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TIMING DEVICES
TOUCHTONE
REMOTE PHONES
PREAMPS

VTG
CONFERENCE

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REGULAR FEATURES

Cover Photo: One of Santa's helpers, Bruce Butler, Communications Engineer for the Grosse Pointe, Michigan Police and Fire System is caught loading up for Christmas. Photo by Wallace Murray.

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routes to improved receiver intermod performance, including discussions of types of devices, circuit configurations, noise figures, injection requirements, and resulting overall performance.

THE EVALUATION AND DESIGN OF MOBILE GAIN ANTENNAS BY COMPUTER SIMULATION - A computer program has been written to simulate antenna performance on a small groundplane. The solution for a quarter-wavelength antenna has been expanded to include larger antennas with more complex current distributions. This paper, by R. S. Kommrusch (Motorola), includes a summary of the computer program and presents gain relationships between a quarter-wavelength antenna and various gain antennas over different sized groundplanes.

RANDOM TIME-SHARING OF A DIGITAL COMMUNICATION CHANNEL - Mr. T. J. Hutton of Wabco, Inc., will describe a means of time-sharing of a digital communications channel bv many users. Sharing is achieved by means ot pseudo-random time-multiplex transmission. The scheme is especially useful where a synchronous system is impractical. System performance will be examined in terms of bandwidth and number of users.

EVALUATION TRUNKING FOR LAND MOBILE RADIO SYSTEMS - A technical team from Motorola will present data and analyses which provide a quantitative basis for evaluating some of the factors which affect the communications capacity of trunked land mobile radio systems in comparison with nontrunked systems. These factors include the effects of message lengths and message adaptability under heavy traffic conditions; effects of signaling time and accuracy; and the geographic factors related to service range and frequency sharing.

THE EFFECT OF COCHANNEL INTERFERENCE ON THE PARAMETERS OF A SMALL-CELL MOBILE TELEPHONE SYSTEM - In a small cell mobile telephone system, each channel may be used simultaneously in cells spaced sufficiently apart to limit cochannel interference. The extent of the interference depends upon the distance between cochannel cells, the number of land stations per cell, and the receiver capture ratio. In this paper, by Bell's J. W. Engel, the quantitative tradeoff relationships among the parameters are derived for various cell configurations.

VHF MARITIME SERVICE - This paper, by Cdr. A. A. Kirchner, will describe the limited history of marine communications and the progressive technical changes in the art. It will then deal with current changes in FCC rules pertaining to MF Coastal Harbor Service. Finally, it will present the current status of VHF ısage for the west.

SATELLITE REPEATER ARRANGEMENT IN A NEW MARITIME MOBILE TELEPHONE SYSTEM - This paper describes a new maritime mobile radio telephone system developed by NTTPC. The first part of the paper outlines technical features of the entire system and the second section covers the satellite repeater arrangement adopted to reduce dead areas of the service. A team of specialists from Nippon Tel & Tel present the paper.

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Estimating Repeater Coverage

Know what to expect from your anticipated repeater installation by applying standardized range-gaging techniques . . .

Until very recently it was generally believed that coverage and range predictions for a repeater could never be made with a reliable degree of accuracy because of the overwhelming number of variables involved in the overall repeater system. A few writers began to find ways to compensate for some of the variables in advance, and the radio industry moved in to help reduce "coverage estimation" from the realm of speculation to a process at least resembling a science. Before any real attempts were made to prepare realistic coverage estimates, commercial users were given "degree of confidence" figures. A 100-watt transmitter with an antenna at 500 ft on 150 MHz FM, for example, might be said to have a 90% probability of providing thorough coverage over a 20-mile radius. Now, thanks to the abundance of comprehensively prepared analyses by modern communications engineers, much more reliable predictions can be made with a consistently higher degree of accuracy. Today's coverage estimates can be calculated on the basis not only of such factors as power, antenna height, band of operation, and mode of transmission, but of such elusive elements as terrain type, vegetation, propagation characteristics, rf diffraction potential, transmission line length and type, and many others.

<u>50 MHz</u> -- The 50 MHz (low-band) spectrum allows better rf diffraction than any other VHF signal; the physical length of the wave is long enough to afford a degree of "bending" by the atmosphere to allow signals to follow the earth curvature to some extent. This frequency range also is characterized by ionospheric reflection during some seasons, which tends to reduce the ground-wave usefulness (because long-distance "skip" signals can cause interference with intended signals). The 50 MHz region is near the center of the

"noise intensity" spectrum, too, which tends to negate the advantages of over-the-horizon capability. That is, the wavelength of a 50 MHz signal is such that extremely long ground distances could be covered if noise were not a factor.

150 MHz -- This wavelength (called high band by commercial users and amateur FM'ers) offers a good compromise between the advantages of low band and UHF (450 MHz). High-band signals don't diffract through the atmosphere as readily as low-band signals, so the theoretical maximum ground-wave range is somewhat less. But the relative absence of noise in this region results in superior receiver performance. And the net outcome is coverage that is indistinguishable from low band, all other factors being equal. Trees and foliage in the vicinity of the receiving antenna tend to reduce the field strength due to an rf absorption that is typical of the high frequencies. This absorption effect may be of so little significance that its mention might seem meaningless, but the signal loss is nonetheless very real, albeit small. Man-made structures such as tall buildings, bridges, and other objects of metal and mortar tend to further reduce signals in the 150 MHz range. Consequently, repeater users operating mobile in a nearby city are apt to find a number of dead spots where satisfactory operation proves impossible regardless of receiver sensitivity and transmitter power.

450 MHz -- The 450 MHz range (UHF) offers the most predictable performance of the three bands. UHF communications is virtually "line-of-sight." As a consequence, a UHF repeater may seem to offer less to users than, say, high band or low band. But UHF does offer many distinct advantages when the repeater is well situated.

City coverage is generally better, for example, because the extremely short waves allow bouncing of signals between buildings without the phase and multipath cancellation that is characteristic of the lower frequencies. All radio signals bounce. But when two bounced signals arrive at an antenna out of phase with each other, they cancel. On low frequencies, the waves are long enough to allow an out-of-phase condition to exist for a long enough time period to prevent meaningful communication. On UHF, however, an out-of-phase condition might be corrected by simply moving the antenna a few inches. The slow fade and mobile QSB of the lower frequencies become a rapid -- sometimes almost unnoticeable -- flutter or "chop," which does not necessarily interrupt communications on UHF bands.

The deleterious effect of foliage on received signals is considerably more pronounced on UHF than on VHF, and repeater users will notice a seasonal fluctuation in communicability; extended in winter, reduced in spring. The effects of heavy foliage are so severe that the vegetation of the general area must be taken into account by UHF repeater planners if a successful repeater system is to be expected.

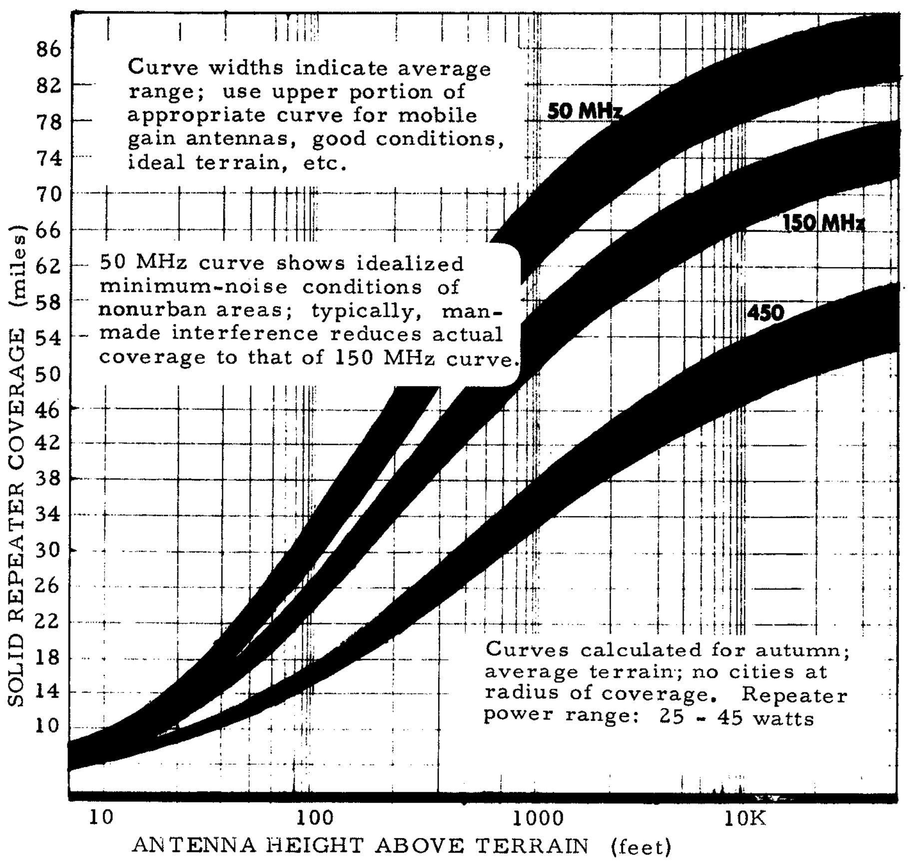
The Communication Products Department of General Electric has incorporated most of the principal criteria in the calculations onto a slide-rule device so that prospective GE customers can decide for themselves what performance must be expected from the equipment to attain a desired radius of coverage. *

An elaborate mathematical analysis of anticipated coverage can be precluded, of course, if a radio transmitting system is already in use at the proposed site. In this case, several mobile units can make coverage surveys by monitoring the output of the transmitting station through the areas of desired coverage and noting the periodic limiter current readings. Later, power differences and antenna gain differences between the existing station and the proposed station can be accounted for by correcting the actual readings in accordance with standard dB scales.

* "Range and Signal Strength Calculator," available from GE, Commercial Products Department, GE, Electronics Park, Syracuse, New York.

The accompanying graph shows the range to be expected for various repeater heights. For the calculations on which the graph was plotted, these prior assumptions were made: Terrain of coverage is relatively flat, with no cities or structural complexes at radius boundaries. Foliage density is average. Transmitter power output is 25 watts with no losses calculated in the transmission line.

The 50 MHz curve in the graph is based on a near-absolute no-noise condition, which is more idealistic than realistic. In practice, metropolitan areas are encountered and latent band noise is high -- and the heaviest toll is the 50 MHz band. In such cases, the 50 MHz curve could



overlap or be under the 150 MHz plot (which remains constant regardless of area characteristics).

There are a few basic differences between dB indications, depending on whether the gain or loss is calculated for a receiver or a transmitter. The transmitter, of course, is rated in watts, where a doubling in power results in an increase of approximately 3 dB. Receiver signal strength is measured in voltage, and a voltage doubling results in an increase of some 6 dB. (Doubling the voltage doubles the current, which quadruples the power to yield an increase of 3 dB x 2.)

These signal characteristics illustrate the importance of receiver sensitivity in a repeater system and show the need for maintaining as high a field strength as possible in the area of coverage. A mobile receiver which typically yields a partially quieting signal with an input of 1.0 μV at the antenna may not even "hear" a signal whose strength is 0.5 μV (equivalent to quartering the transmitted power). On the other hand, improving a mobile receiver's sensitivity from 1.0 μV (for 20 dB of quieting) to 0.5 μV is the same as quadrupling the power of the repeater transmitter.

Timing Devices

for remote control applications

Taken for granted more often than any other control element, the simple timer offers unmatched capability for active command and passive control.

The common denominator of all control systems is the timer. And a multiplicity of timed functions is what gives the control scheme the character of a brain. From initiation of the first control pulse, which starts a planned sequence of events, the timers take over, commanding all the "whens" designed into the system.

Though timers fall into but three basic categories, they cover a virtually unlimited range of configurations, including capacitive, semiconductor, motor-cam, thermal, pneumatic, and clock. Each type has peculiar advantages for specific applications, and not all are ideally suited for use in repeater control applications.

The thermal timer, for example, is small and inexpensive, and it often is proportioned to plug into a standard miniature tube socket. But its reset time is dependent on its cooldown ability. Once triggered, the thermal timer cannot reliably operate at the same period until its thermostatic element reduces to a temperature comparable to its original state -- which may be many minutes. In applications where the timed sequence must be accurate, and where there is a chance the timed cycle must be repeated at short intervals, the thermal timer is a complete bust.

The purpose of this article is to outline the basic timer functions and point out a few of the principal operating characteristics of the most-used types for repeater control. Using this data, designers of control schemes can select the most advantageous timer for a particular application consistent with funds and skills available and with degree of accuracy required.

TIMER FUNCTIONS

The tnree timer types are the delayed dropout, the time delay, and the interval timer. Figure 1 shows the three functions graphically, in terms of voltages being controlled by the timers.

The overall character of any timed sequence can be shaped according to individual requirements with the aid of conventional switching functions (solid-state devices or relays).

Some timing devices can be difficult to classify, because their functions vary according to the control voltage application. The Agastat* line of pneumatic delayed-dropout timers is a case in point. This device turns on as if it were a conventional relay, and remains in this state until coil voltage

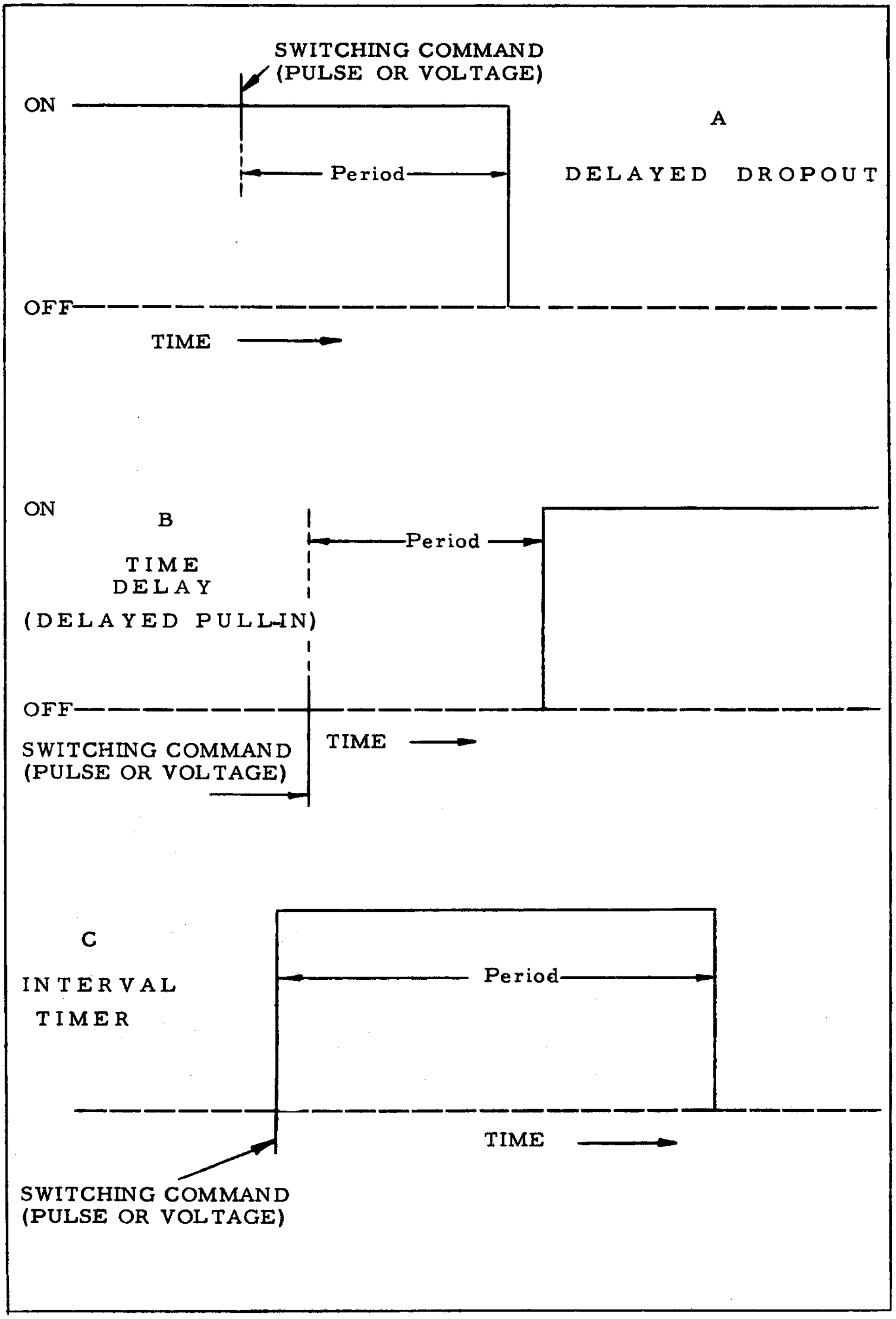


FIGURE 1. PERIOD DESCRIPTIONS OF BASIC TIMERS

is removed, at which time its period starts. At the end of its period, the contacts release and the timer is "off." Use of a pulse, rather than a continuous voltage, however, gives the Agastat delayed dropout the character of an interval timer, in that a specific and precise "on" period results from each pulse application.

The most widely used delayed dropout timer is the simple capacitive device, consisting of no more than a relay whose coil is shunted with an appropriately selected electrolytic capacitor. This type of dropout cannot be triggered with a short pulse because the electrolytic must be fully charged before the timed function can occur. And adequate charging, in some cases, can take several minutes. The tendency of an electrolytic to resist voltage changes is a characteristic which can be used to turn the delayed dropout into a conventional time delay as well. The requirement here is to reduce the coil voltage with a resistor to just that amount required to energize the relay -- no more. The capacitor, then, when placed across the coil, opposes the voltage and keeps it below the critical triggering point until it is effectively charged. (See Fig. 2.) The limitations of the capacitor-relay timer are more numerous than serious, but often these limitations are of such a nature as to prevent the use of this type of timer in an otherwise relatively uncomplicated switching scheme. The period, for instance, may vary considerably, dependent on such local conditions as ambient temperature and voltage stability. Timers of this class should only be used where energization time is not critical and where the timed period can vary a great deal without deleteriously affecting system operation.

* Registered Trademark, Elastic Stopnut Company, Elizabeth, New Jersey.

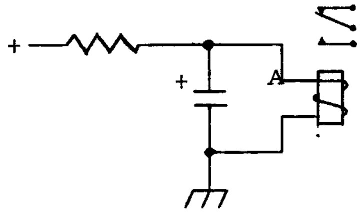
Solid-state timers -- particularly those employing SCR's -- provide an ideal means of timed sequencing in situations calling for reliability, positive switching, accuracy of period, and ease of triggering. The only significant disadvantage with solid-state timing devices is their inherent complexity. Often a control system will require as many as five discrete timed functions. With a solid-state scheme, a separate and complete electronic circuit is required for each timer.

Figure 3 shows a proved circuit for a solid-state interval timer capable of being actuated by either a pulse or a continuous voltage. The timed period, varied by selection of the potentiometer (R_1), may be anywhere from 0 seconds (zero resistance) to 15 seconds (approximately 220K). The period can be upped to several minutes by using a 100K resistor for R_1 and increasing the value of C_1.

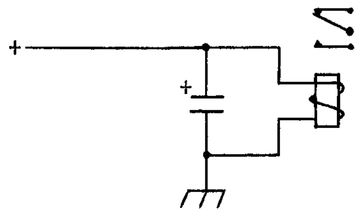
Although the advantages of this solid-state interval timer are obvious in terms of dependability, period repeatability, and general imperviousness to environmental conditions, one can readily see the drawbacks where a large number may be required in a given control application.

The Agastat line of time delay relays is particularly suitable for repeater applications because of a favorable compromise in accuracy, economy, reliability, and convenience. The Agastat is available as a delayed dropout or delayed pull-in; it is small, compact, and completely self-contained; and it is as easy to use as a conventional relay. In most cases, the Agastat is provided with an integral vernier adjustment for varying the time (often from 75% of its preset period to several hundred percent).

The Agastat is a pneumatic timer, whose period is determined by air pressure against an integral diaphragm. In the case of the delayed



TIME DELAY (DELAYED PULL-IN)
Relay coil at A sees gradually increasing voltage which eventually reaches "critical" (switching) level. Resistor reduces voltage to just that amount required to energize relay.



DELAYED DROPOUT
Relay coil is supplied with sufficient voltage to provide fast pull-in of contacts. After capacitor reaches full state of charge it will hold coil energized for a time after coil voltage is removed.

FIGURE 2. USE OF RELAYS AND CAPACITORS TO CONTROL UNCRITICAL TIMED SWITCHING SEQUENCES.

pull-in, pressure begins to build up with application of coil voltage. (The pressure point of switching is determined by diaphragm position, which is adjusted by the vernier.) When the pull-in takes place, the timer will remain energized in exactly the same capacity as a relay until coil voltage is removed, at which time it will immediately drop out and will be ready for the next timed sequence.

Factory fresh Agastats are out of the price range of most amateurs, unfortunately. But an abundance of them on surplus shelves brings the acquisition cost down to a level comparable to that of quality thermal timers -- about $5 each.

It is easy for a system designer to end up with an excess of components in his control system. Careful study of timers and their characteristics will help to minimize this eventuality. The telephone control circuit presented in the July issue of FM was an example of overcomplication with timers ("UHF Amateur Mobile Telephone," by Ken Sessions). Figure 4a illustrates the approach presented in the original article for timed automatic telephone shutdown. Inversion of the design logic, however, simplifies the circuit by eliminating a relay (Fig. 4b).

Both sketches in Fig. 4 show the accomplishment of a single function.

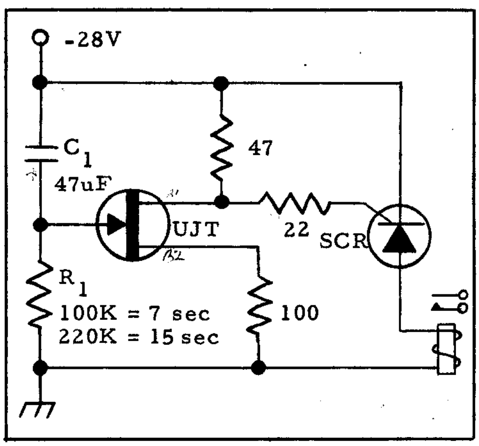
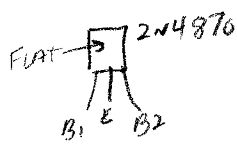


FIGURE 3. SOLID-STATE INTERVAL TIMER (pulse or voltage keyed).



The extra relay in 4a is the result of constricted thinking. When a carrier appears, the COR pulls in to provide a signal at K_1 to prevent the timer's operation. In 4b, the COR provides a signal when it is not energized, which can feed the timer directly. In both cases, the timer pulls in to turn off the control voltage when no carrier occupies the input frequency for a specific period.

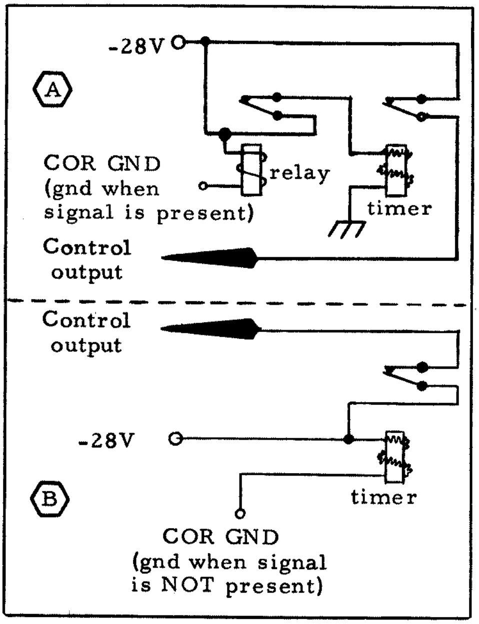


FIGURE 4. LOGIC INVERSION TO SIMPLIFY CONTROL SCHEME.

My mistake in the original design was in thinking "I don't want X function to happen while the carrier is present." This line of logic led me to insert a control element (K_1) to deenergize X function in this condition. A more positive approach would have been "I do want X function to happen when no carrier is present." This statement immediately suggests direct energization of X function from the no-signal state.

If your own control system is still in its design stage, look again at your timed sequences. Proper selection of timing devices can save you a lot of unnecessary components. And bear in mind that complete control systems can be constructed with timers as the sole function selection mechanism.

VHF - UHF Quickie Preamps

Where desensitization proves no great problem, the operation of a repeater can usually be enhanced by the installation of an rf preamplifier on the receiver. Individual circumstances notwithstanding, repeaters generally are heard better than they hear. In many cases, this inequality is attributable more to the pains that have been taken in "supertweaking" the repeater transmitter than to inherent deficiencies in the repeater receiver. But a little extra time spent with the remote receiver will often pay off in valuable range extension.

There is, of course, a limit to the useful sensitivity of a receiver. When the receiver is already exhibiting a value of 0.3 µV (for 20 dB of quieting) during the repeat mode, there is little hope for improvement. Rf preamplification at this point would almost certainly result in sensitivity to the repeater's own transmit signal, or perhaps the relaying of signals which should be considered as no more than noise. An additional problem is the tendency of a preamplifier to saturate when excessively strong signals are in the vicinity of the repeater. Such a condition can make a reamp useless in situations where a number of repeaters are deployed at the same location. (A saturated condition results when the preamplifier is made to conduct heavily in the presence of weaker signals on the frequency for which it is designed to operate.)

But for the majority of receivers, in the 0.8 µV to 1.5 µV class during repeat, the rf preamplifier can be the perfect complement.

150 MHz Preamplifier

Figure 1 is a schematic diagram of a soundly engineered FET rf preamplifier submitted by Court Broad (VE3EW), of Canada. His circuit, which appeared in the Toronto FM Communications Association Bulletin*, has been duplicated and used with success by a great many two-meter FM'ers and repeater builders in the U. S. and Canada. The design emphasizes simplicity in that it uses but one semiconductor to yield a compact unit capable of adding some 6 dB to a receiver's usable sensitivity.

When attaching a preamplifier to a receiver, it is a good idea to exercise restraint. Don't try to get more sensitivity than your system is capable of handling. The danger signs are excessive first-limiter current, evidence of oscillation, undue susceptibility to interference.

The preamp uses a Motorola MPF-102 FET in a common-source amplifier configuration. For best noise performance neutralization is needed. This is easily accomplished by feeding an out-of-phase signal from the

*Box 943, Toronto 5, Ontario, Canada

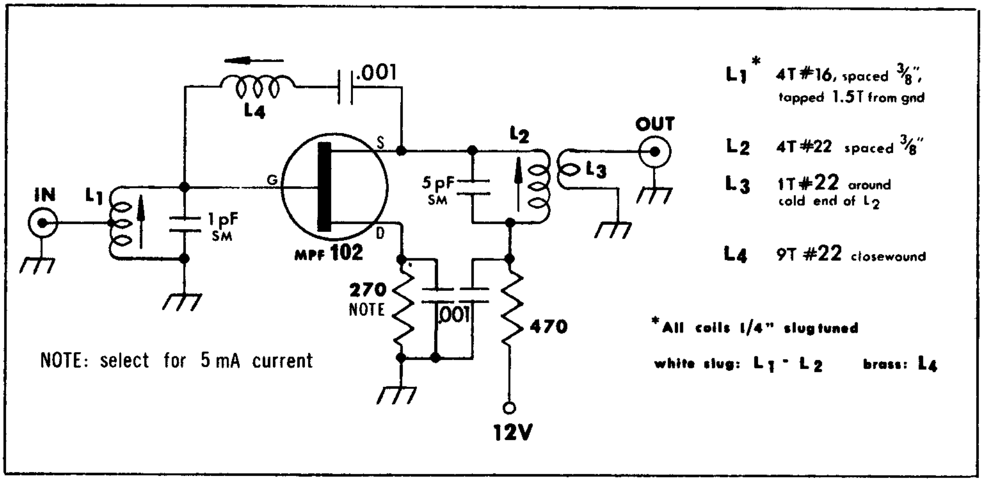


FIG. 1 SIMPLE 150 MHz PREAMP

preamp output back to its input. L_4 is used to accomplish this.

Anyone familiar with VHF construction techniques should have no trouble in duplicating the performance of this unit. Court Broad claims no originality, since variations of the circuit generally have been published before. The component types and values, however, may be peculiar to this unit.

The preamp is built in a Hammond 1411D minibox. This facilitates complete sheilding of the unit and allows flexibility of installation in either base or mobile equipment.

A good VHF signal generator is required for "optimum" adjustment of preamp; however, a rough tuneup can be made using on-the-air signals. First, peak the repeater receiver for optimum performance; then insert the preamp ahead of the receiver. Make sure that the length of coax is the same in the final installation as the one used for tuneup. Set the generator for a nonsaturating signal at the first limiter. Adjust L_1 and L_2 for maximum indication, reducing the generator output as the preamp is tuned to resonance.

Next, connect the signal generator to the output of the preamp and connect the input of the preamp to the input of the receiver. Increase the signal generator output until a reading is obtained at the first limiter as before. Adjust neutralization coil L_4 for minimum signal feedthrough. This adjustment must be made with the preamp connected to its power source. Reinstall the preamplifier correctly and readjust L_1 and L_2. Repeat this procedure several times to be sure of the correct setting, because the adjustments do have a tendency to interact slightly.

This preamp has a measured noise figure well under 2 dB; this figure results in man-made noise being the only limiting factor in the receiver's ability to hear weak signals. The bandwidth of the preamp is approximately two megahertz (the design center is 147.00 MHz).

450 MHz RF Preamplifier

As a rule, rf preamplifiers for the 450 MHz region require somewhat more critical layout than those for the VHF bands. And, of course, the semiconductors for the UHF range

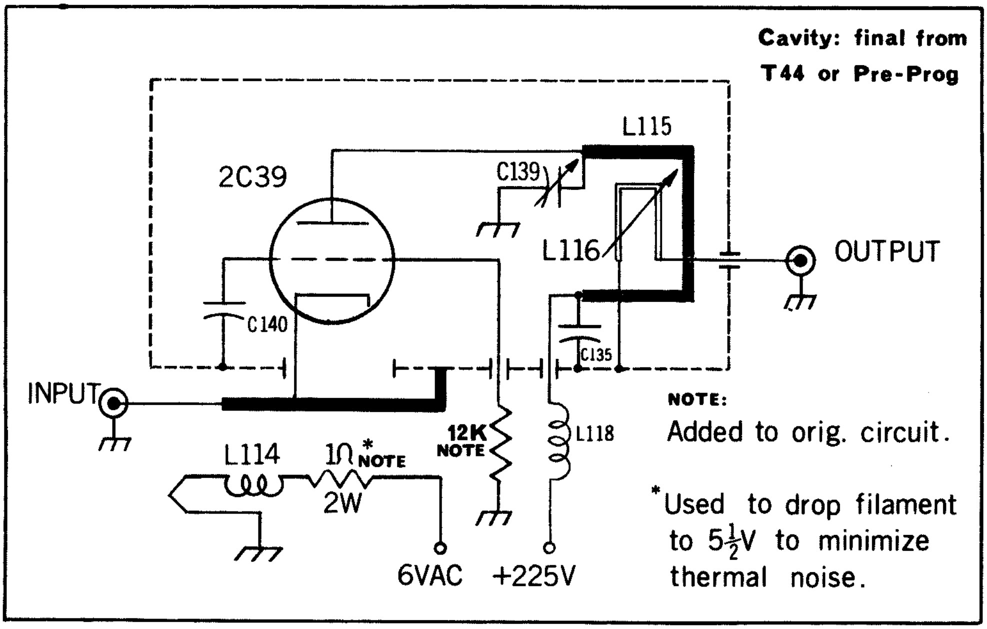


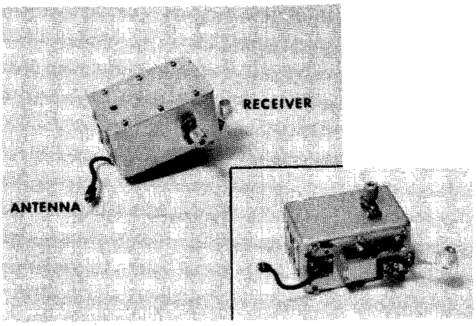
FIG. 2 SATURATION-PROOF 450 MHz RF PREAMPLIFIER.

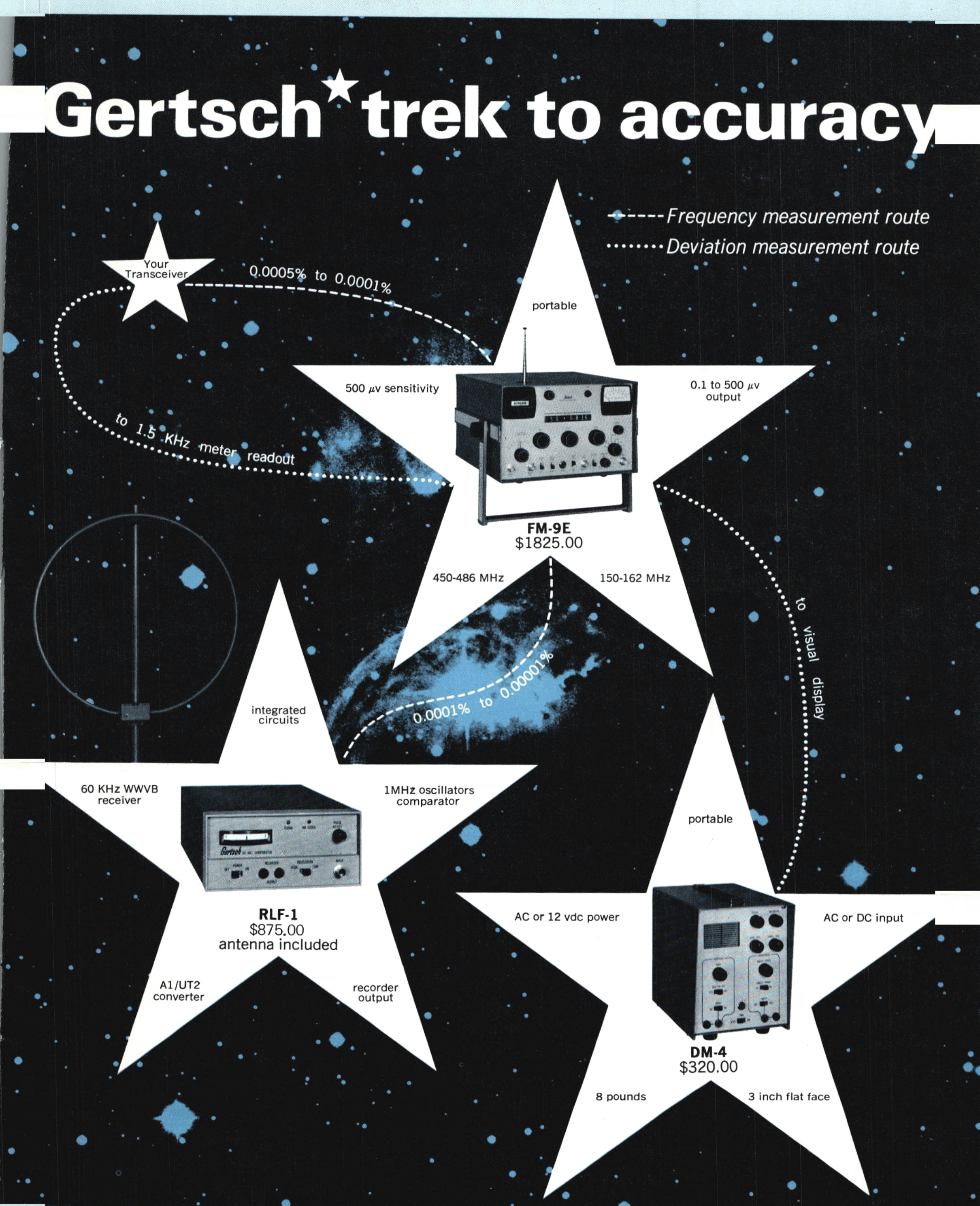
are a bit more expensive. Amateur ingenuity being what it is, however, someone always seems to come up with something simple, quick, and effective.

Such is the UHF preamp whose circuit is shown in Fig. 2. Adapted from a Motorola idea by Don Milbury (W6YAN), this unique device is the complete "final" cage and associated circuitry from a Motorola T44 transmitter! Its most interesting -- and most attractive -- feature is the fact that it is virtually impossible to saturate this remarkable amplifier. The unit retains its high sensitivity regardless of ambient rf. This makes the unit particularly desirable for applications where a preponderance of repeaters exist, as in commercial two-way or broadcast installations.

Another nice feature is that no modification is required of the T44 final to produce the UHF preamp. It uses the same tube, the same components, the same everything!

To be sure, this preamp's dependence upon the vacuum tube is more than excused by its availability, ease of construction, and overall performance. The finished preamp is said to have an effective signal gain in the neighborhood of 20 dB. There are only two isgnificant points of concern: First, the plate voltage should be limited to around 200 volts to minimize thermal noise pickup; and second, you can expect some mechanical difficulty in moving the T44 transmitter's final cage to another chassis.





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If considerable time has been spent trying to find a trouble, with no success, look at the stages on each side of the one with the trouble. Recently, a Motorola 5V showed all the symptoms of an oscillating high i-f but the trouble turned out to be a screen dropping resistor in the second mixer with too much resistance.

* * *

One trouble that sometimes makes a strong man weep is lopsided modulation. This frequently shows up in a receiver as signal "chopping" even when the signal is several microvolts. A meter in the discriminator will jerk to one side when modulation is applied to the transmitter. If the limiter in your audio checks out okay, try a new oscillator tube.

* * *

Silicon rectifiers in the ac power supply can be a source of hash and noise even up to the two-meter band. Try connecting a 0.01 μF disk ceramic across each diode. The trouble is that the abrupt on-off switching creates high-order harmonics.

*****

Older model transmitters using 2E26 tubes can be pepped up quite a bit by substituting 6146 tubes. Units such as the 80D have the sockets too close together, but by carefully filing off the base of the tubes, they will fit. File off only that portion that overlaps the other tube. An 80D with 600 volts on the plate will put out over 80 watts with this modification.

* * *

To avoid marking up a schematic diagram as you check off the items you have tested, lay a piece of tracing paper over it. As each stage or part is given a clean bill of health, mark it out with a pencil. This will help to avoid overlooking any components.

* * *

In a number of makes and models of fixed-station equipment, a low-level hiss is present in the loudspeaker when the receiver is squelched. This is usually caused by the noise amplifier. The cure varies from make to make. In Motorola equipment, try a bypass capacitor directly across the terminal of the squelch pot. GE equipment seems to let it feed through via the B-plus line. A decoupling network can be added in the B-plus to the noise amplifier, and in stubborn cases also in the B-plus to the first audio amplifier.

* * *

If you have a number of identical units to work on, and marginal service information, take one of the units to a Xerox machine. You can make a fairly good picture and write the measurements on the copy. In the case of the bottom of a printed circuit board, you can use it as a service template by punching holes in the desired places.

* * *

The use of "bargain" or surplus crystals is not a good practice. Once in a while, you come across one that would work fine if only it weren't 5 to 10 kHz off at the operating frequency. If you can't wait for the correct crystal, use a torch and open it up (it isn't really very valuable anyway). If the crystal is low, liquid oven cleaner will etch it up in frequency. If it is high, rub a little solder on a plated portion of the crystal. Keep in mind that temperature changes may do funny things to your frequency. Order the correct crystal as soon as you can.

* * *

Two different ratings are used on commercial FM equipment, continuous and intermittent. Continuous means just that, while intermittent normally means one minute of transmitting followed by four minutes of standby. Nearly all mobiles and most fixed stations are rated for intermittent service. The only exceptions that come to mind are transmitters equipped with blowers, and the newest mobile solid-state equipment.

* * *

Ever have a filter capacitor to replace, and find that the factory used the lugs for a common tie point for a dozen wires? Cut the lugs off of the old capacitor instead of unsoldering all the wires. Replace the capacitor, then lay the lugs up against the corresponding lugs on the replacement capacitor and solder the lugs together. Works okay for volume controls too, and is a lot neater than it sounds.

* * *

Ceramic trimmers used on much of the older two-way radio equipment have a tendency to "freeze" and it is possible to damage them. If one is difficult to turn, touch it with a soldering iron for a few seconds. Don't hold the iron on it too long; just warm it up.

* * *

For best performance of GE TPL receivers using the "RASER" front end, do this: After tuning for maximum limiter current, put a voltmeter on the output (audio). Then, using a signal of about 10 dB quieting, retouch the resonators for maximum quieting. The points of maximum limiter current and best quieting seldom coincide.

*****

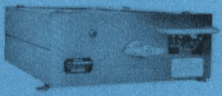
Watch out for automobiles using booster-gap type spark plugs. They seem to put more ignition noise on low voltage wiring. More filtering may be needed in the wires feeding 12 volts to your set.

450-470 mc General-Electric
Progress Line Accents
10 watts, 12 volts transistor power supply; front or rear mount. Complete accessories
Model No. EG 48S

Wide Band. . . . $178
Narrow Band. . . . $198

Same model with channel guard. . . . . $233.
EG 48CT (Trunk)   EG48CF (Front)

6 METERS F. M.
MOTOROLA X-51GGS SPECIALS VERY CLEAN!
3 frequency dual front end receiver
2 frequency transmitter
Receiver has a transistorized power supply
Transmitter uses a dynamotor.
12 volts   50 watts   wide band
in 15" cases
Units complete with cables, multi-freq. control head, speaker, microphone, control relay and fuse block $128.



450 MHz USERS

Gregory Electronics offers you a large selection of Motorola T-44 Series U.H.F. equipment.
Complete with cables, control head, speaker, microphone, control relay and fuse block.
All units are 15-18 watts in 15" cases

T-44 A - 6 or 12 volts	- vibrator supply	$48.
T-44A6- 6/12 volt	- vibrator supply	$58.
T-44A6A-6/12 volt	- vibrator supply	$68.
T-44AAV-6/12 volt	- vibrator supply	$88.

With the conversion data in the schematic digest seen above, you can be on 432 MHz in no time!

G-E Schematic
Outline and
Interconnection
DIAGRAMS
for G-E 2-way
FM RADIOS
VOL. 1
Pre-Progress Line
(1949-55)
25-50 MHz
72-76 MHz
VOL. 2
Pre-Progress Line
(1949-55)
150-174 MHz
405-425 MHz
450-470 MHz
$4.50
each volume

General Electric
4ES14A
6/12V• 450-470MC
12-15 Watts
less accessories
$38
in lots
of 10 . . . $30

GREGORY ELECTRONICS CORP.
249 Rt. 46, Saddle Brook, N.J. 07662 Phone (201)489-9000

Number 6 on information card

mitchell on touchtone*

Touchtone is becoming ever more popular in amateur radio remote signaling applications. Touchtone dials manufactured by Western Electric and Stromberg Carlson have already been seen on the surplus market. These range from the 10- to 12- and even 16-button touchtone dials used in military and computer application.

Two tones are generated when a digit button is depressed. The output tones pass over the same leads as the supply voltage, similar to the way transistor microphones work. The dial can be connected to the input of many transmitters using carbon mike input. Sometimes the supply voltage drops under load, but minor changes will permit their use directly into the transmitter. Supply voltage can be around 6-12 volts across the dial.

The block diagram of the tone receiver shown in Fig. 1 is simplified from those used by military, computer, and telephone application. Amateur radio application is not as critical. Much of the limiting takes place in the FM transmitter and receiver. Codes can be arranged so that not all tones will be needed. In this case, the tone receiver can be simplified. Part values such as relay and transistor types are unavailable, but this is no big problem since scrounging is a normal process and types may not be critical. UTC type VIC inductors are ideal since they are tunable; 88 mHz toroids may also be used by selecting proper values for capacitors.

* Gene Mitchell K3DSM

Instead of the output relays for the tone receiver, solid state AND gates may be used. The logic is shown in Fig. 2.

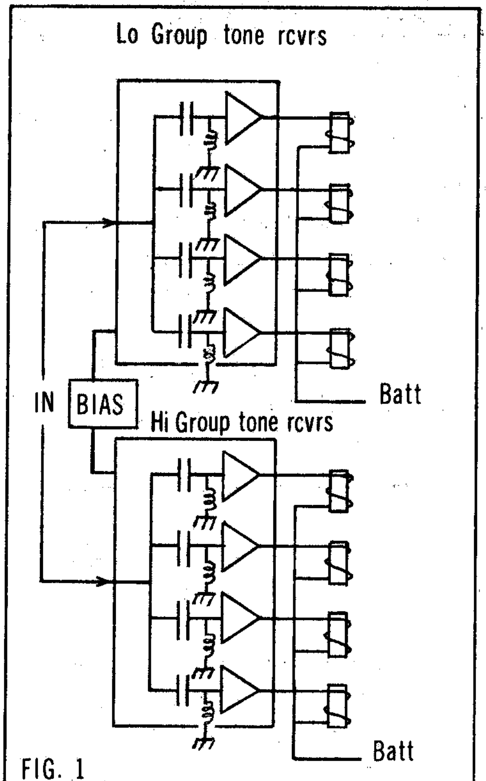


FIG. 1

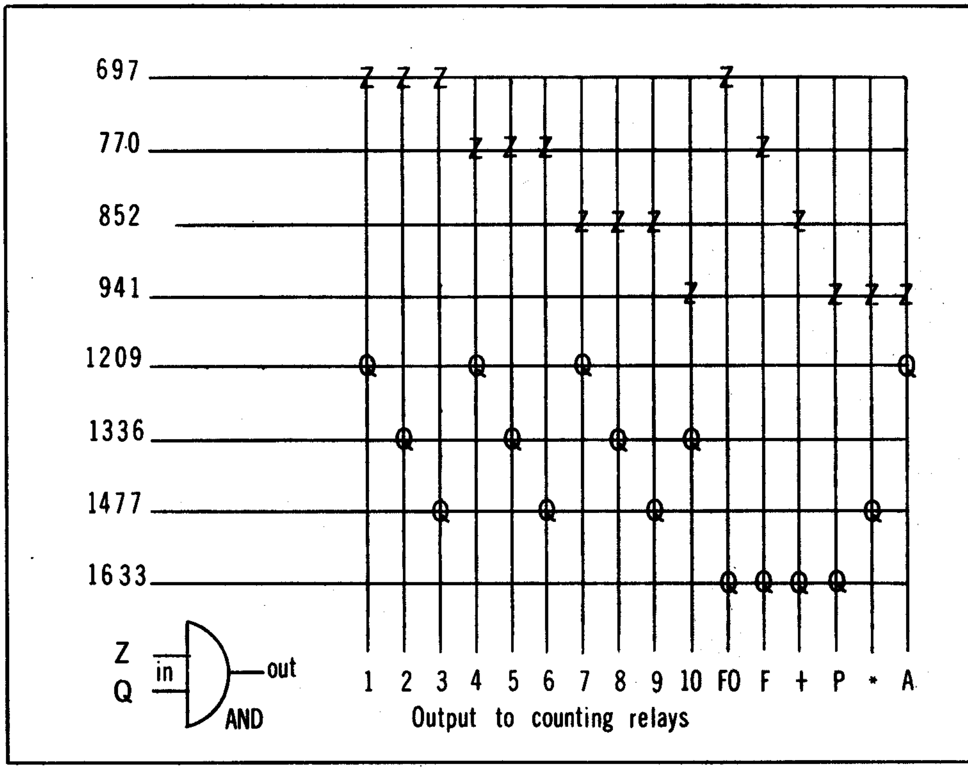
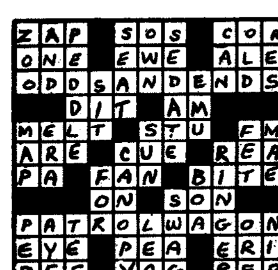


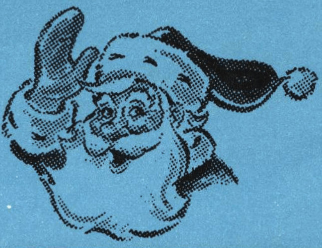
FIG. 2 SOLID-STATE LOGIC CIRCUIT

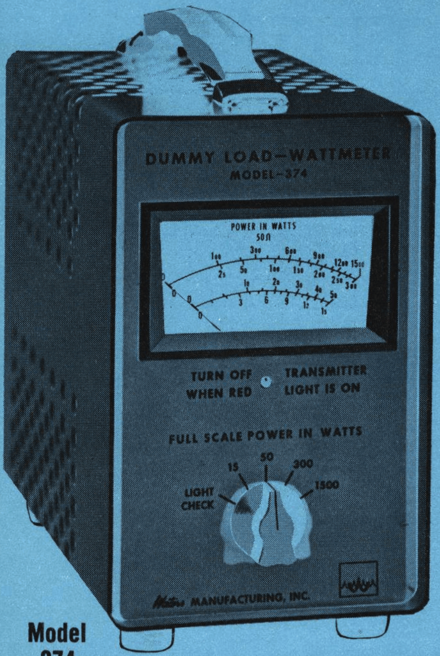
"I told you that rig of yours was used in a coal mine."

LAST MONTH'S PUZZLER:



For a ham's happier Christmas...!

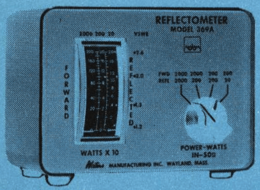




Model 374 $145.00

DUMMY LOAD/WATTMETER

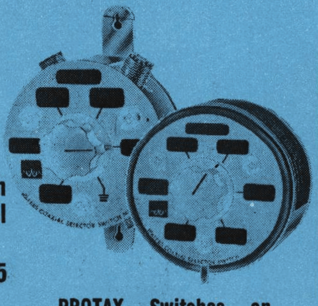
Waters '374' Dummy Load/Wattmeter will help him maintain his modern 2 KW (PEP) rig at peak efficiency. Registers power output to 1500 watts over a frequency range of 2 to 30 MHz. Its four calibrated scales (0-15; 0-50; 0-300; 0-1500) permit accurate readings to ± 5%. Load impedance: 52 ohms. VSWR: 1.3:1. Weight: 12 lbs.



Model 369A $127.50

REFLECTOMETER

Measures both forward and reflected power (VSWR) simultaneously on unique double meter. Covers 3.5 to 30 MHz at 52 ohms on two separately set forward scales of 200 and 2000 watts (20 and 200 reflected) to insure accurate reading. Comes complete with directional coupler.



Model 375
6 - position with rear axial connecttors
$13.95

Model 376
5 - position with side radial connectors
$12.50

PROTAX Switches operate through 150 MHz

PROTAX™ ANTENNA SWITCHES with Automatic Grounding

Waters PROTAX™ Coaxial Antenna Switches automatically ground the entire antenna system when the shack is shut down. Readily handles 1000 watts and comes complete with knob and escutcheon plate with erasable marking panels. (Model 376 has mounting bracket.)

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Circle number **5** on Reader Service Card.

HYBRID COUPLING IN REMOTE TELEPHONES

The requirements of phone patches depend on the application: remote or local—

Autopatch circuit shows simplicity of interconnection.

Connecting a phone patch into a remote system so that the telephone can be answered or used for initiating dialed calls can present some interesting problems because of the circuit parameters of the phone patch itself. But before the effects of these characteristics can be understood, it is necessary to have a basic understanding of the workings of a conventional telephone.

A telephone line typically consists of three wires. One of these is a floating ground, and need not be considered with respect to the actual circuit. The remaining two wires (L_1 and L_2) carry all signals for both ringing and communication.

When the telephone rests on its cradle, the line (L_1 and L_2) is essentially an open circuit; at least its impedance is high enough to appear open. When the phone rings, a fairly high ac voltage is developed across the open lines. The high voltage ac is coupled to the bell inside the telephone instrument as long as the handset is in place. When the handset is lifted, however, an electrical short is placed across the line (in the form of an inductor). As long as a dc circuit exists between L_1 and L_2, the telephone will be "off the hook," but if the circuit is broken for any length of time, a "hang-up" will occur. If it is broken at rapid intervals, the act of "dialing" takes place.

Thus, for ringing, L_1 and L_2 must be isolated; and for communicating, they must be shorted (with a 600-ohm inductance).

As it happens, typical phone patches offer an isolated L_1-L_2 pair internally. The manufacturers of these patches have designed the units for use by individuals who will physically remove the handset from its cradle. If the L_1-L_2 pair were not internally isolated, amateurs would be unable to leave the patch in the phone circuit.

When a phone patch is used in remote radio applications, it <u>cannot</u> have an internal isolated pair. If it did, the telephone would go right on ringing after the answering circuit has been energized. A remote patch <u>can</u>, however, have a dc internal L_1-L_2 pair. The reason for this is that the phone patch is not a part of the telephone circuit <u>until</u> the remote operator sends the "phone on" command. Therefore, the isolated L_1-L_2 pair of the phone line is used for ringing when the "phone on" circuit is not energized. At energization, the phone patch can be used to "short" the line.

Here is where the selection of the right patch is important. Many of the less expensive units contain a pair of series transformers separated by a capacitor. Shorting of the capacitor may provide the dc path from L_1 to L_2, but if the transformer windings present a mismatch, serious gain loss can result.

Three commercial patching units were tested for optimum performance in the author's remote telephone system: the Monarch, the Johnson, and the Waters Universal Hybrid Coupler. The Monarch exhibited a gain-loss characteristic to such an extent that no amount of control manipulation could remedy it. The Johnson patch exhibited a moderate gain loss, but not so bad it couldn't be tolerated. The audio null in the Johnson phone patch was also not quite what one could consider optimum, either, although it was by no means unacceptable. Good transformers in a good phone patch design should give sufficient null so that receive audio does not get fed back into the transmitter through the phone patch coupling circuitry. This is doubly important where the repeater already couples receive audio to the transmitter. Interconnection of the hybrid patch should have minimal effect on overall system audio. Insufficient null greatly increases normal repeater audio output without commensurately increasing the incoming audio from the telephone to the transmitter.

The Waters Universal Hybrid Coupler performed the best (which was to be expected, since it is the most expensive of the three). The Waters unit provided several bonus features, too, that proved very beneficial for autopatch operation.

First, getting a proper dc continuity on the Waters unit was simplified because the coupler contains an internal 600-ohm transformer across the line (for making tape recordings). Figure 1 illustrates this portion of the circuit.

As can be seen from the schematic, a dc circuit in the Waters coupler can be obtained by merely lifting the top leg of the transformer primary winding (yellow lead) and moving it to the other side of the capacitor.

Another bonus feature of the Waters coupler is its built-in compressor-amplifier, which tends to normalize all telephone signals to a constant value. The repeater transmitter is thus supplied with a uniform level of audio from the coupler, regardless of the audio characteristics of a particular telephone circuit.

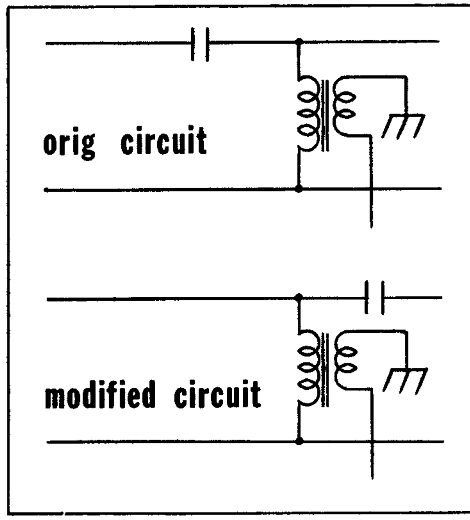


FIG. 1 WATERS coupler and Autopatch mod.

But the most noteworthy aspect of the Waters coupler is its null capability. In the autopatch installation in which the coupler was used, sufficient null was achieved so that repeater audio remained the same whether the phone patch was in the circuit or not, and the audio from the phone line could be set to the same level as the incoming receiver audio. Reports from parties on the landline end of the phone patch proved that no significant differences existed between the automatic patch and a conventional telephone connection.

A simplified version of the circuit in which the phone patches were tested is shown in Fig. 2. That portion of the circuit above the horizontal broken line is the "ring" circuitry. When the ac "ring" voltage appears on the phone line, it is rectified and used to key a sensitive plate relay (5-8K ohms). When the ring relay pulls in it keys the transmitter push-to-talk and triggers a simple audio oscillator connected to the

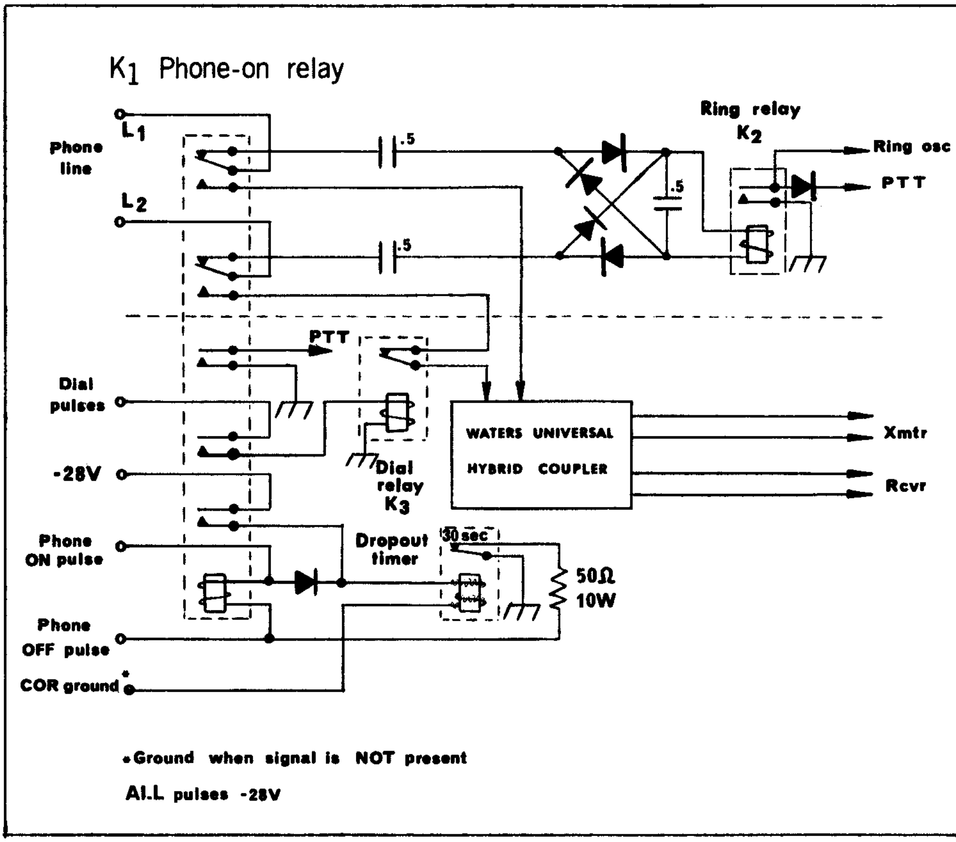


FIG. 2 Simple Autopatch Circuit.

transmitter mike line. The diode is used to keep the push-to-talk circuit from energizing the oscillator each time the carrier-operated relay is keyed.

When the phone rings, or when the remote operator wishes to place a call, he transmits a signal that will give him a low-voltage negative pulse from his own control circuit, which pulls in and latches the "phone-on" relay. (The 50V diode keeps the "on" pulse from being overworked.)

The phone-on relay accomplishes the task of lifting the receiver from the hook, and couples the L_1-L_2 line into the dc circuit of the patch. Dialing, then, is simply a matter of rapidly opening and closing the dc circuit, which is done by pulsing the dialer relay with low voltage signals from the repeater's control system tone decoder.

In the circuit pictured, hang-up is achieved by merely releasing the phone-on relay. This can be accomplished both actively and passively. For active shutdown, low-voltage negative pulse from the control system will place a voltage on the ground side of the phone-on relay which is of the same polarity as the opposite coil terminal. The 25-ohm resistor accepts the load during the pulse and the relay is released. Passive shutdown is done with a 30-second timer whose period begins the instant an input carrier disappears. When a signal comes on the repeater input frequency, the timer is defeated, and the period will begin anew when the carrier-operated relay is released.

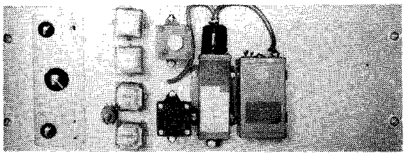
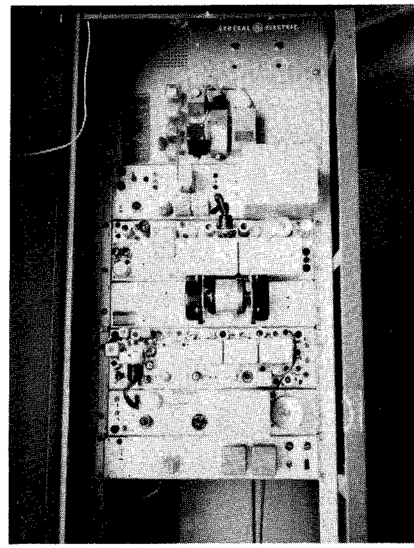
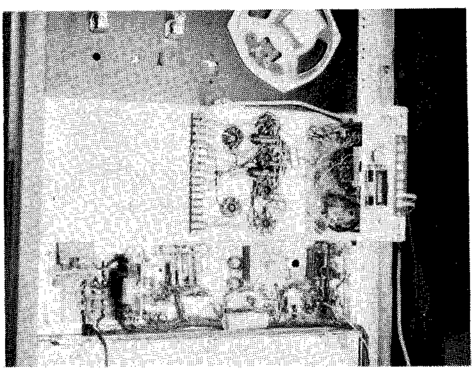


PHOTO SHOWS WATERS COUPLER (LEFT), TIMERS, AND CONTROL RELAYS. PICTURED AUTOPATCH CONTAINS ADDITIONAL ACCESS CIRCUITRY NOT SHOWN ON SCHEMATIC (FOR SUCH "EXTRAS" AS TIMED ON, TIMED OFF, COR-ENERGIZATION THROUGH ANDING, AND AUTOMATIC SHUTDOWN FOR EXCESSIVELY LONG TRANSMISSIONS).



AUTOPATCH (TOP PANEL) IN COMBINATION WITH CONVENTIONAL 450 MHz REPEATER AND A LIMITED CONTROL SYSTEM PROVIDES USERS WITH HANDIE-TALKIE AND MOBILE ACCESS TO TELEPHONE LINE.



REAR OF AUTOPATCH PANEL CONTAINS ALL WIRING AND A TERMINAL STRIP FOR INTERCONNECTING PHONE INTO REPEATER SYSTEM. THE APPARENTLY BLANK AREA ON THE LEFT SIDE OF PANEL IS ACTUALLY A CIRCUIT DIAGRAM OF THE AUTOPATCH SUBSYSTEM.

An automatic phone patch can be as simple or as complex as the designer wants it to be -- and the only difference is the ease of access. The performance of the system, however, is dependent almost entirely on the selection of a suitable audio coupler. A good generalization, then, would be to advocate skimping in everything but the audio coupling unit--but here, if you're going to buy, by all means, buy the best!

December 2-way City

SAN FRANCISCO
EVERYBODY'S FAVORITE CITY

If you're going to the VTG Conference, take note: A good way to see a lot of San Francisco in a short time is to take the 49-mile scenic drive which begins at city hall, the most dominant feature of civic center with its French Renaissance style and 300-foot dome. Other buildings include civic auditorium, Brooks Hall convention site, the State building, Veterans' War Memorial and Opera House, the federal office building, public library, health center, and the San Francisco museum of art in the Veterans' Building.

From the central area the route turns on Grant Avenue and runs through Chinatown. Next comes the north beach of "Little Italy," where the city's largest minority make their homes.

A stop at Telegraph Hill is right on the way. The drive then passes on through the Marina and on to the Presidio, a 1,542-acre military reservation, giving views of North Bay and the Golden Gate.

It passes to the northwestern cliffs and beaches of the Pacific and by Cliff House, the modern seaview restaurant that overlooks Seal Rocks.

Just up the hill is Sutro Heights Park. Three miles down the beach is the Fleishhacker Zoo and pool, the largest in the world.

Next stop is Chinatown, then the Golden Gate Park. At this favorite tourists' spot can be found the De Young Museum, the Conservatory, Japanese Tea Garden, Museum of Natural History, Steinhart Aquarium, Morrison Planetarium, and Stowe Lake.

From Twin Peaks there's an excellent view of the city, and continuing on past the United States Mint to Mission Dolores, a religious shrine, the drive passes McLaren Park.

The tour returns to town by the Bayshore Freeway, going under the San Francisco-Oakland Bay Bridge to the old Ferry Building with the 235-foot clock tower. Embarcadero, where great passenger liners and import ships from all parts of the world arrive and leave, is next, followed by Fisherman's Wharf.

Union Square appears and the drive ends at Market Street.

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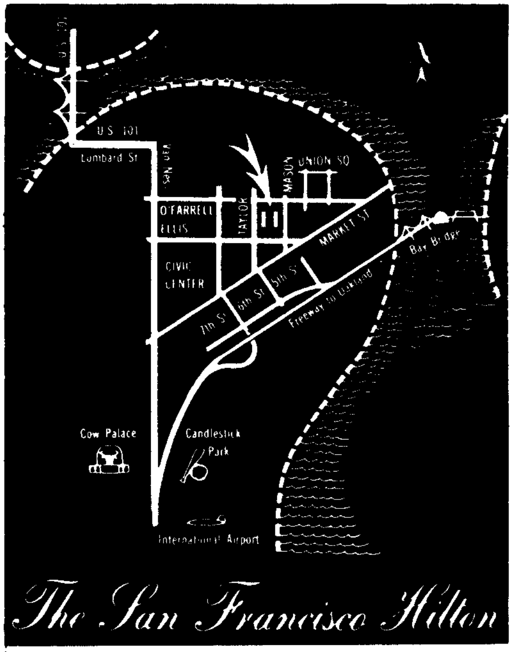
All papers will be printed and bound into a conference record and a copy issued to each conferee.

Coffee Breaks...

Tuesday Morning and Afternoon and Wednesday Morning, for one-half hour, coffee will be served in the exhibitors' area. You are invited to the exhibits of your choice.



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CHECKS:

Make Checks payable to "1968 VTG Conference." Advance Registrations to be discounted, must be received prior to November 18, 1968.

HOTEL:

Send Hotel Registration card separately to Hilton Hotel.

Attend the 19th Annual IEEE 1968 VTG Conference. It will be devoted to everyone interested in mobile communications, personnel or pedestrian communications, automotive electronic or electronic engineering, mobile supervisory and data transmission.

We hope you will participate with speakers and even debate where necessary to provide a rewarding exchange of information. There will be more than 20 top-line exhibitors. Also, the ladies will find exciting shopping tours, sightseeing tours and colorful activities, which we feel will enhance their stay.

With personal regards, we hope you plan to attend.

R. H. Moore
Conference Chairman

IEEE
1968 VTG CONFERENCE
Hilton Hotel — San Francisco

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	LUNCHEON	☐ $ 6.50
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(SEE OTHER SIDE)

Highlights of the VTG Conference

For the benefit of the technical minded individual who needs a little more prodding before making the decision to attend San Francisco's VTG Conference at the Hilton Hotel, FM Magazine presents this preview of the fascinating program:

TUESDAY MORNING, DECEMBER 3, 1968

8:30 - 9:00 am

OPENING ADDRESS

Mr. R. H. Moore, Conference Chairman
Department of Communications
City of San Jose, California

9:00 - 12:00 noon

SESSION I — DIGITAL TRANSMISSION TECHNIQUES AND VEHICLE LOCATION METHODS.

Chairman: Mr. R. J. Evans
Michigan State Police

1:30 - 5:00 pm

SESSION II — LAND MOBILE CHANNEL UTILIZATION AND MARITIME MOBILE COMMUNICATION.

Chairman: Mr. Walter Darnell
Bell Telephone Company of Pennsylvania

WEDNESDAY MORNING, DECEMBER 4, 1968

8:30 - 12:00 noon

SESSION III — ELECTRONIC DESIGN

Chairman: Mr. William Elder
American Trucking Association

2.00 - 4:30 pm

SESSION IV — ELECTRONIC PROPULSION AND VEHICLE GUIDANCE.

Chairman: Mr. Klaus Haase
County of Los Angeles

LETTERS

Sirs:

Your FM Magazine is doing a great job in many areas, but it distresses me to see the editorials and answers to letters become no more than an attention-getting device by picking at ARRL a la CQ and 73. There is not a thing wrong with having a difference of opinion with ARRL or anyone else, but be sure you have the facts straight before printing it as gospel for one and all.

One of the most popular targets for your (and others') gripes is incentive licensing. Have you really looked behind the scenes on this? When any organization is hinted to and finally told outright by its regulatory agency (FCC) that it had better improve the quality of its membership to where it is a useful service or stand to lose spectrum space at the next Geneva conference, it behooves that organization to get with it, even if it is an unpopular move to many people.

Again, in your answer to a letter on page 45 of the Sept 68 issue, you blame the editors of QST for a statement or opinion of an author. The two are not one and the same, as you should well know. An author's statements and opinions are his own, and unless they are so grossly incorrect as to be misleading should not be changed by the editors or publishers when printed. I am sure you editors would be incensed if any other publication implied editorial policy to some odd-ball statement by one of your authors.

Technically, you are going great. It is a vast improvement over the first issue I ever saw. I do not recall the date, but it had a "horse-mobile" on the cover.

Let's hear more about the 50 MHz FM activity. From the number of stations I hear on 52.525 every time there is an opening, I am sure there must be more interest than your magazine contents indicate.

Glad to see the Chronicles ended. It reminds me all too much of Citizens Band type operation, and we here in Connecticut can hear all we need of that just by listening to the childishness going on in the NYC area on several two-meter repeater frequencies. The favorite pastime seems to be to try to defeat the other guy's latest foolproof control system. Maybe it keeps the technical people on their toes, but it does nothing for those of us who want to use two-meter FM to communicate!

So when ARRL asks for help, give them some straight dope. Don't wait until they go elsewhere, then criticize because their AUTHORS do not agree with your EDITORS!

Good luck.

T. McMullen W1QVF
Collinsville, Connecticut 06022

Editors:

I have just received your renewal request for FM Magazine.

As much as I like the magazine, I have decided not to renew unless there is a change in editorial policy. I am referring to the recent unreasonable attacks upon ARRL.

As a ham my loyalty must be, first, to amateur radio as a whole. If we don't have enough unity to keep amateur radio a going concern, everything, including FM, is lost.

Whether we like it or not (I like it), ARRL is our most effective instrument for representing our interests. I happen to think it is doing a very good job -- in fact, an amazingly good job considering the tremendous number of things it must do on a very modest budget. Of course I don't agree with everything ARRL does, but neither do I agree with everything my church, my lodge, my school, my community, etc. does, either.

It seems to have become fashionable to complain about everything, but I think most of us are up to here in complaints and are getting tired of it. It is easy to complain, very hard to be constructive. Meantime, somebody has to do the hard work and I am in a mood to help rather than complain. ARRL is run by a group duly elected and anybody can work for the election of those he wishes.

I don't like everything ARRL does or everything you do or everything anybody else does. But I think we are all much further ahead to overlook petty differences and pull together in a constructive fashion. I hope you won't be tempted by the easy popularity one can get temporarily by being a militant "agginer."

Hopefully,

Ralph H. Turner W8HXC
Oberlin, Ohio

IF YOU ARE A MEMBER OF A CHURCH OR LODGE AND ARE DISSATISFIED WITH ITS GOVERNMENT, WOULD YOU (1) GRIN AND BEAR IT, (2) OFFER SUGGESTIONS FOR CHANGE, OR (3, GET OUT OF THE GROUP ?

Ken:

In the September issue of FM, I noted your very true critique of the Albuquerque repeater. The purpose of this letter is to tell you that the problem has been rectified. At that time, the unit was located on Capilla Peak, about 40 miles from Albuquerque. Unfortunately that 9300-foot site was shielded from town by a very flat-topped 9700-foot peak.

Because of that poor location, the unit was moved about 5 weeks ago to Sandia Crest, a 10,000-foot peak about 6 miles out of town. Although a better location for coverage, the Crest is plagued with RF from 4 TV stations, 3 FM broadcast stations, 4 continuously keyed mobile telephone channels, and about 100 commercial users (including the FAA and FBI). To avoid causing intermod, the repeater is operating with 15 watts out, and receiver sensitivity is set to open the COR at 1.5 μV because of received garbage (mostly from the MTS). With these limitations our coverage north extends north to Los Alamos (about 60 miles), west to Grants (60 miles) and south to Past Soccoro (over 80 miles). It talks the same range it hears. Most of this coverage has been plotted with a 2-watt hand-carry unit. Coverage has not been plotted east.

The unit is narrowband, as are all New Mexico repeaters, and it is linked to both the Alamogordo repeater (WA5KUI) and Capitan repeater (WA5DMQ).

I hope that on your next trip through New Mexico you will find the repeater system more enjoyable. I am sorry that I was not able to copy you either direct or through the repeater that morning when I told you of the poor location.

73's

Philip H. Dater, M. D.
WA5JDZ
9006 Crestwood, N. E.
Albuquerque, New Mexico 87112

Dear Editor:

Thoroughly enjoy your pub and operating on FM. This mode is certainly different--captive, yet versatile. The advent of repeaters, with their numerous advantages and possibilities, brings to amateur radio many new and exciting experiences. In one giant step, FM seems to have advanced the amateur state of the art by at least an order of magnitude.

I am continually amazed by the low cost and high performance of the equipment available for this mode of operation. Performance specifications seem to be known and available for almost all of this gear. It's certainly a relief and a satisfaction to be able to drop my mobile unit off at the local two-way service shop and pick it up later with the assurance that it's in tiptop shape and meets specifications.

The future looks very exciting: automatic phone patches with touchtone dialing, directional calling, repeater-to-repeater hookups, tone signaling, etc. The manufacturers have so many accessories available for mobile, fixed and repeater use; even our wildest dreams may come true. We might even look forward to a type-approval system for ham-band FM gear as well as ham gear for all our bands.

You are doing a wonderful job of presenting FM to the amateur world. Keep up the good work.

C. M. Shaw W4SMS
P. O. Box 1001
Ft. Walton Beach, Florida

Dear Editor:

In the Letters column, September issue, you stated something erroneous in answer to WØDKU's letter. You stated that a Pat Devlin was wrong to use a 10-minute identification of his relay, and that the FCC now requires 3-minute intervals. I am just wondering how you arrived at this information. I will quote my source of argument as printed in the ARRL License Manual, copywright 1967. Although this source might possibly be obsolete, it still is the basis for a good argument.

In the "U.S. Regulations" section, Part II, U.S. Amateur Regulations, Part 97, Subpart D -- Operating Requirements Procedures, 97.87 a, iv (page 74 in my book), it states that amateur stations shall give their call signs "at least once every 10 minutes during any transmission of more than 10 minutes duration." How, then, can you say that this has been changed to 3 minutes? Or does this just hold for "repeaters," which are illegal for amateur usage? I hope it doesn't hold for remotely operated base stations, which are only an extension of individual stations. However, if you can tell me where you received this info, I would be glad to know also. Since engineers-in-charge of the various FCC radio districts only interpret the laws as they see them, they do not set government policy. Quoting one of them might not be admissible.

I will be looking forward to your answer.

Edward H. Zumstein WB6NCO
6 Wilshire Avenue
Vallejo, California 94590

HERE IS A RECENT FCC MANDATE:

> "Enclosed is the new license for your club (repeater) station. You are reminded of the identification and logging requirements of Section 97.87 and 97.103 of the Amateur Rules. Automatic identification by means of taped voice or code wheel is permissible; such identifications should be made AT LEAST EVERY THREE MINUTES while the repeater is being used. . . " — FROM FCC MEMO TO ART GENTRY (K6MYK)

HERE IS ANOTHER:

> "Repeater identification shall be made every three minutes in accordance with Section 97.87 (a) (1) (ii) of Amateur Rules." — FROM FCC MEMO TO KEN SESSIONS (K6MVH)

Editors:

Sign me up for your FM Magazine, for 61 issues and a Sentry crystal.

Your magazine is really going great. The technical and construction data in the past four issues is worth the price of the 61 above.

The chance to try out a Sentry crystal is a nice addition; I was going to give them a try on my next crystal order. I have been using only International crystals for FM after a very costly experience with two other brands. Hope it works out o.k.; it will be nice to have a good second source of usable crystals.

Keep up the good work.

Walter Davis K6KET

Hi Ken --

The Enid repeater is operational, at the home of K5CAY at present. The boys in Tulsa have had their receiver on the TV tower operating for several days now. It does stretch their receiving range quite a bit. The Kaw Valley Amateur Radio Club in Topeka has the Topeka repeater ready to operate and they are waiting for the license. We are preparing to assist the local sheriff on Halloween as we have the last two years. I hope to get Bob Nordstrom, KØIFJ, to write it up if anything newsworthy happens. So while we hope for an uneventful night, you will get a story out of it if things bust loose.

Don Chase WØDKU
4543 South Elizabeth
Wichita, Kansas 67217

Editor:

Should repeaters talk .34 to .94, or .34 to .76, or maybe .94 to .34; the controversy goes on and on! Machines on .34 to .94 clobber simplex activity on .94, while simplex activity clobbers the .94 to .34 rigs and the .34 to .76 units are bothered by out-of-towners keying up on .34 and monitoring .94.

Be it good, bad, or indifferent, the .34 to .94 combination seems to have become pretty standard, so it seems logical not to use .34 except as an input to .94 rigs. Repeaters talking out on .76 could use, say .14 for their talk-in.

For a system to please everybody, how about a repeater on its own frequencies, say .14 to .76, tied in with a .94 base station. Signals on either .14 or .94 would key the .76 transmitter, with .14 having priority. Any signal on .14 would key up on .76 and, if it was accompanied by a tone burst or PL code, would also key up on .94.

The repeater boys could communicate through the machine without bothering anybody, monitor .94 between transmissions, and, by use of the tone, work simplex stations on .94. In fact, with this arrangement you could even use .34 for the talk-in, since you'd be able to talk to .34/.94 visitors.

Due to the frequency spacing this system would make separate sites for the transmitters and receivers almost mandatory, but if you're looking for top notch performance two sites is probably the most practical way to go in any amateur repeater.

I don't know of any systems set up this way at present, but it sounds like a fairly good idea. If you give it a try let me know how it works out.

J. A. (Murf) Murphy
K5ZBA/9
Lisle, Ill.

NEW PRODUCT –

To be available soon from K-N Electronics in a new solid state audio compression amplifier. The unit, designed to be used at the microphone input of FM or SSB transmitters, offers a high compression ratio and wide frequency response. The compressor may also be used with Public Address systems, tape recorders, etc.

For further information, watch for future advertising of this product in **FM** or write to:

K-N Electronics, 107 Moorewood Avenue, Avon Lake, Ohio 44012, or check number 19 on Reader Service Card.

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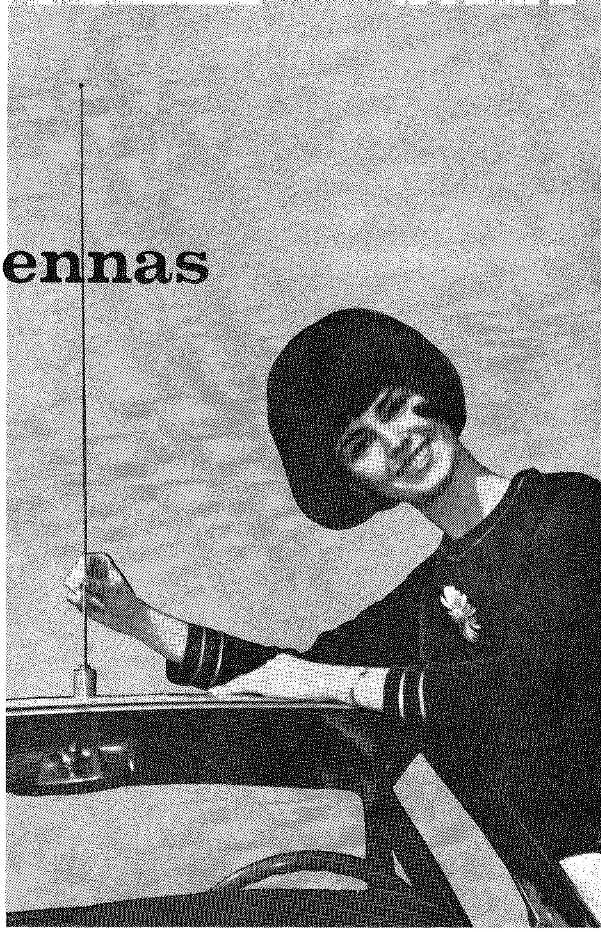

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FOR SALE....Motorola Permakay Filters #TFN 6013AW Wide Band Filters for Motrac 450 MHz receivers $4.00 ea. Art Housholder 1774 Farwell, Des Plaines, ILL. 60018 Phone 827-3433

WANTED....Will pay reasonable amount fcr manual and schematic for Rayethon Model 21TR-11-A- 6 volt DC. Will copy and return. W. J. Hinkle, Box 88 Amsterdam, NY 12010

Wanted..Manual and/or schematic wanted for Raytheon 21TR-11-A & Ferris 18B sig. gen. Joel S. Look, Box 25, Claremount, NH 03743

WANTED...One 60 watt Transistor Power supply for GE Progress Hi-Band FMT/C, State Condition. Wm Ratliff, North 3rd St., New Freedom PA 17349

FOR SALE OR TRADE.....Model 19 Teletype machine with 60 wpm gears, communications type palets and all accessories. Wanted..... G.E. Progress Line 2 meter base. Contact: Richard Zach 33 Pike Place, RFD 4, Mahopac, NY 10541

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WANTED...Wiring diagram for a Motorola Twinn V-T-51GAD low-band 60 watt. Will pay for postage and for photo copies of complete wiring diagram; or would like to borrow the manual long enough for copying. Fred Specie 1150 South Ohio, Columbus, OH 43204

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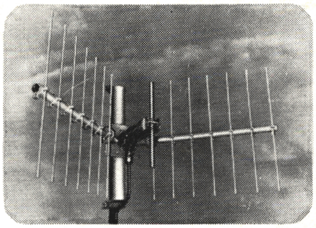

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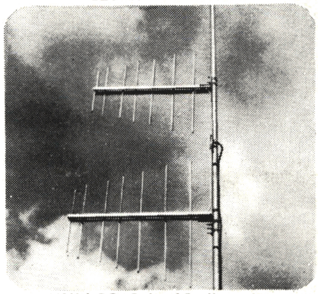

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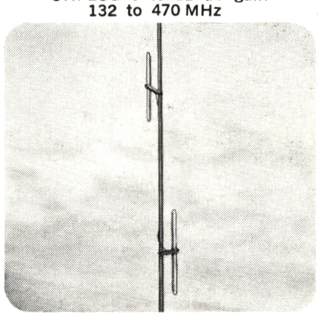

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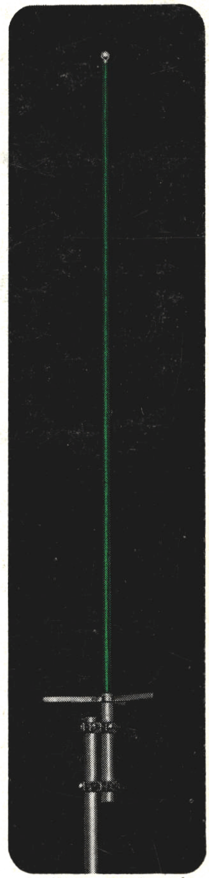

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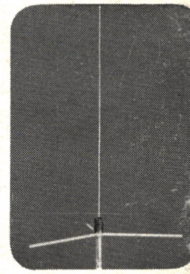

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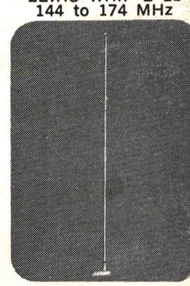

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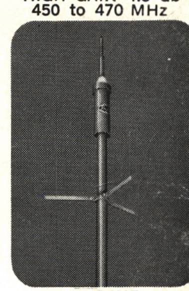

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