dummy load" of sufficient power handling capability to keep it "loaded" at 50 ohms. Then couple into the **driver tank** (output) circuit with a low value coupling capacitor (.001 at 1 kV) or a one turn link (see page 30 **CATJ for May 1974)** to an "F" fitting soldered to the chassis for output coupling.

A transmitter strip rated at 5 watts output will be about as big as you can go and still keep the output level from the driver stage (i.e. **to the output amplifier)** down around 0.5 to 1 watt. This is still 20-40 db too much signal, and some of this you can **dump** in the in-line attenuator.

---

(1 — *Signals can be added anyplace along a trunk or feeder line as we shall discuss in this series.)*

(2 — *110 VAC or required coil voltage for relay)*

# DEAD TRUNK VS. 2ND HEAD END

*START BIG – EXPAND SMALL*

It is the nature of the CATV animal that given two (or more) close-to-one-another communities, the "beast" settles into the larger, more in-need-of-TV community first. Then, if everything goes well, other nearby communities are cabled.

In the eyes of the regulator, if a man has a franchise (permit, easement, etc.) for community "A", he must obtain a like legal instrument before he can proceed to cable into Community "B". In the eyes of the regulator (1), anything outside of the original community ("A") is a new community in fact, even if no community exists there!

Or to put it another way, if your franchise allows you to operate in Mountainburg, you are legally entitled to cable only Mountainburg. Line extensions to small subdivisions that adjoin Mountainburg or even a drop that starts inside of the corporate limits of Mountainburg but ends up serving a home "just outside the town limits" is *technically a no-no,* and *will be* until such time as you, as the cable system operator, go before the proper local authorities who provide municipal (or county) services for the adjoining sub-division(s), or the lone home owner that lives just outside of Mountainburg, and secure the required franchise to provide service in that region.

Usually line extensions into nearby areas are handled with very little fanfare and perhaps (admittedly) some disregard for the letter of the regulator's rules, if not the spirit. This is often *not true* when the nearby region to be served is 3, 5 or 8 miles up the road.

A system operator with his feet on the ground and his mortgage declining does start to look around at other nearby towns. On the assumption that the town he begins in was the *best* of those available in his area to begin with, we can assume that those left to wire are either smaller, or less in need of the traditional master antenna service which today's smallish CATV systems can deliver.

*Or both.*

Still, there *is* cable potential there, and the challenge to offer that service is considerable. For one thing, adding new subscribers in a new town will shoot the monthly gross receipts upward, and it can usually be done without much more than a modest increase in monthly expenses.

When a town reaches 50-60% saturation, and all of the town has been cabled, the climb upward beyond that point is slow. The big carrot hanging out there is paying off the initial system debt.

If the plant is a modern, solid state system, the amount of time and effort to keep up 300/500 or even 900 subscribers on the initial first plant should be modest. Your technician (this may be *you*!) probably has time on his hands that could just as well be spent minding an addition 3, or 5, or 7 miles of plant a few miles up the road.

Items such as wages, vehicles, bookkeeping and promotion can serve two nearby towns just as well as one in-town (system). True, there will be new pole rental, addi-

tional electricity, and additional billing expenses, but the same expenses would accrue if the system operator experienced a sudden growth in the town in which he initially built.

Finally, there is nothing quite so exhilirating as bringing cable to a *new* community. To most of us, building a new system is a combination of great sport and tedious work when it is going on. We often say, "never, never again", but once done, we are anxious to get to another one.

*THE BIG DECISION*

The number one decision to be made is the new head end. Should there be a second head end? Or, should you trunk from community "A" into "B"?

A lot will depend upon how far away "B" is located, whether you can get there from "A" without undue stresses from state and federal highway people, and just how good your pictures look at the point on the "A" system where you would jump off and head for "B".

Additionally, if "B" is down in a hole, it may be possible to go up on a nearby ridge and get all of the signals you want (without large, expensive tower installation); or, conversely, it may take *such a big stick* to serve "B" that that head end will cost you more than the "A" head end, for a *smaller* community.

The system itself will be very similar to your "A" system. Chances are you will want to invest in the same amplifiers, connectors and other plant electronics as with "A" since inter-changeability becomes more important as the need for spares increases. Thus, it boils down to the second head end. Is it better to build a new one, or is it better to trunk?

There *is* one more possibility. Perhaps the new community has a far superior head end site. You may have cut a few corners on the first head end, due to a combination of lack of experience and reluctance to go up that extra 100 feet with the tower, or stack antennas in quad arrays. And now you wished you had. Maybe community "B" is just enough closer to some major market that the marginal UHF independent would be 10-20 db better at "B" than at "A".

If some of these possibilities are true, you should consider installing a new master head end at "B", and tieing it *back to "A"* with a trunk. In that manner you may end up with better signals at "A" and "B" and by removing the existing head end at "A" you will save some bucks.

*OPTION ONE*

Your first decision when you consider trunking is *what channels* will you trunk? Let's set up a hypothetical situation in which we have three more or less local signals and five that come from far Grade B or beyond.

The three locals are on channels 3, 6, and 10. They can be received with good levels at either "A" or "B" communities. To get cable-perfect signals from these three channels would require approximately 75-100 feet of tower, 7-9 db gain antennas, and no pre-amplifiers, at either site.

The five distant signals look like they require 300 feet of tower, 12-15 db of antenna each, and pre-amplifiers on all channels, plus a converter on one channel. They are channels 4, 5, 8, 11, and 39.

Because there are only five signals that require the big stick and more elaborate antenna systems, it is worth considering picking up *local 3, 6, and 10 at both sites* with modest towers and antennas, and also picking up distant 4, 5, 8, 11, and 39 *at just a single site* and transporting it via trunk from "A" to "B" (or "B" to "A"). The significance of this suggestion may escape you until you realize that we can put five channels on low band (2, 3, 4, 5, and 6) and trunk transport them for far less cost than putting trunk transport signals on low band and high band, and having to space our trunk transportation system amplifiers for high band cable attenuation.

Of course there are numerous other options available. We will touch on them briefly here by mentioning that we could also transport at sub-low only (below channel 2), or we could transport at sub-low and low band if we required more than five channels.

The beauty of a low band transport approach is that you can utilize standard CATV equipment without expensive sub-low to low or high band converters and one-of-a-kind sub-low transport amplifiers.

The disadvantage to low band transport is that the cable losses are higher than with sub-low transport, although it may not be as significant a number as you might suspect.

Back to our example system and communities "A" and "B". See Diagram 1 for a block layout of the problem and one solution offered. If we are to utilize low band for trunk transport, our five distant signals (4, 5, 8, 11, and 39) have to end up on channels 2, 3, 4, 5, and 6. However, channels 3 and 6 are already occupied by semi-local signals so for trunk transport they need to be taken out of the trunk transport feed for the duration of the run between "A" and "B".

At the end of the community "A" trunk, where we jump off into the transport run to "B", a mini-head end is installed to process channels 2, 4, and 5 as they come off of the cable. This can be done with virtually any selective processing system, such as second hand Channel Commander 1 units. AGC is not important since theoretically the trunk signal will be exceedingly stable. At the same mini-head end, channels 8 and 11 on the cable are converted (with either heterodyne processors or V to V converters) respectively to 3 and 6. If the processors are capable of +52 dbmv output (on channel 6), then we are ready for a modestly high level start on our trunk transport system into the "B" community.

The run into "B" will depend a great deal on the cable approach you take. There is the age old trade-off between cable losses and amplifiers; *the lower cable losses in the cable the fewer amplifiers.* Cable has risen more dramatically in price than amplifiers recently, so leaning towards more amplifiers may be the least expensive approach (we shall see). At the same time we have another trade-off consideration, and that is, noise build-up and beats.

While there are a few low-band-only solid state amplifiers still available on the market (2), chances are you will at least consider us-

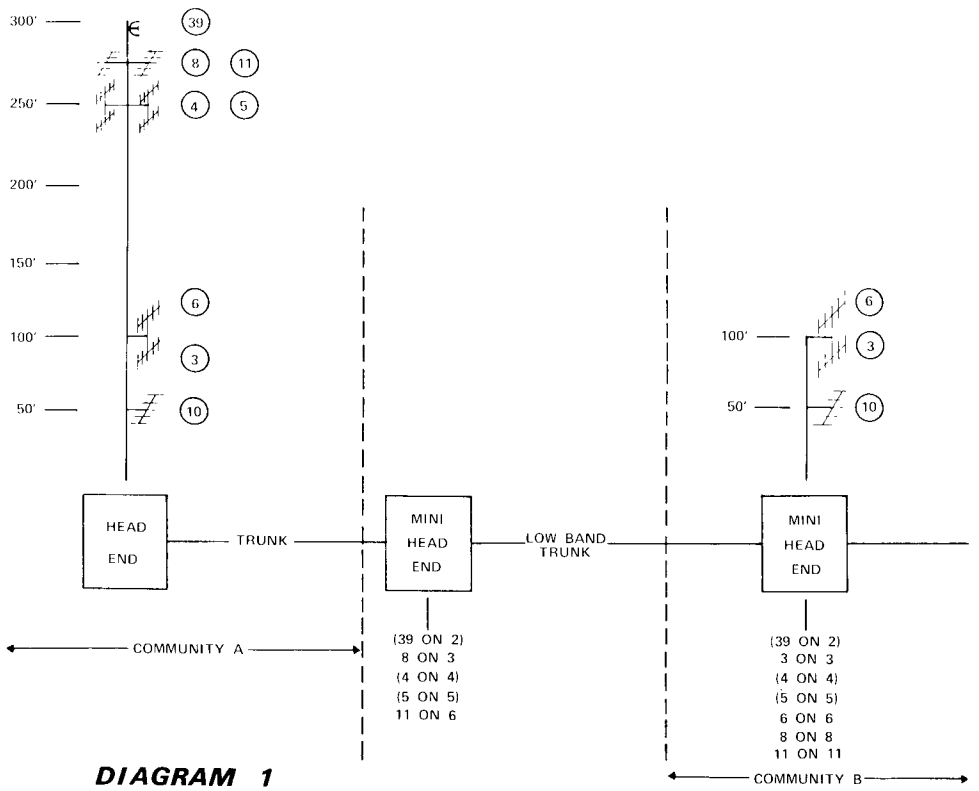



***DIAGRAM 1***

we can approximate the influence of the mini-head end by simply considering it another amplifier station (if its noise figure is comparable or certainly no worse than our line amplifier). In total run lengths of amplifier cascades that do *not* approach the *maximum advisable* cascades of amplifiers, the amplifier manufacturer suggests, we can just about ignore the mini-head end for inner-mod influence.

The sub-low trunk transport approach has long been practiced by some of the larger systems that had unusually long into-town trunk runs, or which serve several communities from a single head end trunking into / through / and out of town on the way to the next community. In a sub-low transport system, the system is designed around converting either all of the transported channels to sub-band (below channel 2), or some of the channels (typically high band) to the sub-channels, and low band are carried in place.

This requires converters to go down to sub and converters to come back to the in-place channels. Low or descrete high band channels, to sub (i.e. down conversion), can be handled with individual channel converters, VHF channel to sub channel. The cost of such units runs in the $275. to $500. range, depending upon the manufacturer. Or, high band can be block converted from channels 7-13 to a sub range, with everything staying in place as the down (frequency) conversion is effected.

Another option to down conversion from low band or high band to sub-band is a heterodyne processor such as the Channel Commander II that accepts the cable input channel, converts down to IF, and then comes out on the appropriate sub channel. On the other end of the line, the conversion from sub channel back up to low band, or high band, can also be handled by a Channel Commander II. (3)

*(3) Through the years the primary supplier of low-sub equipment has been Jerrold, although Blonder-Tongue and others have offered VHF to sub-low (and back) single channel converters from time to time. The current availability of block high band to sub-low down converters is questionable, however, as is sub-low up converters (as a block back to high band).*

*OPTION TWO*

After deciding whether trunking or a separate head end is best, if you have chosen the trunking route, the route or method of installation is the next consideration. Getting bestween communities is getting tougher every day. Usually if you can stay on county roads, your problems will be far fewer than if you are forced to go along state or federal highways. In some states, highways maintained by the state are not a problem, but in most states you have to deal with a state agency that is unfamiliar with your problems and *not* ready to accept your request for parallel run and crossing rights at face value. Some states *separate* highways and bridges and/or over (under) passes into *separate agencies,* and you may end up dealing with a pot full to get simple permission to parallel the roadway.

Usually your chances with the federally administered highways is pretty good if you have adequate time to wade through the paperwork.

At the county level, you have a couple of options. Usually a county board of supervisors will grant an *easement for passing through* (officially called by many different names in different states) with only minor inspection. If you are simply asking for the right to connect one non-county administered region (community "A") with another non-county administered area (community "B"), and you do not intend to serve anyone within the county itself with signals or service, the process will get quick approval. On the other hand, if you intend to pick up a trailer park, motel, or whatever along the way (*and why not?)* located *in the county,* then you must go through whatever process your county requires for granting of a franchise, permit, easement or whatever. *And,* you will also have to go through a Certificate of Compliance procedure with the FCC. You can temporarily avoid this by initially passing *through* the county from "A" to "B", but build in the distribution provisions to add

**TABLE FOUR**

Representative cable pricing can be dangerous at this time in our industry. We are bound to make some people who sell cable unhappy, and some people who buy cable will clamor that we are too high, or too low. But we report it as it is none the less.

We sampled five major suppliers in the categories shown, and averaged their quotations to us as of press time. These are for relatively small quantities in each category (we specified 50,000 feet). All are for copper clad aluminum center conductor cable.

| Type Cable | Price per Thousand |
|---|---|
| 412 plain | $ 78.09 |
| 412 jacketed | $ 89.73 |
| 412 messengered | $107.19 |
| 412 jacketed/flooded | $ 98.70 |
| 500 plain | $101.12 |
| 500 jacketed | $117.86 |
| 500 messengered | $136.53 |
| 500 jacketed/flooded | $128.77 |

county located residences or businesses later on, *after* you have the service franchise and CAC taken care of.

In dealing with a county, or more especially a state, for a parallel and crossing permit, your chances for speedy approval improve considerably when you explain that you intend to locate your cables, wires, appurtenances, etc. on *existing* utility poles. Properly explained (if this is your plan), it quickly becomes clear to the authorities that you will *not* rearrange any existing ground level easements; everything you are going to do is overhead.

Sometimes it pays to stay away from the "how" you are going to install your cables, especially if you *sort of intend* to either bury or set your own poles. Sooner or later the authorities will have to know, but it is often better to deal with that matter on a man to man basis with the *man responsible for watching the roads,* than with a county board of supervisors. If you start out explaining that you are going to set 7 miles of poles, or dig up 7 miles of easements, you just *know* there are going to be a few eyebrows raised when you ask for your *otherwise simple* parallel and crossing permit.

*OPTION THREE*

Now comes the question of how to install the trunking system. Obviously local factors such as terrain, presence of large bodies of water to be crossed, and the extent that the highway between the two communities is already built-up, will enter into the equation.

Ideally, you would like to install it and forget it. With trunking amplifiers every .5 to 1.0 or so miles, the best system would be one that stays constant all year long, regardless of air temperature, and one that costs you nothing to maintain or keep up or in place, after initial installation costs.

That would be a buried system, properly installed. If "A" and "B" are rural communities with nothing but relatively flat farm land in between, you may be able to bury the trunk cable for as little as 10 cents a foot trenching (and back fill) costs, if you shop around for the equipment to rent and do the work yourself with your own people. System operators with whom CATJ talked in preparing this report verified figures as low as 9 cents a foot machinery and labor for the trenching this summer, when they shopped around for used J-20 or V-30 machines to lease by the week or month (4) for the job and used either their own employees or a combination of one employee supervisor and one or two locally hired laborers.

If a buried system can be done, with local factors considered, it appears to be the *least expensive method* going today for long

*(4) Most machinery leasing equipment companies, including your local rent-everything company, will rent J-20 machines for around $700.00 per month, less obvious mis-use maintenance costs you might incur. You may do several hundred dollars per month better than this figure by dealing with a Ditch-Witch distributor however.*

inter-community trunk runs. Even if you have to bury say 80% and go aerial for 20% (such as when you cross bodies of water, other cross roads or highways), chances are burial is still the best technique.

Whether you seriously consider setting your own poles will depend to a large extent on what you will be passing today *and* tomorrow on your trunking run. If the area is essentially farm land, the extra (or first) set of poles may not be objectionable to anyone that could stop you before you get started. But if the region is building up and the day will come when the road you will follow will be heavily built up with commercial and/or residential sites, poles may be impossible to swing. The expense of poles this year is pretty high as well. A comparison of set poles vs. do-it-yourself underground is shown here in Table 5.

Renting space on existing utility poles will probably cross your mind once or twice, if poles are already in place. Naturally the usual evaluation of existing lines and potential rearrangement costs must be made. If there exists a substantial run of *electric only* poles along your route, and these electric-only poles are owned and operated by either an REA or other rural electric cooperative, this may be the best bet of all. Until now rates for use of these poles has stayed in the $2.50 per pole range in virtually all areas of the country; $1.75 per pole per year is still common. In the present climate of rising pole rates this *may* not last much longer, but the gamble that rates will continue low on clean ready-to-attach-to rural electric poles may be worth the chance that they will not rise as sharply as joint-use poles are threatening to climb.

**TABLE FIVE**

A comparison of do-it-yourself underground costs vs. do-it-yourself pole setting costs will vary from area to area of the United States. Checking current **low-ball** prices at press time, CATJ found the following price indications for operators who really watch their pennies and are willing to do much of the work themselves.

Per mile of underground/aerial, for self-setting poles, we can assume that using class 7 25 feet poles, a man who worked at it could get by with 27 poles (spaced at 200 feet).

Poles . . . . . .$18.23 (1)
Holes, setting. . . . . .$ 5.00 (2)
Hardware. . . . . .$ 1.70

This comes to $24.93 per pole; call it $25.00 per pole set for averaging. (1) is an average price now being paid by mid-western operators for this size and class poles. (2) assumes a farm type tractor with auger, and a 3-man crew drilling three pole holes per hour of work time, at typically rural wages.

At $25.00 per pole, we have 27 poles, for $675.00 per mile of poles (we said this was low-ball!).

Thus we have $675.00 for poles, plus the cost of the strand per mile. At $47.00 per thousand for imported strand, this is $248.16 per mile for strand. This gives a total of $923.16 per mile for materials **and poles set,** not counting labor or cable. This works out to $0.1748 per foot for the ability to install the cable (and strand).

Flooded, jacketed cable runs a few pennies more per foot than non-flooded (or non-jacketed) cable. However, if you can locally hire men and rent a J-20 or V-30 so that you come out around $0.10 to $0.12 per foot for the trench opened (and closed), you are at least money ahead of setting your own poles.

See Table 6 for comparison of costs of an "ideal underground mile" vs. an "ideal self-poled aerial mile" in rural country.

**TABLE SIX**

Using the figures developed here for underground (do-it-yourself) and set-your-own-poles aerial construction for a **five mile low band trunk run,** we are able to compare the relative savings in one form of construction vs. the other. Naturally, these are both ideal numbers and not representative of the actual conditions you will probably experience in your area. These numbers are presented more as a guide to **methods of comparison,** than as a set of industry averages at this time. If the numbers happen to be utilized for **direct cost comparisons,** we would suggest you consider these numbers low-ball (that is, **below** national averages).

In the case of aerial construction, we have chosen 500 messenger cable to avoid the cost of strand and lashing. In the case of underground, we have chosen 500 jacketed/flooded cable. **Neither** are polystyrene cables. Cable loss per 100 feet at 83.25 MHz (channel 6 visual) is assumed to be 0.80 db.

| | Aerial | Underground |
|---|---|---|
| Cable | $3,604.39 | $3,399.53 |
| Amplifiers (1) | 7 units | 7 units |
| Poles (set) | $3,375.00 | n/a |
| Ditch, opened, back filled | n/a | $3,168.00 |
| Pedestals | n/a | $ 203.00 |
| Labor to install aerial | $ 950.40 (2) | n/a |
| Power Supply (3) | $ 165.00 | $ 165.00 |
| Total (4) | $8,094.79 | $6,935.53 |

(1 - 25 db gain specified; 25 db spacing at channel 6 visual; + 52 dbmv mini-head end output)

(2- At the rate of 660 feet per hour with messengered cable (3.2 poles per hour); three man crew at $4.00 per hour each is 0.018 per foot; "x" 2 for burden and equipment use factor equals 0.036 per foot installed )

(3- ITE model 3060 power supply, installed at near mid-point of trunk run and feeding power in both directions)

(4- Does not include cost of amplifiers and fittings)

**Ideally,** at $225.00 per solid state low-band trunk amplifier, the total cost of the 5.0 mile low band trunk run would be $9,669.79 for the aerial run and $8,510.53 for the underground run. This is exclusive of the cost of the mini-head end at the exit of community "A" or the mini-plus local signals added (3, 6, 10) head end at the entrance of community "B". Table 7 compares this cost factor vs. the cost of installing a second separate head end at "B" for direct off-the-air reception for all 8 (3 local, plus 5 distant) signals.

## TABLE SEVEN

By comparing the costs for either underground 5.0 mile low band trunk run or aerial 5.0 mile low band trunk run, vs. the costs to build a second full head end, we are able to make some type of determination as to the proper approach to our problem.

CATJ recognizes that only systems located in the "flat country" require big towers, and that you may be so located that the tower portion of the costs shown here are not representative of **your** situation. At the same time, you may have some unusual costs associated with getting into an elevated site (such as a mountain or hill top) which the fellow building a 300 foot tower on flat pasture land would not have. Whether the cost of building a passable road into the new "B" head end site would be even close to the cost of building a 300 foot tower for the flat land located system operator is, of course, questionable.

| | Trunked System | Separate Head End |
|---|---|---|
| Tower | $ 1,500.00 (100') | $ 8,400.00 (300') |
| Antennas 3, 6, 10 | $ 500.00 | $ 500.00 |
| Antennas 4, 5, 8, 11, 39 | n/a | $ 2,080.00 |
| Pre-Amps 4, 5, 8, 11, 39 | n/a | $ 900.00 |
| Downlines, racking, etc. | $ 450.00 | $ 850.00 |
| Head End Building | $ 1,200.00 | $ 2,100.00 |
| 39-2 Converter | n/a | $ 205.00 |
| Processors - leaving "A" | $ 2,000.00 (1) | n/a |
| Processors - at "B" | $ 3,200.00 (2) | $ 3,950.00 |
| Underground Trunk System | $ 8,510.53 | n/a |
| | $17,360.53 | $18,985.00 |

The cost comparison shows a slight advantage in favor of the low band trunk from "A" to "B". However, given the relative differences in price between geographic regions of the U.S., the scales could easily tip the other way, in favor of a discrete head end at "B".

One thing probably would not change: the annualized costs of maintaining a separate head end at "B", maintaining the mini-head ends at "A" and "B", and the trunk between communities. In either case, the signals from channels 3, 6, and 10 are local in nature and their head end gear would require little routine touch-up work. Head end processing on distant channels is always touchy, more subject to changes in levels and abrupt signal quality changes. This usually increases technician trips to a head end. The cost of a head end site to maintain a 300 foot tower (approximately 6 acres) is substantially more than maintaining a 100 foot stick for the local signals (1/2 acre).

(1- Used Channel Commander I units or on-channel Blonder Tongue strip amps.)

(2- Same as [1], but with bandpass filters added for strip amps where adjacent channels are utilized. Blonder-Tongue **type** equipment pricing is shown for the second head end, which is, on the average, **lower** than industry averages for similar equipment.)

# RECEIVING ATS-6 SATELLITE SIGNALS

*OFF THE GROUND*

During May of this past spring, another in the continuing series of high technology satellites was placed into orbit from Cape Kennedy. On hand to witness the event were a number of representatives of the Federal Communications Commission, including *David Kinley,* recently appointed head of the *Cable Television Bureau.*

This particular satellite, dubbed the ATS-6, is the latest in a series of "birds" which hover at various points over the equator in a stationary orbit. As the earth revolves on its axis, the satellite also moves at the same speed, creating the illusion that both the bird and the earth are stationary, one to the other.

This particular satellite, *unlike others previously launched,* has some direct application to the CATV industry and it offers, technically, the opprotunity for cable operators to explore the new world of earth terminal technology, down links, and target audiences.

*EXPERIMENT*

ATS-6 is an experiment. The program has an expected (experimental) lifetime of twelve months. The program involves placing a relatively high transmitter effective radiated power translator into geo-stationary orbit at a point 22,300 miles above the equator directly above the Galapagos Islands (west of Chili). The "secret" of the satellite, if there is one, is a very high gain antenna array, a 30 foot parabolic antenna that unfolded after launch and positioning of the satellite.

The ATS-F program will officially commence operations on September 9th and terminate in May 1975. When the experiment is complete, the satellite will be carefully moved from its permanent geo-stationary position over the Equator west of Chile to a new location over the Equator south of the Maldive Islands in the Indian Ocean. There the system will become operational on a permanent basis to provide instructional television to an estimated 3,000 villages in India. An excellent background article appeared in the *April 1974 issue of BM/E!* (Page 54) for those who may wish to know more about the full program.

*PROGRAMMING*

Aside from the technical innovations associated with the project, and the basis question of "what do we have to do to receive the signals?", the content of the transmitted programming has special interest to the CATV operators in the regions of the United States where service from the satellite is expected.

The entire program has been financed in the main by a grant from Department of Housing and Urban Development (HUD). To justify the experiment on *any* basis, the program's backers felt it would be necessary to accomplish some pre-established goal with the programming that will flow through the machine.

Programming is to be handled on a regional basis, with separate programming activities for each of the three "footprint areas" (more about those shortly).

Tentative "sample" programs have been released by one of the three programming groups, the *Federation of Rocky Mountain*

**TYPICAL PROGRAMMING SCHEDULE**

September 9, 1974

| Time (EDT) | Program/Function |
|---|---|
| 0855 | Antenna Pointing |
| 0910-1010 | Materials Distribution (A) |
| 1010 | Antenna Pointing |
| 1015-1115 | Materials Distribution (B) |
| 1115 | Antenna Pointing |
| 1120-1155 | Career Development (A) |
| 1155 | Antenna Pointing |
| 1200-1235 | Career Development (B) |
| 1515 | Antenna Pointing |
| 1530-1600 | Interactive Health (C) |
| 1600-1625 | Oral Skills (C) |
| 1625 | Antenna Pointing |
| 1630-1725 | IHS (D) |

(A – Rocky Mountain East; B – Rocky Mountain West; C – Alaska Zone E; D – Alaska Zone H).

Materials distribution is defined as the transmission by satellite of programs, films, etc. which school districts in the project have requested. These transmissions will be video-taped by the school district requesting same, for use on a delayed basis. The material distribution portion of the project is expected to be expanded considerably during the course of the project.

*States.* An excerpt of it appears elsewhere here. It would appear that the experimental nature of the entire project may suggest that other than closely timed "telecasts" directed at participating school districts and Public Television Stations, the actual use of the satellite's time will be difficult to forecast much in advance of the actual event. CATJ has been advised that the *time-usage of the system may easily exceed 50% of the time available.* The important thing to remember about the programming is that it will be different than anything you may now carry on your CATV system, and there will probably be plenty of surprises for the hardcore dedicated viewer of the "channel".

*FOOTPRINTS*

Either the entire project is highly secret (this we discount), the entire project has loose *(let's wing it)* format (this we suspect), and/or the entire project is a big learning process for *everyone* involved (this we know).

CATJ asked some of the people involved with the project why cable television was not *more* involved. After all, the U.S. Government did purchase approximately sixty earth receiving terminals for the project, and they did end up going into a fair number of individual school systems, a few public television stations, and two CATV systems (2) and two translators. The answer we received was basically "there were questions about the copyright liabilities of cable television systems". When we pointed out that the U.S. Supreme Court had ruled in March of this year that, at the present time, CATV systems owe no copyright liability to anyone, we were told "yes, that is true. . .but when the project was being planned years ago we did not know this".

We asked,"Would you now encourage CATV systems to participate in the project?". The answer, "Not officially, but the signals will be there in the footprints. . . .".

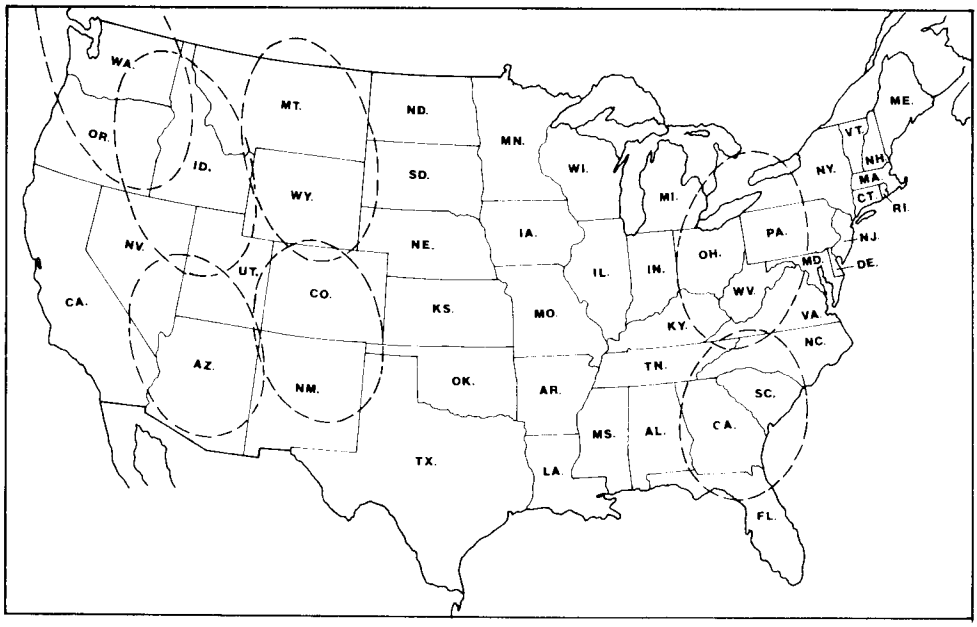
What are *the* footprints? Or, *what are footprints?*

Footprints are space people talk for the area on earth which the satellite transmitting antenna (all 30 feet of it) will illuminate. A 30 foot diameter parabolic antenna at 2.6 gigahertz is one heck of a lot of antenna. The 3 db pattern for the transmitting antenna is less than 1.0 degree wide, meaning, of course, the earth-area illuminated is exceedingly small.

The planned-for footprints for the basic continental 48 regions to be covered are shown here. They are sub-divided from the general "Appalachia" and "Rocky Mountain" designations into "Appalachia East" and "Appalachia West" and then further subdivided again into "North" and "South" within each sub-district.

*(1) BM/E - Broadcast Management Engineering, 274 Madison Avenue, New York, New York 10016.*

*(2) CATV systems at Elko, Nevada and Wallace, Idaho reportedly have received earth terminals. Additionally, the Reno, Nevada CATV system will participate with a microwave feed from a receiving site near Las Vegas.*




**MAJOR FOOTPRINTS**

The directional transmitting antenna array will be moved remotely from earth during the day so that each of these districts and sub-districts receives programming during the period dedicated to it.

Since the satellite was launched there has been time during early July to "test" the footprints. We wish that we could report a confirmation of the planned footprints at this time. Unfortunately we cannot. We have been told, "Everything seems to be functioning as we planned", which could mean all is well, or, all is not so well. There seems to be no panic among the participants as they head for the first week of programming starting on September 9th, so let's assume things are going alright. However, one highly placed engineer did tell us "it will be months before we have complete confirmation of the footprints", which is logical since there are plenty of measurements to be made before such a determination can be made.

*RECEIVER REQUIREMENTS*

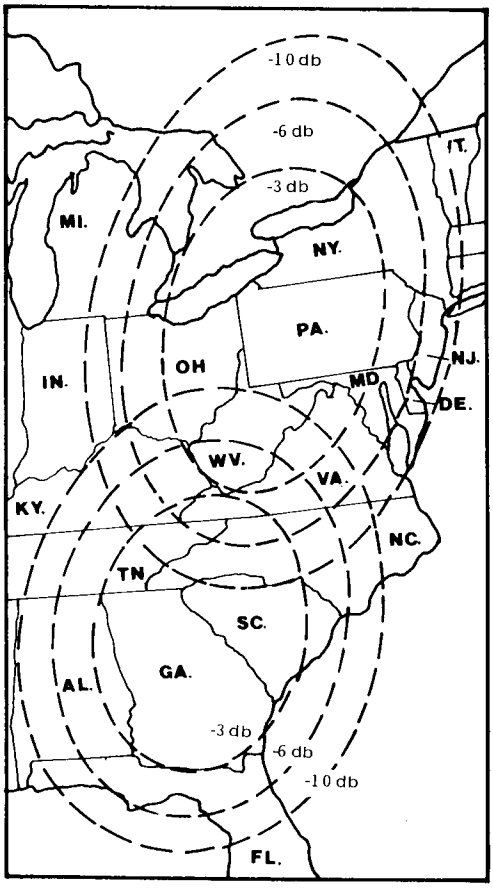
Basically, a satellite is a translator (or transponder). Signals originate on earth at one or more points and are beamed to the satellite at some frequency. The receiver on the satellite picks up these signals, amplifies them, and frequency converts them to a new outward bound frequency, and then re-transmitts them back to earth on the new frequency.

The earth to satellite direction is called an *uplink*. The satellite to earth direction is called a *downlink*. Our concern is with being able to receive the downlink broadcasts.

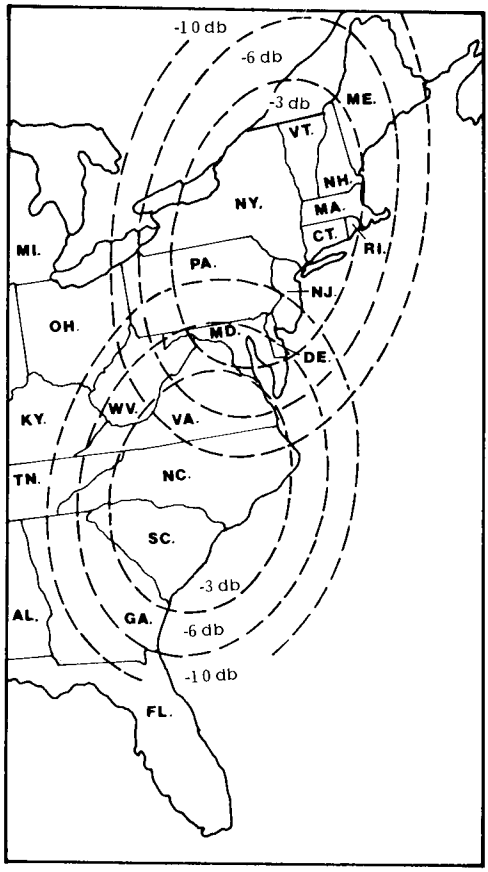
The receivers purchased for the project were manufactured by Hewlett Packard under contract. There are approximately sixty of them, some of which have been located at communities identified here separately. If you happen to be near or passing by one of these communities, you might find a visit to the ROM (receive-only-terminal) or IT (intensive-terminal) rewarding.

Basically, the ROM or IT sites begin with a 10 foot dish, manufactured by Prodelin. The dish is mounted at ground level on a pedestal mount that allows the system operator either to change the dish's aiming direction remotely by motor control, or, to accomplish the same thing manually.

If the satellite is stationary, why must the dish move? To conserve fuel, NASA in launching the satellite placed it into a position




**APPALACHIA WEST**




**APPALACHIA EAST**

that is two degrees out of plane with respect to the Equator. Thus the satellite antenna beam varies +/- 2 degrees each day *North* and *South*. The designers of the system built in the mini-tracking system on the ground terminals to allow the receive dishes to be moved slightly to compensate for this change. However, it is the opinion of CATJ that this type of fine pruning for CATV service is *unnecessary* since the kind of signal to noise ratios we should be dealing with will hardly notice the under 5 db signal level change expected. (We bring this up in case you visit a site and notice the "tracking mechanism" and wonder why it is there in the first place.)

The basic receiving system employed by the ROM sites is shown here. The 10 foot dish antenna feeds into a 4.2 db (they claim) noise figure bi-polar transistor pre-amplifier. The receiver is a basic TRF (tuned radio frequency) unit with the *demodulation* (i.e. conversion of RF to video and audio) *taking place at the 2.6 GHz region.* Approximately 120 db of gain is involved in the receiver.

The modulation is FM/FM; that is, the video and audio portions are frequency modulated. That presents the main problem to CATV systems who might otherwise deal with direct frequency (down) conversion at the receiver. If the video were AM and the audio FM, following the standards established for commercial TV broadcasting here in the United States, a simple frequency converter (converting the 2.6 GHz signal down to an unused VHF TV channel) could be employed. And the system would be very similar to a UHF TV receiving system at a CATV head end.

**EXISTING DOWNLINK LOCATIONS**

System operators can visit existing sites in their areas to explore what is required to become a part of this project. The list which follows is for the Rocky Mountain region only. We are attempting to obtain a similar list for the Appalachia region, and will print it when it becomes available.

**ARIZONA**

Tuba City (1)
Hayden (1)
McNary (1)
Gila Bend (1)
Fredonia (1)
St. Johns (1)
Seligman (1)
Phoenix - KAET/8
Tucson - KUAT/6

**NEVADA**

Owyhee (1)
McDermitt (1)
Carlin (1)
Winnemucca (1)
Ely (1)
Elko (2)
Battle Mountain (1)
Las Vegas - KLVX/10

**COLORADO**

Monte Vista (1)
Meeker (1)
Montrose (1)
Antonito (1)
Collbran (1)
Naturita (1)
Pueblo - KTSC/8
Craig (1)
Denver - KRMA/6

**NEW MEXICO**

Penasco (1)
Cuba (1)
Dulce (1)
Springer (1)
Wagon Mound (1)
Questa (1)
More (1)
Las Cruces - KRWG/22
Albuquerque - KNME/5
Portales - KENW/3

**IDAHO**

Challis (1)
McCall (1)
Lapwai (1)
St. Maries (1)
Salmon (1)
Moscow - KUID/12
Vallibue (1)
Boise - KAID/4
Osburn (1)
Pocatello - KBGL/10

**UTAH**

Blanding (1)
Enterprise (1)
Heber City (1)
Kanab (1)
Morgan (1)
Panguitch (1)
Hyrum (1)
Provo - KBYU/11
Salt Lake City - KUED/7

**MONTANA**

Busby (1)
Colstrip (1)
Ft. Benton (1)
Roundup (1)
Three Forks (1)
Whitehall (1)
West Yellowstone (1)

**WYOMING**

Saratoga (1)
Pinedale (1)
Riverton (1)
Arapahoe (1)
Dubois (1)
Lovell (1)
Sundance (1)

(1 - School system installed terminals)
(2 - CATV system terminal)

The FM/FM technique has signal to noise advantages over AM/FM, and it allows the planning people to do some clever things with several additional secondary audio channels as well, with greater ease than had the system been an AM/FM system.

Within the 3 db antenna footprint, the kind of carrier to noise (signal to noise) ratios for which they have designed is 49 db. That is substantially more signal than we are accustomed to working with in CATV. (Recall that section 76.605 (a) (9) requires us to maintain a 36 db signal to noise ratio for any signals first picked up within their Grade B, or better, contours.) We could therefore "slip" our standards by as much as 13 db below those established for the project ROM sites, and still have a signal level which our viewers would find entirely adequate.

It *may not be necessary* that we slip at all, but it is helpful to know what the design thinking was when the system was planned, and how it inter-relates to CATV technology at this time.

In addition to knowing that if you took one of the contract receiver systems built by Hewlett Packard and installed it at your site, if you were within the 3 db footprint, you could expect a 49 db signal to noise ratio, it is also helpful in planning *how far outside of the footprint* proper you might be able to be located and still have an acceptable signal to noise ratio.

In July, CATJ carried a feature on signal to noise ratios (Page 29). You might take a look at the photos of the 30 db SNR and 35 db SNR shown on Page 33 of that issue to get a "feel" for what you might expect with a ROM site system located *some distance beyond* the primary footprints.

You also might take a look at the CATJ feature in the July issue (Page 6) on parabolic antenna design tricks. The 10 foot model utilized at ROM (and IT) sites has a solid reflective surface. In actuality, the mesh needs to be 1/4 inch dense (i.e. 1/4 inch openings are permitted). It does *not* need to be *solid* by any means. Probably to the people working with these receiving sites, the 10 foot parabolic seems quite bulky. To CATV operators with experience with much

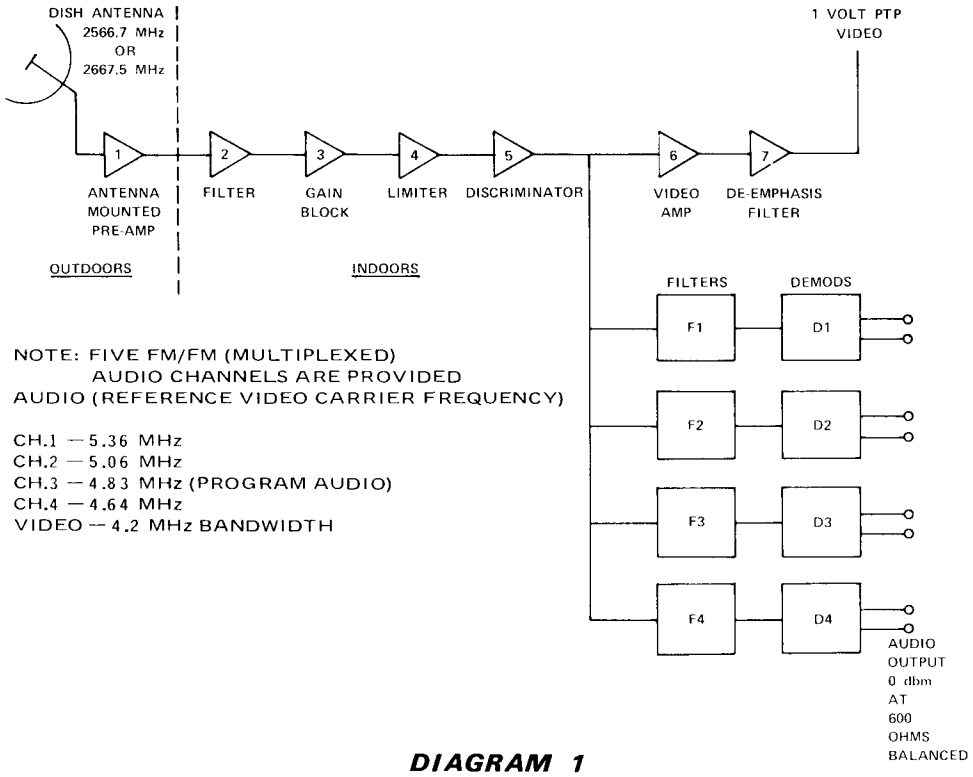



***DIAGRAM 1***

larger parabolics, it may seem in the "toy class".

What we are going to suggest to system operators is that enlarging the parabolic size *may* well be the least expensive approach to getting more system gain, although we are *warning* in advance that the *tolerances required* for accurate dish aiming and accuracy-of-dish construction at 2.6 GHz is far stricter than down in the UHF (or VHF) region. On the other hand, if you are well within the footprint for your locale, you may easily get by with less than a 10 foot dish, if you are willing to go below the 49 db signal to noise ratios the system planners counted on. For example, you could take a 4 foot UHF TV dish, discard the feed, and screen the surface with a 1/4 inch mesh. The new feed antenna will have the 2.6 GHz pre-amplifier installed *right at the antenna terminals,* and all other things being equal, you could expect to have signal to noise ratios right around 40 db.

*REMEMBER — EXPERIMENTAL*

Recall that the entire program is experimental. The people running the program for approximately one year here in the United States apparently have their hands full running their own programs. We get the distinct impression they are *not anxious to enlarge their own program* to include more CATV systems. But there is no reason why we cannot as *grass roots individual operators* take part in the program by developing our own earth terminals.

CATA discussed this with the Cable Television Bureau and with some of the staff members at the full Commission. No one up there admits to having an answer as to how our participation would be viewed.

For example, *do we need CAC approval* for adding the satellite signal? There are two schools of thought. One says that because these broadcasts are not really television broadcasts in the sense of (FCC) Broadcast Bureau responsibilities (i.e. they are not intended for the general public via direct [home] reception), that *no one* at the Cable Bureau really *has the authority* to tell us we can or cannot participate (by receiving the signal and placing it on our cable systems).

Another school of thought says that we will require CAC waivers or special relief.

*It is interesting to note that the two CATV systems who were donated receivers for the one year project* (Elko, Nevada and Wallace, Idaho) *did not request nor have they been granted Cable Bureau approval for carriage of these signals.* In fact, no one at the Cable Bureau seems to know anything about their participation.

Keeping in mind that the project is for slightly less than one year, and that the programs to be transmitted by the project relate to instructional training for the dis-enfranchised youth of this country who will receive primary job training skills via the project, *we would hope that the official attitude at the Cable Bureau and at the full Commission would be one of allowing the experiment to proceed, with participation by everyone and anyone who wanted to spend the funds and time necessary.*

With that thought in mind, CATA has filed a request for a blanket waiver of FCC rules (*without* addressing ourselves to whether the rules even cover this type of situation), to *allow any system* with the guts and desire to participate to do so, unfettered by any "no you can't do that" rulings from the regulators. We have received direct encouragement from numerous people at the Commission to take this approach to the situation, and we feel confident that no CATV operator will be shot down from participating in the program after he gets going.

This series on CATV participation in satellite receiving technology will continue in the September issue of CATJ.

## CABLE DROP

On Page 25 of the June CATJ, a Diagram (6) of the maximum bandwidth of a properly aligned Commander I and the minimum bandwidth of a properly aligned Commander I should have been labeled as follows: The **left hand portion** of the drawing is the **maximum** tolerable sweep display for wide-bandwidth alignment; the **right hand portion** is **minimum** tolerable alignment.

TV Station on the Move

# CABLE RIGHTS IN A MAJOR FACILITY CHANGE

*PROFIT MOTIVATED*

No one has ever seriously suggested that television broadcasters are not motivated by the profit dollar. A television station, at least the main portion of its physical apparatus, remains essentially the same whether that station serves a community of 10,000 or a community of 10,000,000. Both stations, if they are full power and tower have equivalent dollars invested in their transmitters, towers, and antennas. Of course, studio facilities differ, usually as a function of local advertising revenues.

Before CATV systems were brought in under the umbrella of FCC regulation, our concern with broadcaster activities was minimal. *If they left us alone, we left them alone.*

Now, with "must-carry", "specified zones", Grade "A" and "B" contours, higher and lower level priority broadcasts to contend with daily, we are deeply involved when a broadcaster seeks to tip the balance of power in our area.

Last summer during the eighteen FCC regional "small operator meetings", a group of CATV operators in Mississippi appealed to FCC representative Tony Cavender at a Jackson meeting to look into the "change in power balance" caused by Tupelo's channel 9 (WTWV) major change in broadcast facilities. The Tupelo station went from a short stick to a big (1590') stick, and moved its transmitter location in the process. This created new "zones of influence" for the station, and CATV systems which had not even been able to receive the channel 9 signal prior to the change suddenly found it was a must-carry "local". Viewers accustomed to watching their NBC programs on another channel for many years were suddenly denied the prior channel in favor of WTWV.

A similar situation is in the making in northern Missouri. Only this time the "Application for a Construction Permit" to make the major facilities change has been "set for hearing" before the FCC, and CATV operators in the area should be aware that they have the "legal right to intervene" in the hearing, and to file comments with the Commission.

As we shall see, several CATV systems would be substantially effected by the change if it goes through as applied.

*# 170 TO # 130 +*

The Ottumwa, Iowa/Kirksville, Missouri market is rated at approximately number 170. The ARB ratings credit the market with 26,000 prime time television receivers and the ADI people include a total of 30,900 sets in the area of dominant influence. The "market" has a single station—KTVO channel 3 which identifies as Ottumwa/Kirksville. The station is a "cherry picker"[1] with network programs carried from ABC (primary affiliation) and CBS (secondary affiliation). The station broadcasts with 100,000 watts visual ERP from a 1101 feet tower near Lancaster, Missouri (Schuyler County) just south of the Iowa line. The transmitter location is approximately 25 miles north of Kirksville, and 29 miles south of Ottumwa. KTVO is the only station in the "market".

Just a little further to the east is market number 130—Quincy, Illinois/Hannibal, Missouri. This market has two established VHF

stations (KHQA-7 which is a CBS affiliate and WGEM-10, an NBC affiliate). ABC network service was supplied for a time by WJJY-14, located to the east in Jacksonville, Illinois. But WJJY went dark some years ago and recently its license was cancelled and its call letters turned back into the Commission.

*That final chapter for WJJY apparently motivated KTVO to make its move.*

KTVO has made application with the FCC for a construction permit to move its transmitter from its present location *25 miles north of Kirksville* to a new location *25 miles east of Kirksville.* The CP would include a move to a new tower that would be 1981.2 feet above average terrain.

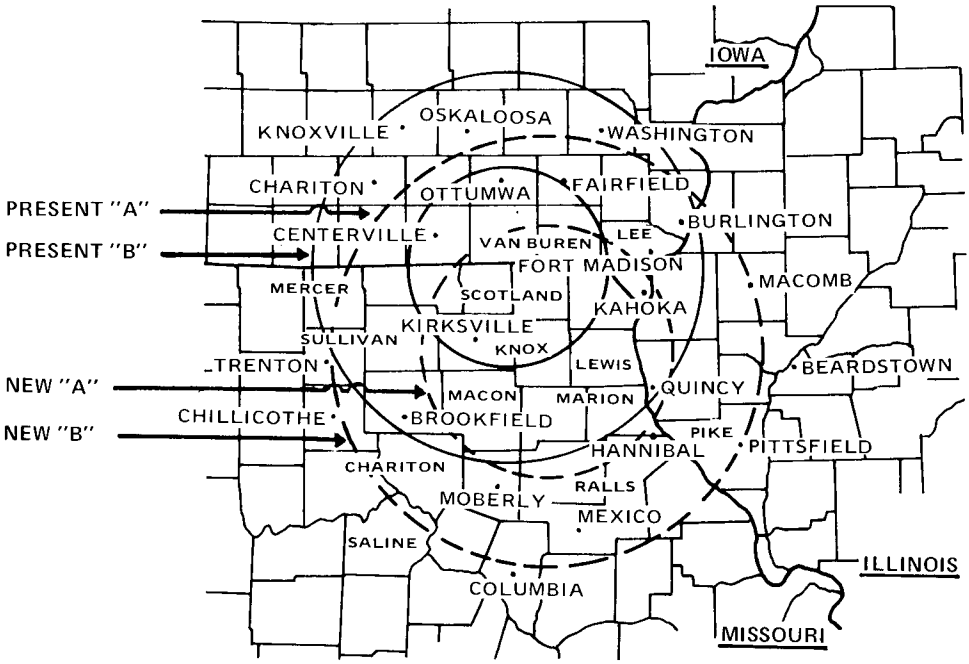
In making this proposed move KTVO would begin placing a "city grade" contour over 1/2 of the Hannibal/Quincy market (Quincy) and high level Grade "B"over the other half (Hannibal). With ABC network missing in the Hannibal/Quincy market, only a blind person would miss noticing the likelihood that the new KTVO would switch to fulltime ABC affiliation.

*LITTLE KCBJ PROTESTS*

The application for the new site and tower has been opposed by not the Hannibal /Quincy VHF stations (in the long run it would help, not hurt them), but by an innocent bystander in the power play—little KCBJ-17 down in Columbia, Missouri, and because of the KCBJ protest the matter has been designated for a hearing at the FCC.

KCBJ claims that the new KTVO would be placing a Grade "B"contour within 4.5 miles of the Columbia city limits. That causes KCBJ some concern because "KTVO does not presently serve Columbia but under its proposed changes its signal would invade the northeast portion of KCBJ's present coverage area". KCBJ notes that while at the present time KTVO is a secondary affiliate of the CBS network, that with the move closer to Hannibal/Quincy (which already has a CBS affiliate in KHQA), the programming on KTVO would certainly become exclusively ABC in content for network periods.

Up to this point it seems like primarily a battle between two TV stations, one a struggling, relatively new UHF with an ABC affiliation, and the other an established VHF that seeks to move from an ARB prime time set count of 26,000 sets to an ARB prime time set count of 66,000, and an ADI of 30,900 sets to an estimated ADI of 120,000 or higher.



*ENTER CATV*

As great as the impact might be on KCBJ, *CATJ* feels the impact on viewers of effected CATV systems would be much greater.

To put into category some of the systems which would be effected:

(A) *CATV systems presently carrying other ABC affiliate stations,* and not carrying KTVO at all, but who would be forced to replace their existing ABC station with KTVO, and provide KTVO non-duplication protection.

This would include the CATV system in Hannibal *(Hannibal Cable TV)* which presently carries ABC programs from KTVI (St. Louis) and KCBJ (Columbia). Hannibal's 4,600 plus subscribers would probably lose full time service from both stations and might lose both altogether.

(B) CATV systems presently carrying other ABC affiliate stations *and* KTVO, where KTVO is a lower priority than it would become with the move which would force the systems to install non-dup equipment to give KTVO non-dup protection against other ABC affiliates.

(C) CATV systems presently carrying KTVO, which in its present ABC/CBS cherry picker status, asks and receives non-duplication protection, but with ABC affiliation full time would require a new set of non-duplication protection.

(D) CATV systems carrying KTVO as an equal-priority signal grade status as other ABC (CBS) affiliates, but with the move will find the signal of a lower grade, thereby forcing the CATV systems to drop either the KTVO signal altogether (if beyond B) or non-duplicate protect others against it!

The combinations are endless. The chaos fairly boggles the mind. The existing and present estimated KTVO coverage is shown in the map accompanying this report.

*SHOULD CATV INTERVENE?*

The CATV industry in southern Iowa, central and northeastern Missouri, and western Illinois has a fair amount at stake. At best, there is substantial new equipment to buy, and even systems *beyond the new predicted coverage pattern* (such as to the east in central Illinois) are going to find themselves with a greatly accentuated set of co-channel on channel 3 from the new KTVO.

That's at best. At worst, there are viewing habits to be broken. People in the immediate vicinity of Hannibal and Quincy will get their first "local" ABC service. Cable subscribers in both towns will find their ABC viewing patterns disrupted, and the *future growth of both systems may be impaired* because, for the first time since UHF WJJY went dark, there will be an off-the-air ABC service available.

CATV has quite a bit at stake . . . .but whether CATV system operators in the region ask to intervene in the FCC hearing will depend upon their own evaluation of the costs of staying silent and facing the consequences. *(1) In CATV language, a "cherry picker" is a station that picks or chooses its network programming from two or more sources, usually at the discretion of station management. This naturally creates problems for CATV systems forced to non-duplicate the station's programs since the schedule is constantly in a state of flux and is unpredictable at best.*

**JUST FOR THE RECORD -**

In order to clarify the situation of the free bonuses available with early subscribing, the **UNDERSTANDING FORM 325** booklet was offered for the **pre-publication subscribers;** after the first issue was in the mail, the subscription card within the May issue offered the **free WALL CHART** as a subscription bonus. The expiration date for the free **Understanding Form 325** was May 15th and June 15th for the free **Wall Chart.** In case you wish to order either of these items, see the handy insertion card in this issue, or contact our office.

# UNDERSTANDING THE PUSH-PULL AMPLIFIER

*WHY PUSH-PULL*

When an RF carrier is amplified by a semi-conductor device (and this includes discrete transistors, FET's, chips and IC amps), not only is the signal amplified, but the semi-conductor reacts as a (frequency) doubler or mixer.

For example, if we amplify a channel 2 visual carrier (55.25 MHz), at the output of the amplifier, we would measure not only the 55.25 MHz carrier, but we would also measure a *new* signal at 110.50 MHz, or twice the frequency of the input carrier. The new carrier or signal at 110.50 MHz is generated *within the semi-conductor* in the amplification process and it is called *second order distortion.*

Unfortunately, things get much worse when we amplify two carriers in the RF amplifier. If, in addition to our 55.25 MHz visual carrier, we also have a channel 4 visual carrier at 67.25 MHz, we would *expect* to have no fewer than 55.25 MHz, 67.25 MHz, 110.50 MHz (2 x 55.25), and 134.50 MHz (2 x 67.50) at the output of the amplifier. However, with two or more carriers *going into the amplifier,* we have *more* than just the two plus their 2x carriers *coming out.* Because in addition to frequency doubling the original input carriers (55.25 x 2 = 110.50; 67.25 x 2 = 134.50), *we also have sum and difference frequencies* present at the output of the RF amplifier. In this situation, we will also have 12 MHz (67.25 - 55.25), and 112.5 MHz (55.25 + 67.25).

Note there are six carriers present at the output, the original *two plus four more.* This is just an analysis of two visual carriers. A 12 channel system with 12 visual carriers, 12 aural carriers, 12 color sub-carriers, plus some quantity of FM band signals and a pilot carrier or two, starts to defy human computation!

Now naturally these undesired *second order distortion* carriers are never as strong coming out of our amplifier as our primary desired signals. But they are there, and if they were to happen to fall on or within a visual carrier signal region of a TV channel on the system, we would see some form of picture degradation on our desired pictures. (See *CATJ for May 1974,* Pages 24/25 for beat pattern effects.)

When the Federal Communications Commission first allocated the 12 VHF television channels we now function with, this potential problem was at least taken into consideration. Certainly not with CATV or line amplifiers in mind, but with direct transmitter radiation problems in mind. Consequently, low band channels were so grouped so that when we apply the "2x rule" to their primary frequencies, we find that 2x the primary frequency always falls someplace *above channel 6 but below channel 7* in the spectrum. On channel 6, for example, 2x the 83.25 MHz visual carrier frequency is 168.50 MHz, while channel 7 (the next channel in line) has a visual carrier frequency of 175.25 MHz.

As long as CATV system operators were satisfied with 12 standard assignment VHF channels, the CATV industry had few real problems with *second order distortion* products. But, as soon as we began to think about our "empty spectrum" on our cable plants,

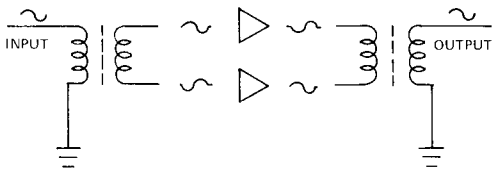



**DIAGRAM 1**

and wondering aloud how we might be able to force-feed additional TV channels through the cable and amplifiers, the *second order distortion* bird came home to roost!

For example, 2x channel 3 visual carrier frequency falls in mid-band channel "A". If it shows up at a high enough level on the cable plant, it will definitely show a herring-bone type of beat with any signal we happened to be cable-carrying on Channel "A" on our CATV plant.

To enable our industry to utilize the so-called mid-band channels between 6 and 7 (we generally speak of mid-band as starting around 120 MHz and running up to 174 MHz, although most users of cable do not use the full range [1]), the push-pull amplifier was developed.

*WHAT IS PUSH-PULL?*

Basically, a push-pull amplifier stage consists of two transistors (chips, etc.) operating electrically *180° out of phase* with each other, with the outputs combined through a transformer as illustrated in Diagram 1. Very cleverly the second order distortion products generated in the amplifier stage(s) are cancelled in the transformer (180° out of phase cancels), and this makes possible amplification over a frequency range that spans more than a single octave (2).

The typical amplifier stage operating on each side of a push-pull amplifier is a standard amplifier circuit with both current and voltage feedback (see CATJ, May 1974, Pages 40-46). The individual stage is designed flat or with 2-3 db maximum tilt by changing the feedback ratios. Input and output impedances are matched to 75 ohms. See Diagram 2 for a typical single stage. This type of circuit is exactly the same as a single ended amplifier, which was discussed in some detail in the May issue of CATJ.

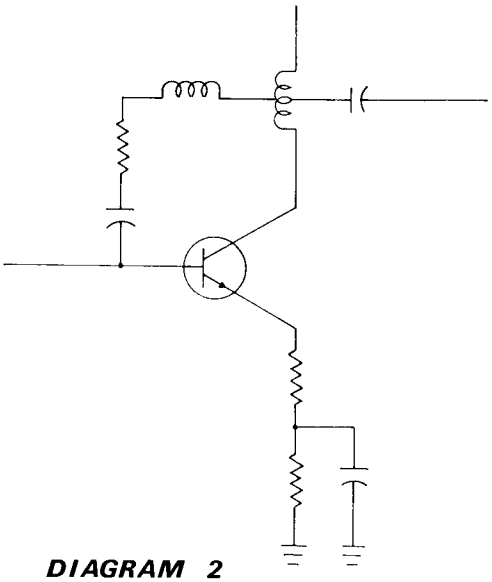


**DIAGRAM 2**

There have been two major designs for the development of a push-pull amplifier. The first we shall discuss utilizes a two-way splitter as its basic element. We are all aware that a two-way splitter divides the signal fed to it into a pair of separate but equal outputs. A 75 ohm splitter has a 75 ohm input and two 75 ohm outputs, and in a standard splitter the two (split) outputs are in phase (each with the other). Another way of describing a splitter is to call it a "balanced divider". See Diagram 3.

However, a push-pull amplifier circuit requires that the inputs to the opposing amplifier stages be *180° out of phase.* So, to the

*(1) There is a tacit understanding between CATV system designers and the FAA that we will avoid the cable use of the 108-120 MHz spectrum for fear that cable radiation in that spectrum might be mistaken for an aircraft omni-beacon station and airplanes overhead might lock onto our cable plant radiation believing it to be an airport omni station.*

*(2) In CATV and other RF work, a frequency-octave is any doubling of the width of a given frequency span. For example, 50 (x2) = 100 MHz is one octave. Once at 100, 100 (x2) = 200 MHz is the next octave. Once at 200 MHz, 200 (x2) = 400 MHz is the next octave.*

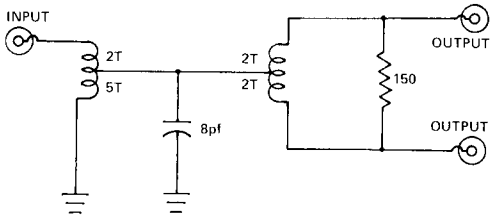



**DIAGRAM 3**

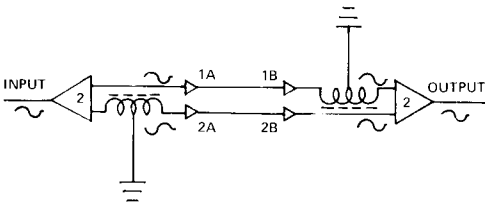



**DIAGRAM 5**

standard two-way splitter (Diagram 3), we modify one of its output legs, or ports, by adding in a 1:1 transformer. This transformer does nothing to the impedance of that leg, but it does create a 180° phase reversal, or lag, in that leg. See Diagram 4.

With two signals of opposite phase, but equal level, we are now ready to drive the twin amplifier sections as shown in Diagram 5. Notice in Diagram 5, that the input signal is fed through the standard two-way splitter, into a phase shifting (1:1) network on one leg and into an amplifier stage on both legs. Stage A (amplifier 1) feeds directly into stage B (amplifier 2) on both legs.

After stage B on both legs, the side which was fed directly by the input two-way splitter now goes through a phase shifting network (1:1) and then both legs are recombined in a second two-way splitter, utilized now as a two-signal-combiner.

While in the push-pull portion of the amplifier as a whole, there is never any type

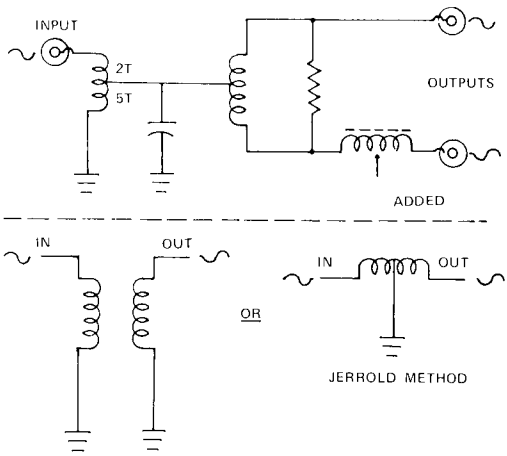



**DIAGRAM 4**

of gain control or tilt control employed. To do so while in the delicate phase-state in the two parallel legs of the push-pull amplifier would introduce a variable (or two) which would change the relative phases of the two legs beyond the point where they could be controlled. Gain and tilt are always employed in the amplifier stage(s) when the the signal is in an unbalanced mode.

In trouble shooting this type of push-pull circuitry (and it is the most popular approach to push-pull around), there are a number of areas which may be helpful to you:

(1) Because of the way that two-stages of push-pull are designed, *one or both* of the amplifiers on *one side* (i.e. 1A and 1B in Diagram 5) could fail and the total gain of the amplifier as a whole would *drop by only 6 db.*

(2) Each individual amplifier stage is a complete single ended amplifier and it should be viewed and trouble shot as outlined in the May issue of *CATJ,* Page 40.

(3) You should use a signal probe and follow the signal (RF) continuity through the amplifier on *one side,* and then on the other side (*CATJ* for May, Page 46). Keep in mind that relative to the input *to* the two-way splitter (on the input to the push-pull stage[s]) you will see a 3 db *loss* down any one leg, but that after the two-way splitter in the output of the two legs (i.e. recombiner) you will see a 3 db *gain* relative to either leg alone.

(4) *NOTE:* The opposing transistor pairs in any push-pull amplifier (i.e. 1A and 2A) are carefully matched (one to the other) by the original

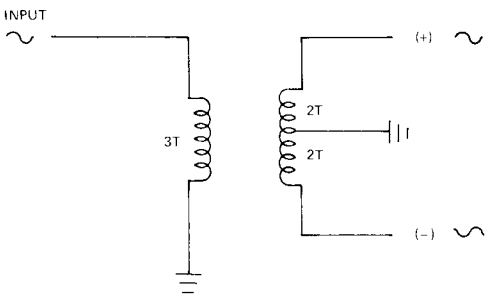



**DIAGRAM 6**

transistor manufacturer. It is very important to understand that if you are going to maintain phase parity between opposing stages, that *matched pairs, and only matched pairs, should be used.* Therefore, if you pop one transistor (i.e. 1A), you must replace that transistor, *plus* its opposing member (2A) *with a matched pair* provided by the transistor manufacturer or amplifier manufacturer. However, you can still use the *good member* of the pair later on, in a *single ended* amplifier stage. So discard only the bad one of the pair.

*OTHER PUSH-PULL CIRCUITS*

Other approaches to push-pull amplifier design follow the same basic pattern, but there are some innovations which you should understand in case your equipment utilizes one or more.

One major difference is the manner in which the out-of-phase signals are developed by the circuit designer. Diagram 6 illustrates a method by which a single transformer (rather than a two-way splitter plus 1:1 transformer on one leg) can create the phase reversal or imbalance required for a push-pull amplifier.

With a turns ratio of 3 turns on the input and a turns ratio of 4 turns on the output side of the transformer, we will end up with 180° phase reversal on the two legs. This deletes both the two-way splitter and the 1:1 transformer.

*FULL PUSH-PULL AMPLIFIER*

A typical push-pull line extender will have four stages of amplification. The first two will be *single ended* and it will be in these stages where the gain and tilt controls are located. Following the two single ended stages will be the two (pairs of) push-pull stages. See Diagram 7.

Normally a plug-in type of cable equalizer is also employed in these amplifiers. It is placed at the input to the amplifier (see Figure 17, Page 45, May *CATJ*).

Push-pull amplifier stages are normally biased like single ended amplifier stages. There is one exception, as shown in Diagram 8.

Notice in Diagram 8 that the base bias voltage developed by R1 and R2 is fed to the center tap of transformer T1 and is then fed to the base of both transistors. This is done for two reasons:

(1) It removes three component parts from the circuit.

(2) It *forces* both transistors to accept the same identical base bias condition.

Also, notice that resistor R5 is common to both circuits. This again removes a component part from the circuit, and it maintains both transistors at exactly the same collector current levels.

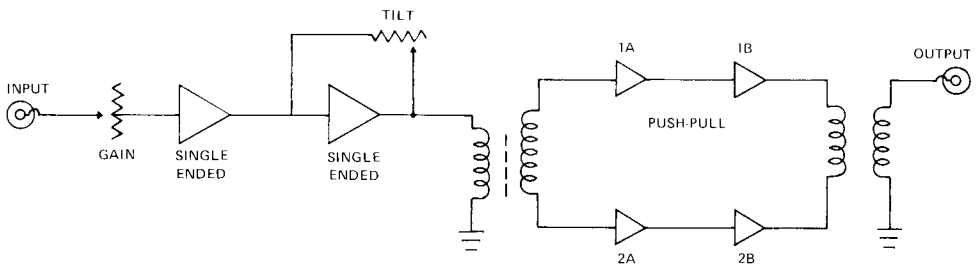



**DIAGRAM 7**

*In a push-pull amplifier, it is not enough that only the transistors are matched.* So too must every ingredient in each opposing stage of the amplifier be matched. With the advance of technology, the industry is finding ways to make more and more certain that the equal but opposite in phase integrity of the opposing amplifiers is maintained.

It is possible to make push-pull circuits compensate for cable losses (i.e. tilt or slope), but in doing so, certain elements are added to the circuit which are unique to only wide band RF push-pull amplifiers.

Diagram 9 shows a technique developed to control the very low end of the RF bandpass response range. The two collectors of the two transistors in opposition are tied together through a low pass filter and a potentiometer. The *collectors are 180° out of phase* with one another and any signal (coupled through the low pass filter) transmitted between the two is cancelled (adjustment of the pot), which is a very effective low-end control scheme.





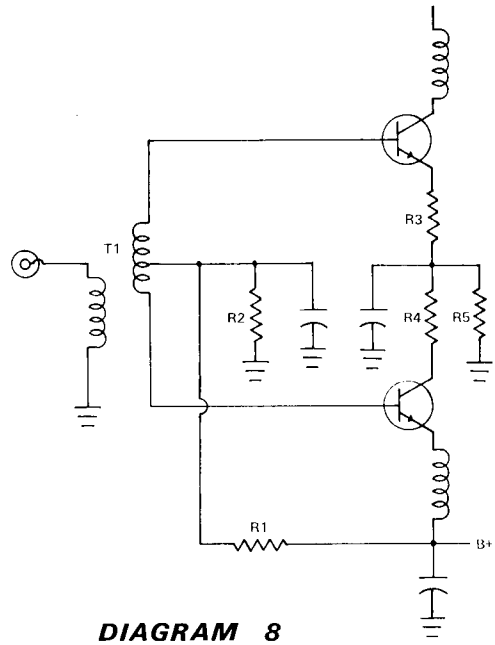



**DIAGRAM 8**

At times, it becomes necessary to peak the very high end of a push-pull bandpass response amplifier. This can be done, as shown in Diagram 10, by connecting an R-C network between the emitters of the two opposing stages. As the two emitters are 180° out of phase with one another, this form of *emitter degeneration* (May *CATJ*, Page 44) allows the adjustment of peaking of the high end.

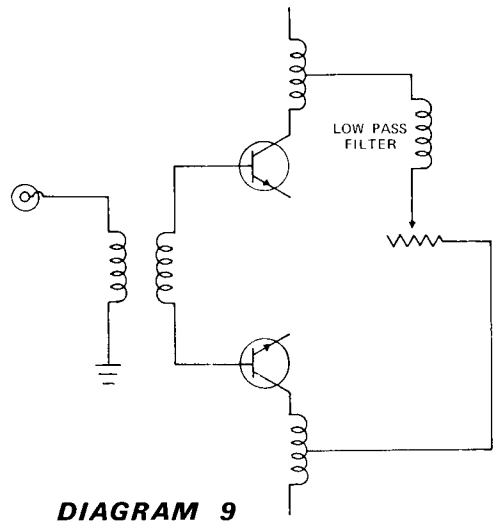



**DIAGRAM 9**

# CATJ SUBSCRIPTION - WALL CHART ORDER CARD

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. . . .**I wish to order CATJ Head End Wall Charts** as follows:
. . . . 1 for **$5.00** . . . . 2 for **$9.00** . . . . 3 for **$12.00,** payment is enclosed.

Name _____

Company (if applicable) _____

Address _____

Town/City _____ State_____ Zip_____

**Place in Envelope with Payment and mail to:**
**CATJ - Community Antenna Television Journal**
4209 N.W. 23rd. St., Suite 106
Oklahoma City, Oklahoma 73107

YES–

. . . .**I wish to subscribe to CATJ** for my system/business. I enclose payment in full of **$10.00** for 12 issues.

. . . .**I am a technician** employed by a CATV system/business and I wish to subscribe to CATJ at my home. My payment of **$7.00** for the special technician annual subscription is enclosed.

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Oklahoma City, Oklahoma 73107

# CATJ SUBSCRIPTION - WALL CHART ORDER CARD

AUGUST 1974
SUBSCRIPTION ORDER
CARD NUMBER ONE

AUGUST 1974
SUBSCRIPTION ORDER
CARD NUMBER TWO

AUGUST 1974
SUBSCRIPTION ORDER
CARD NUMBER THREE

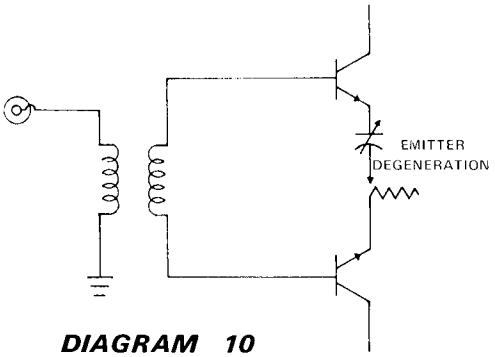



**DIAGRAM 10**

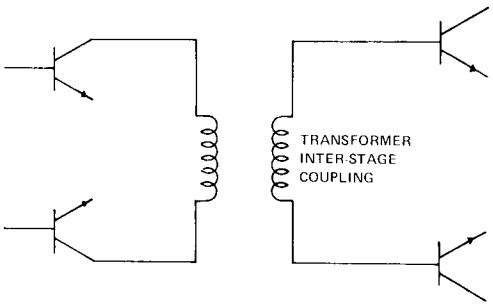



**DIAGRAM 11**

Normally, in push-pull blocks, the upper and lower halves are directly coupled to each other. However, it is possible to transformer couple the stages together as illustrated in Diagram 11.

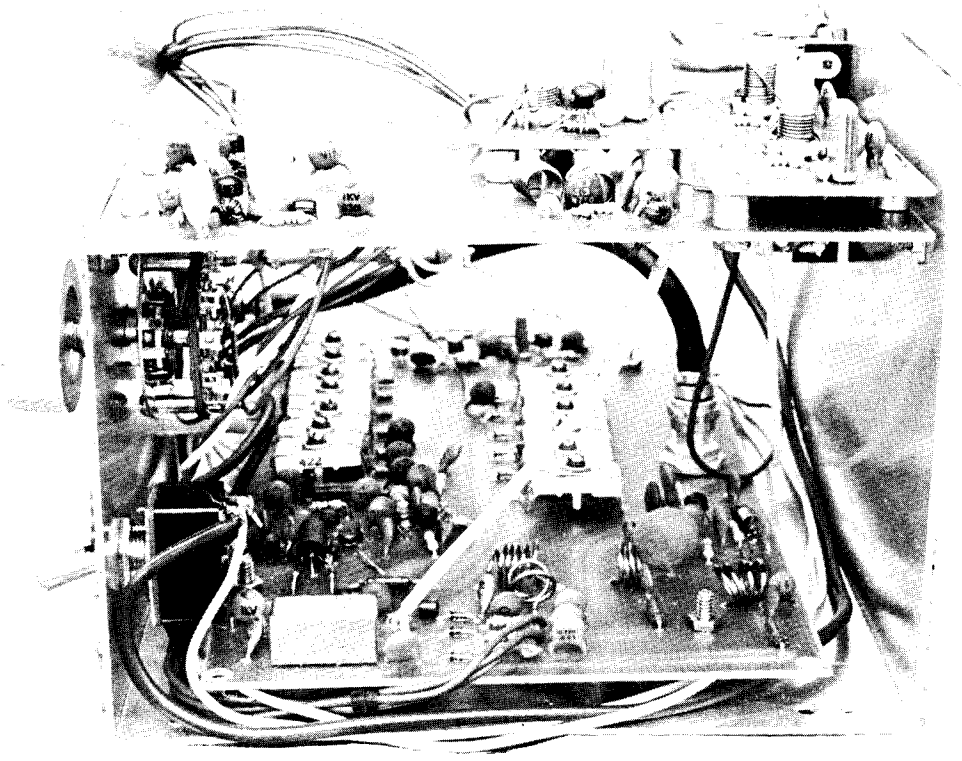
*SYSNOPSIS*

Understanding *how a push-pull amplifier works,* what you can do to repair it, and what you *cannot* do in an emergency should make you a better system operator.

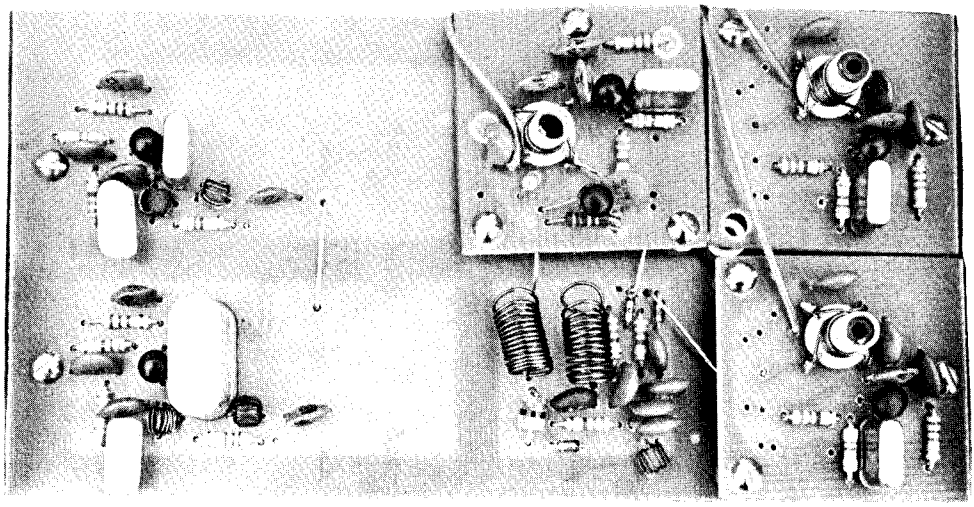
Furthermore, knowing when you need push-pull circuitry and when you do not will perhaps save you valuable plant investment or expansion dollars. If your plant is now, and always will be, a 12 channel standard frequency assignment system (i.e. no use of mid-band channels), your single ended amplifiers are going to work just fine. On the other hand, if you now plan, or someday intend, to make utility use of the mid-band region, push-pull is one of the design criteria which you must accept and plan for now.

# MARK-A-CHANNEL REVISITED

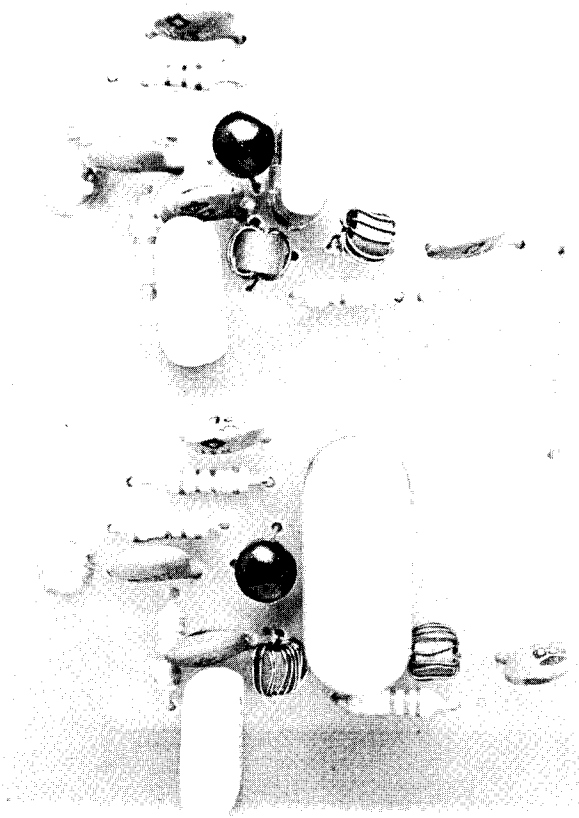
In the July issue of CATJ we presented detailed instructions for constructing a versatile marker device called the **Mark-A-Channel**. To aid you in building this visual/color/aural marker device we are showing here various details of the unit's construction. The Mark-A-Channel is available to CATJ readers in kit form, or as a first for us, a wired and tested unit. Additionally, the circuit boards are available screened for component locations for those who wish to obtain their own parts. See Pages 33-48 of July 1974 CATJ.



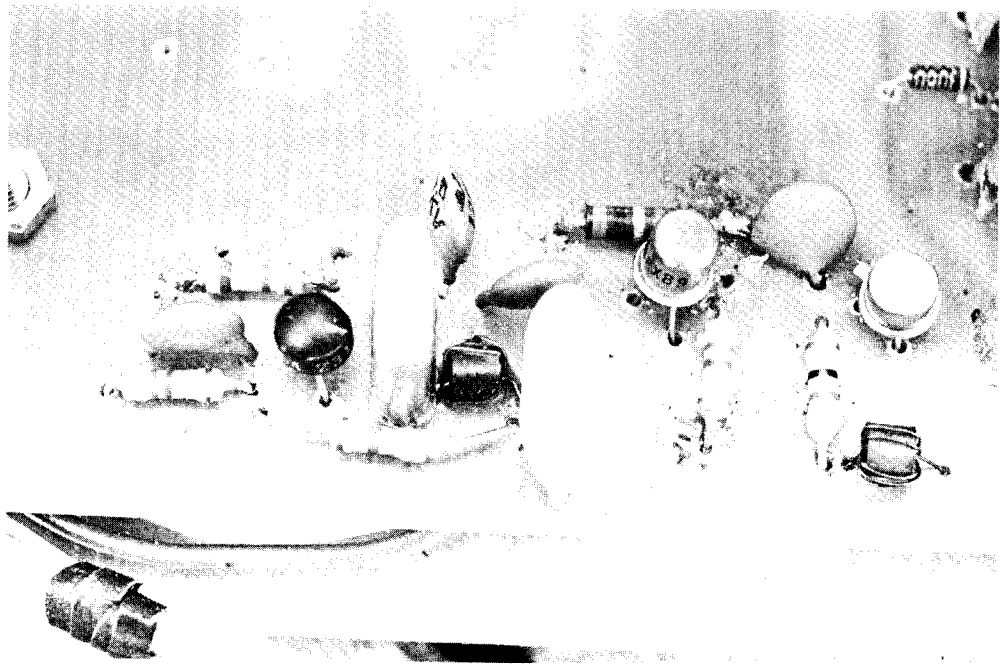
**Mark-A-Channel** is built in two "layers" with 43.25, 65.25, and 163.25 MHz local oscillators on top (right) board; 3.58 MHz oscillator top (left). Double balanced mixer is lower left. Bottom board also contains 6 MHz comb generator (far rear) with 12-48 MHz amplifier, filters and traps.



**ABOVE** - Top left 4.5 MHz, bottom right 65.25 MHz, top right 43.25 MHz, top center 163.25 MHz oscillators.

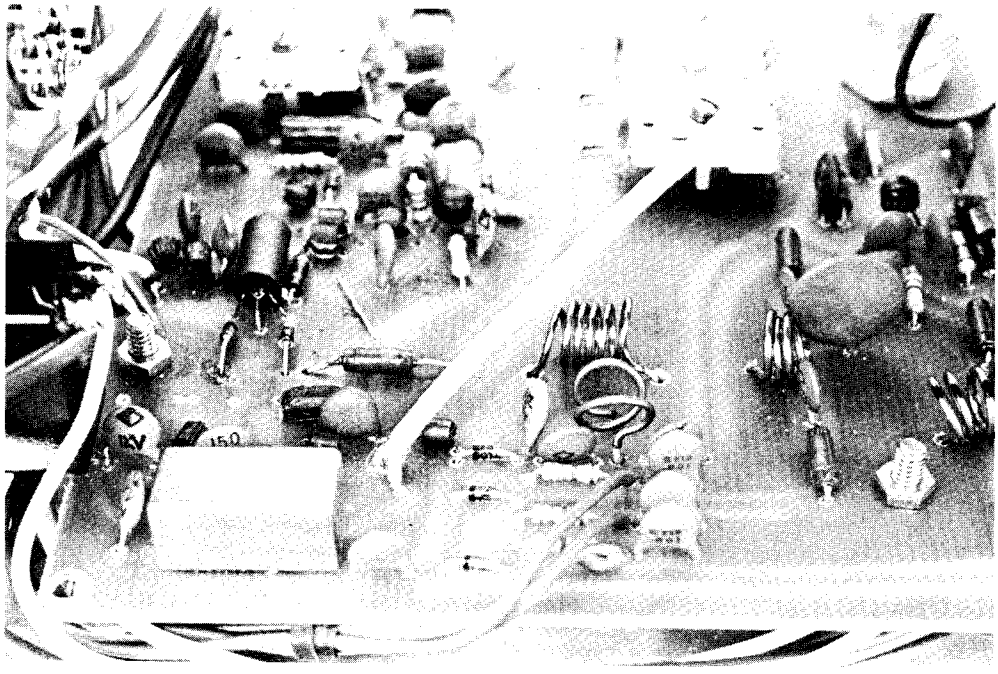


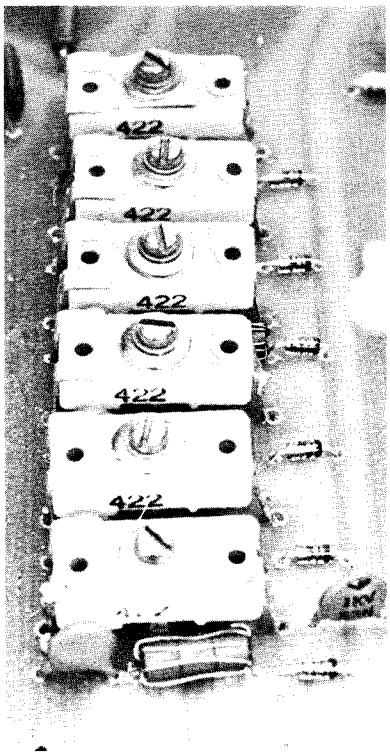
**LEFT** - 4.5 MHz oscillator (top portion) and 3.58 MHz oscillator (bottom portion).

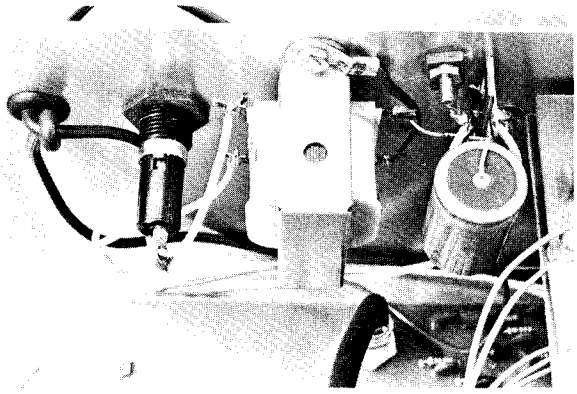


**ABOVE** - 6 MHz comb generator with Q1 (2N3564) oscillator (left of crystal), Q2 comb generator (BFX-89) and Q3 tuned amplifier (E-310).

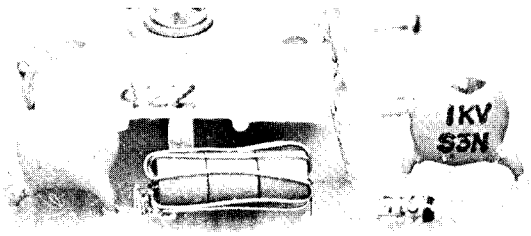
**BELOW** - SRA-1 double balanced mixer (left), with band filters (see Diagram 11, Page 46, CATJ July 1974).

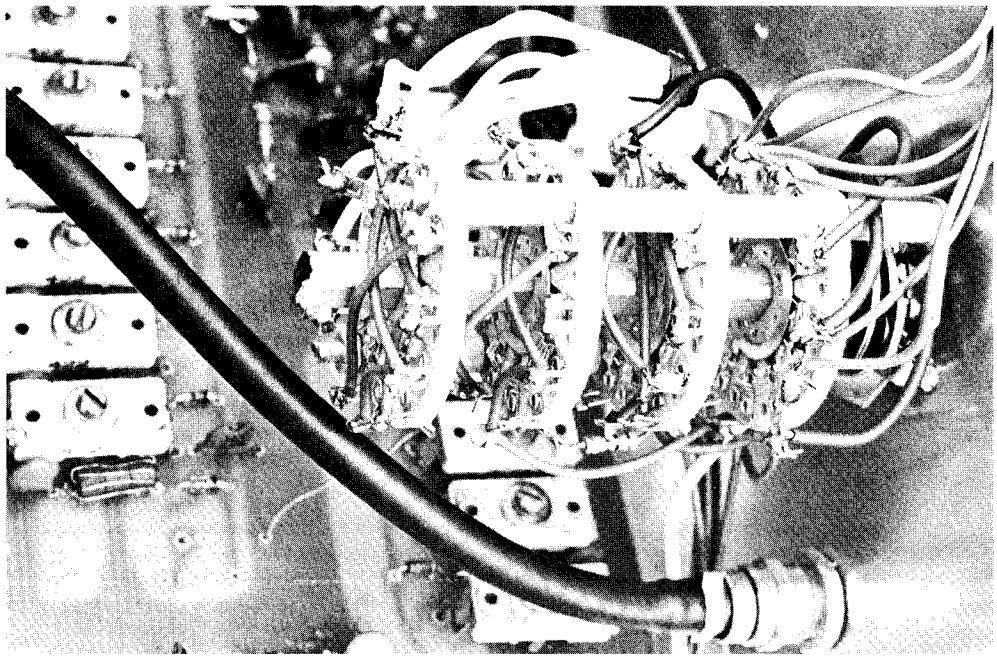




LEFT - C8-13 series traps with D12-17 switching diodes. ABOVE - Power supply mounts on rear panel (Diagram 5, Page 42, CATJ July 1974). BELOW - C13, C46, L20, and DI7 (Diagram 5).



ABOVE - Switch S1 with "D" to left, "A" to right.

# TECHNICAL TOPICS

## SIGNAL TO NOISE RATIOS

"The article on signal to noise ratios in the June CATJ should aid every cable operator in understanding the importance of selecting equipment with a critical eye to noise figures. The statement that the noise figure at the head end determines system signal to noise should have been all caps(!).

I feel there is misleading information regarding the minimum noise of a theoretical amplifier in television service. It has been assumed by the author that noise in the system occupies a 6 MHz bandwidth. However, the noise in the **picture** is limited to about 4 MHz. This results in a theoretical noise floor of 1.12 microvolts, or -59 dbmv. The open circuit noise voltage is derived from the following well-known formula for noise voltage:

$$e_n = \sqrt{4\ RB\ k}$$

where $e_n$ = RMS Noise Voltage

R = Resistance in ohms

B = Bandwidth in MHz

k = Constant equal to approximately $40 \times 10^{-16}$ at 68° F

This yields:

$$e_n = \sqrt{4 \times 75 \times 4 \times 40 \times 10^{-16}}$$

$$= \sqrt{4.8 \times 10^{-12}}$$

= 2.24 microvolts RMS

If this source voltage were connected to a noiseless 75 ohm load, the voltage delivered to the load would be 1.12 microvolts RMS, or -59 dbmv."

Kenneth L. Foster, Chief
Division of Telecommunications
New York State Commission on
Cable Television

**What Engineer Foster states if true for a 4.0 MHz bandwidth, and certainly the video portion of the transmitted signal is limited to approximately 4.0 MHz. However, the noise contribution (it can be argued) from the spectrum immediately adjacent to the video-modulated bandwidth can also appear with the video RMS microvolts signal voltage(s). It can be shown that noise outside of the video passband portion either (1) noise modulates, or (2) algebraically adds to the RMS voltage of the signal present. Since it ends up being inter-mixed with the RMS voltage of the signal proper, how it gets there is academic at best. The selectivity of the front end of the entire system channel (often a pre-amplifier) thus becomes a major concern since any spectrum that it allows to pass on to the processor (after pre-amplification) becomes a noise source which either noise modulates or algebraically adds to the noise present within the 4.0/6.0 MHz desired channel spectrum. Even very selective pre-amplifiers tend to be something broader than the 4.0 MHz video bandwidth. Thus, in our June treatment of noise, we established a 6.0 MHz passband as our noise floor bandwidth criteria and thereupon began with a -57 dbmv noise floor rather than the theoretical -59 dbmv which Mr. Foster suggests.**

## LOST & FOUND - UNDERSTANDING FORM 325

If you were one of the first subscribers, you will remember that the subscription offer was a free copy of a booklet, **UNDERSTANDING FORM 325**. This booklet is intended to be a complete guide to filing the annual FCC reports and filling out a Certificate of Compliance application, but herein is the problem. The FCC has not come to a final decision about some of their requirements for complying.

This has delayed the completion of this booklet, but because there are many points that can be presented to you, our plan is to complete the booklet with the final information that we have, and then prepare an addendum when the FCC makes their final decision. We are now in the process of completing this information, and we will get the booklet off to you as soon as it is off the press.

We do apologize for this delay, but hoped that what information was sent to you could be the most final and up-to-date that could be obtained. Those of you who expected this free bonus with your early subscription can rest assured that this offer is still good and the information will soon be sent to you.

# CABLE BUREAU COMMUNIQUE

The Federal Communications Commission, through its Cable Television Bureau, continues to act upon Certificates of Compliance in ways which indicate current thinking at the Commission in several critical areas of importance to cable operators.

**A squabble between two cable companies** serving portions of Richland County, South Carolina, has been handled **without intervention** by the Commission. Palmetto Cablevision, Inc. and Columbia Cable TV Company have been granted Certificates of Compliance for their existing operations in Richland County in spite of numerous protests, charges, and counter charges by the parties and others. Palmetto carries the signals of WIS (NBC), WNOK (CBS), WOLO (ABC), WRLK (ETV) and wished to add the signals of WTCG (IND) and WRET (IND). Columbia proposed to carry the same signals, less WRET, wishing to replace this one with WRIP (IND). Columbia had sought a cease and desist order against Palmetto, claiming Palmetto was gaining an **unfair competitive advantage** (in the county) by carrying without authorization WRET (IND), WRDW (NBC) and WJBF (ABC).

Palmetto countered with the explanation that WRDW (NBC) and WJBF (ABC) were only carried when under Section 76.61 (e) (2) of the rules a cable system could supply "missing network programming" not available to cable customers on normally carried stations. Palmetto admitted it had been carrying WRET (IND) without authorization, but had dropped the station on March 27, 1974 when it **realized** "Commission authorization was required".

The Commission agreed that Palmetto's carriage of WRDW and WJBF under provisions of 76.61 (e) (2) was consistent with the rules, and dismissed the prior carriage of WRET without authorization as an "unintentional violation of the rules".

A bigger question facing both operators is the Supreme Court of South Carolina ruling that existing state statutes do not allow South Carolina county corporate entities to franchise or grant permits to CATV operators. Both systems have assured the FCC that they will "operate under section 76.31 of the Commission's rules". The Commission has asked both systems to provide detailed data on the county areas they intend to serve, and when they intend to serve these areas, and actual issuance of the CAC's will be withheld until such information is provided to the Commission. CAC's covering the period through March 31, 1977, were indicated.

**The 353 subscriber system** in Waterville, New York, operated by Nu-View, Inc. has received Commission certification as a small system not liable to the provisions of non-duplication protection. Roy H. Park Broadcasting, Inc., operator of WUTR in Utica/Rome had requested that the Commission force the small system to protect the ABC programming on the Waterville system by Nu-View against programming simultaneously broadcast by ABC affiliate WNYS in Syracuse. The Commission refused to do so.

**Temporary permission to carry non-network programming** of a network station, in lieu of approved carriage of an independent station's signals not currently available to the system, has been received by Seminole Cablevision, Inc. of Sanford, Casselberry, and Winter Springs, Florida. The system has CAC approval for WSWB (IND), WDBO (CBS), WFTV (ABC), WMFE (ETV), WESH (NBC), WUFT (ETV), WUSF (ETV), WEDU (ETV), WCIX (IND), WLTV (Spanish), WTOG (IND). The WTOG independent signal is local in nature. At the present time WCIX (IND) is not available and will not be available for 12-16 months because of non-availability of microwave circuits. The Commission has therefore approved the addition of the **non-network programming** of WTVT (CBS) for a period of one year; the Commission decided to "grant special relief" so that the system could "meet the minimum levels of signal carriage afforded to it under the rules ".

A new CATV system to service **Anaheim, California** (Theta Cable of California) has been granted "special temporary authority" to provide service to MATV system customers assumed by Theta Cable in the process of wiring all of Anaheim prior to being granted a full Certificate of Compliance. Theta pointed out that MATV systems within the city were being made a part of the Theta Cable system under construction, and that it wished to avoid disrupting service to these MATV (now CATV) customers while the change-overs were taking place. The Commission went along on a temporary basis with the proviso that those MATV customers would only receive the "must carry" signals that Theta Cable would have on the full system, and that no new customers be added.

**Six New York state CATV systems** operating in the suburbs of Buffalo have been granted CAC's to add the signals of Canadian stations CBLT and CFTO as "independent signals". Local Buffalo stations were **in favor** of the addition of the two signals to the system (!) and had filed on the CAC applications to ask that the Commission **insist** that the two signals be carried 100% of the time. The stations contended that the CATV systems would use the little known provisions of 76.61 (b) (2) (ii) to delete programming carried by the stations which

was substantially "of local Canadian interest" and insert in place of those "Canadian interest programs", programs from other (such as New York City) stations. The Buffalo TV stations contended that the use of the two Canadian signals was nothing more nor less than a "gimmick" to allow the six systems to **substitute at will** programming under the provisions of 76.61 (b) (2) (ii). The Buffalo stations feared an influx of programming from other major markets into the system areas.

The Commission noted that it was requiring the six systems to maintain logs of program substitutions, on a monthly basis, for a period of one year.

**Opposition to the granting of a CAC** for the community of Warren, Michigan (located in the Detroit market), filed by a Michigan State Senator has been set aside by the Commission in granting of a CAC to the proposed applicant. The Michigan Senator had filed an opposition to the granting of the CAC noting that he had information regarding alledged irregularities in the granting of the franchise, and that the matter was pending before a Michigan Joint Legislative Cable TV Study Committee, of which he is a member. The Commission, in approving the CAC, said the Senator's opposition was "vague and raised no question of deviation from the rules by the proposed system". The Commission found no reason to delay certification of the system.

**Another case involving 76.61 (b) (2) (ii)** has passed through the Commission with the Commission again **agreeing with the broadcaster** who objected to an earlier grant. First Illinois Cable TV had been granted a leapfrogging waiver to add the independent signal of WGN-TV Chicago on systems in Illinois. The original waiver allowed First Illinois to carry WGN but to delete "programs of local interest". Midwest Television, Inc., licensee of WICS-TV Springfield, objected and stated that if this happened the systems would employ 76.61 (b) (2) (ii) to add other signals to the systems "at will". The Commission agreed that was potentially possible and ruled that First Illinois could **not** delete "local programs" from WGN carriage.

**A system in Mahoney City, Pennsylvania,** has been denied its request to be granted a waiver on section 76.55 (a) (3) of the rules, covering signal carriage on local signals on only one channel, when so requested by the local station(s). City TV Corporation told the Commission that its 12 channel system serving approximately 1189 subscribers carries three NBC signals, and that when it is forced by local WBRE to delete the programs of the other two NBC stations, that it carries these signals on the channels normally occupied by the two other NBC stations as well. The cable company said that it does so because of its competitive position in Mahoney City against a larger CATV system in the same city and that the larger system was not required to interrupt programming on any channels. The City further argued that, by carrying the signal of WBRE on two or three channels, it was "enhancing the competitive position of WBRE" and that, without City cable carriage of WBRE, the station would not be received in Mahoney City at all.

The Commission found the arguments unpersuasive and directed the City to cease and desist from further multi-channel carriage of WBRE-TV.

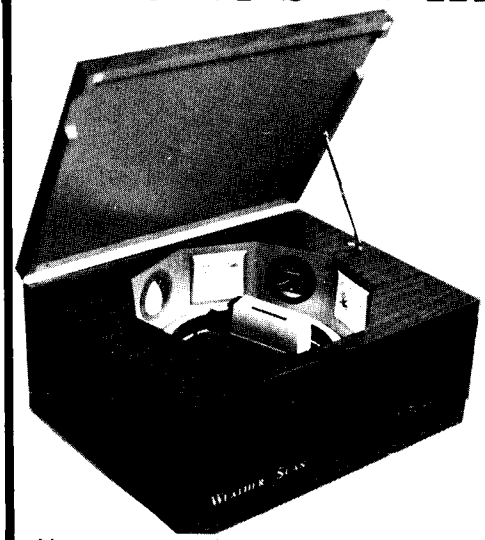
**A Seattle, Washington, CATV system** applicant for a Certificate of Compliance has been granted by the Commission over the objections of two Seattle stations which sought protection against Canadian "pre-release" of U.S. network programs, and over self-generated objections of the Commission that the franchise was **defective. Vanhu, Inc.** will be the fourth Seattle CATV system to carry Canadian signals, and the Commission ruled that Vanhu, Inc. would be at a "competitive disadvantage" if it were not allowed carriage of the same signals as the existing three systems. The Commission also found that "in spite of a six percent franchise fee to the city", the Commission feels it would be "unfair to place an applicant at a competitive disadvantage by requiring it to meet stricter franchise standards than those applicable to its already established competitors in the same community". The CAC was granted through March 31, 1977.

**A dispute over grandfather rights** for 1960's signal carriage of a station previously carried full time, but carried part time since 1965, has been resolved by the Commission in favor of the CATV systems. Iron Range Cable TV operates eight separate CATV systems from two head ends in northern Michigan. Each system has twelve channel capacity. Television station WLUC-TV claimed that the systems did not carry WBAY-2 (Green Bay CBS) from July 1, 1965 through January 1969 and that the systems therefore lost their right to grandfathered rights on WBAY. The systems maintained that, because of the common carrier feed to the systems (microwave), channel capacity was limited, and WBAY-TV **was in fact carried** by the systems during the disputed period on a part-time switched basis. The Commission found that even though the systems did not carry the WBAY signal full time in the disputed period, the signal was carried part time in that period and from January 1969 until the March 31, 1972, cut off date for grandfathering, the signal was carried full time.

**A question of real vs. theoretical Grade B contours** entered into an argument between Staunton (VA.) Video and a UHF station in Charlottesville (VA.). Staunton Video sought a waiver of 76.91 (non-duplication protection) against WVIR-TV. Staunton is within the 35 mile specified zone of WVIR-TV, and the system there serves some 6,000 subscribers with eleven signals.

The Commission consequently ruled that if WVIR-TV will place into operation a translator station to serve the (community of) Staunton (area) within 180 days, that it will enforce 76.91 and 76.93 in favor of WVIR, thereby requiring Staunton Video to afford the station non-duplication protection as the rules allow.

# Economical New Weather-Scan III



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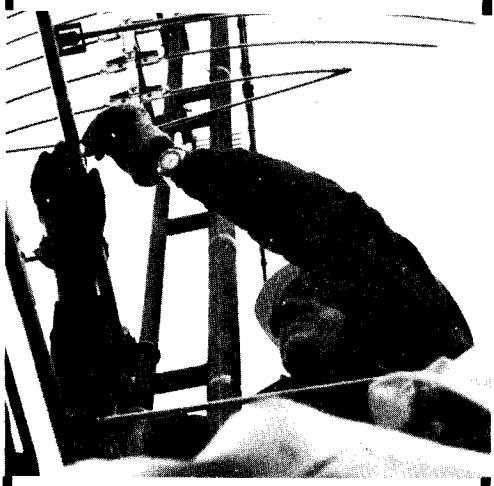

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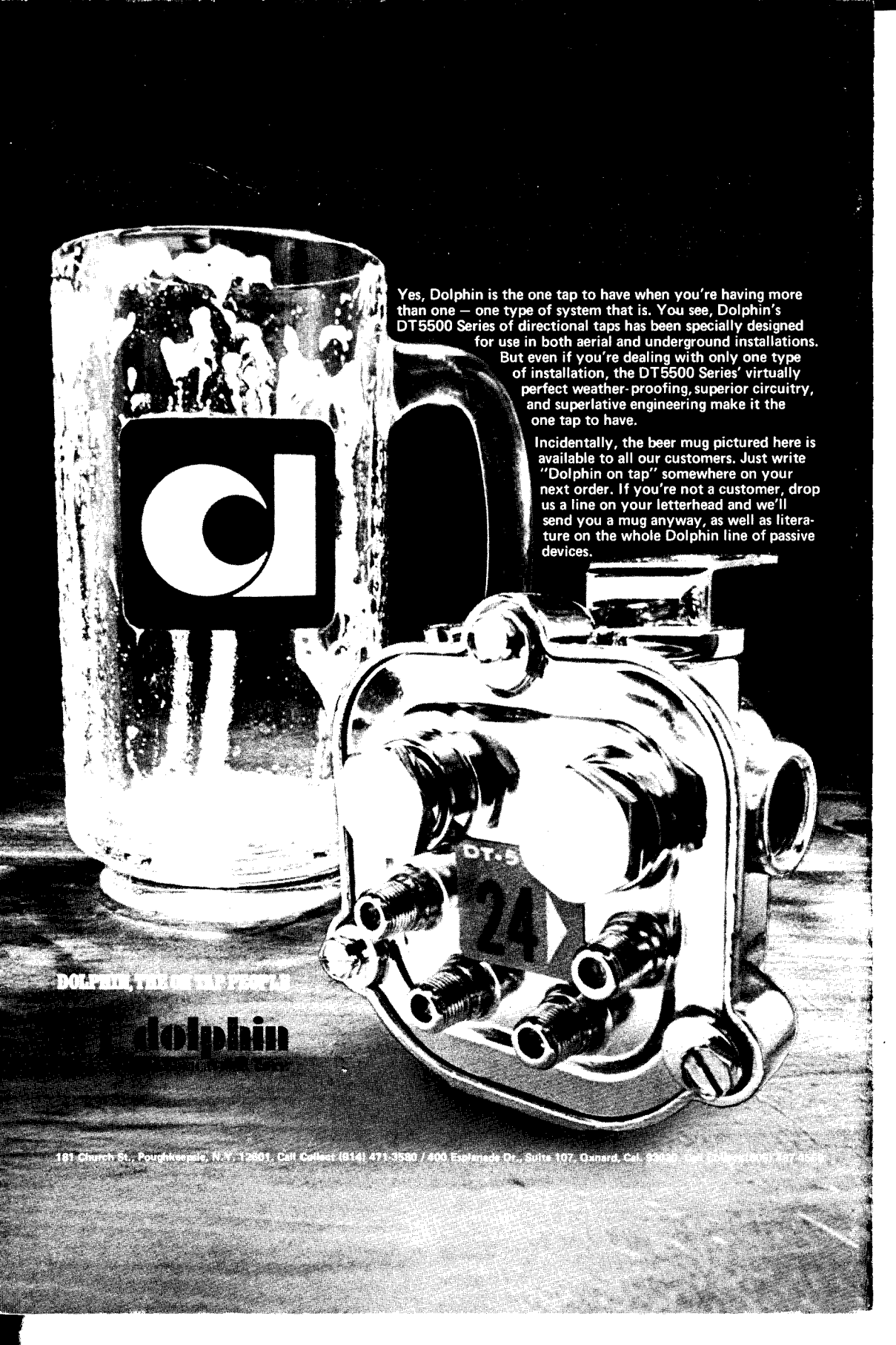
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