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October, 1951
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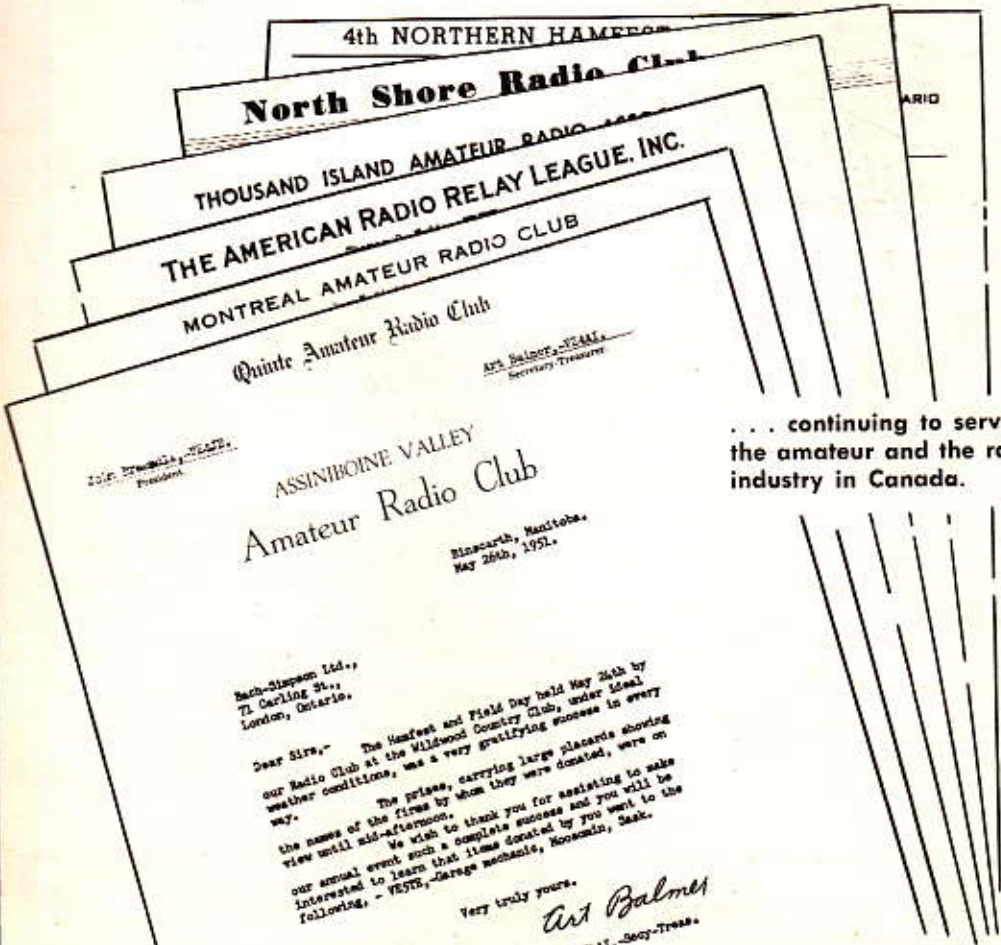

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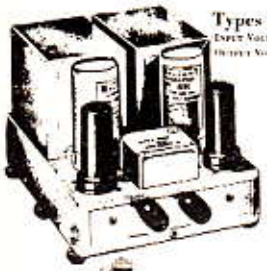

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Table Of Contents

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October, 1951

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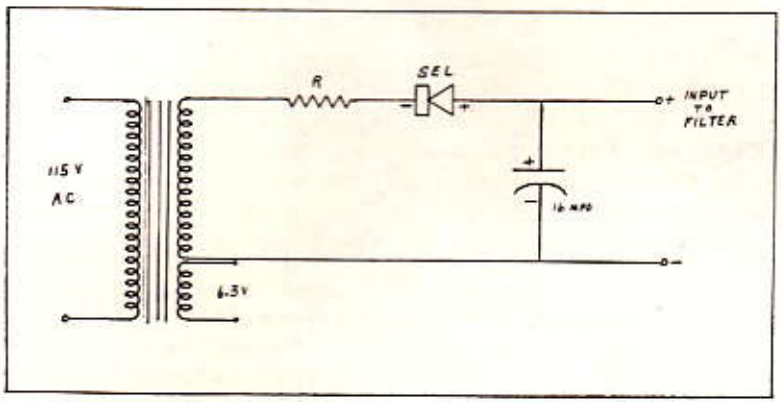

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SIDEBANDS

From the A.R.R.L. Communications Department a few days ago, came a very interesting disclosure on ham radio.

Many Canadian hams associated with the trade know that there isn't enough of some radio commodities in the U.S. to go around in as large quantities as could be desired. Somewhat critical shortages of metals such as copper, chrome, nickel, tungsten and even good grades of steel have slowed civilian production noticeably.

Military production is very much on the upgrade, which accounts for the smaller allocations of critical materials being allowed by the National Production Authority. And each quarter, these very allocations shrink a little more. There are ways of stretching what is doled out, and manufacturers haven't lost any time putting such ideas into practice.

But what turned up in the Hartford news was that an NPA order is expected soon by the Federal Civil Defense Administration and the Industry Advisory Committee of the Electronics Parts and Component Distributors. This order will give priority Defense Order ratings to American amateurs for replacement and other parts in needed Civil Defense equipment uses. It is expected that the order will authorize purchase of hard-to-get materials for all licensed hams of $100.00 a year. And for those hams active in Recognized Operating nets, this figure will be doubled. These amounts will make available some of the harder-to-find controlled items - those not normally available from a local store.

If you're wondering why this action is the subject of this column, remember how many U.S. items we use in our own rigs. And you'll recognize then, that there may be need for a sinilar regulation in Canada in the months ahead.

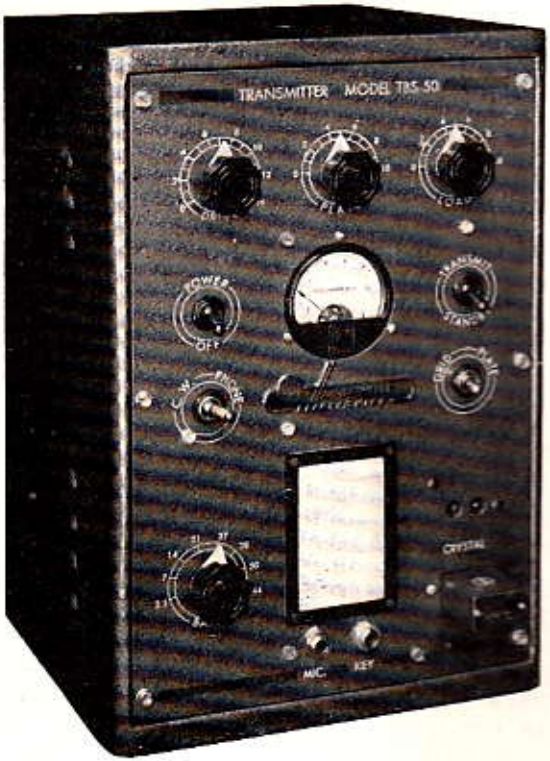
Undoubtedly our authorities would take similar action when the need becomes apparent because of the high esteem in which we are held in official circles. And high though that now is, it could be even higher, if more hams took an active part in the many nets operating here today. Don't expect the other man to do it all. There's a place for you, a position you'll enjoy filling.

Now that we are getting back into the better Fall operating season, give some serious consideration to getting in on one of the networks operating in your neck of the woods. Such an activity is not going to take a great deal of your free time - you can participate without becoming embroiled - and you will get some experience that may be highly useful at some future date.

Another way in which you can be of service is to install a mobile rig. There are more of these being heard on the bands every day, and their usefullness in any kind of crisis that might develop is undisputed. Mobiles can be on trouble spots while other organizations are deciding what to do first.

There's going to be another great advantage to mobile operation with the expected ratification by the United States and Canada, of the treaty which will permit operation by licensed hams in either or both countries.

Get busy on it now, while weather is nice enough for installation in the car - and find out from your nearest EC what you can do on the nets. You'll be happy you did!!!



Versatility Plus

CLIFFORD A. HARVEY, W1RF
Harvey Wells Electronics, Inc., Southbridge, Mass.

Gear trains, gang tuning, and a departure from rack and panel construction are almost certain to stop most home builders of transmitting equipment. But when hams with commercial facilities get together and apply their combined ingenuity, good use is made of all the mechanical aids possible. The result is a small but unusually versatile phone and c-w transmitter that covers eight bands.

Front view shows the neat grouping of controls and the compact housing.

FLEXIBILITY CONTINUES to be the keynote of post-war commercial transmitters. Amateurs are much more frequency conscious, due perhaps to the better understanding of propagation characteristics of the various bands, and also to the fact that there is now extensive operation on all the ham bands through 2 meters. The complete amateur station should be able to work from 80 to 144 mc.

The answer to the problem of what a ham rig should contain seemed to resolve itself into a medium-power transmitter that would have wide frequency coverage, could be used at home with an a-c pack, or mobile with a dynamotor, and could serve adequately as a driver for any of the modern power amplifier tubes popularly employed.

By producing an all-band transmitter in a package small enough to fit comfortably beside the communications receiver, the space problem is of no consequence. Since up to 50 watts is available on all but the highest frequencies, where power is far less a factor because of high-gain beams, satisfactory communications can be carried on using this rig alone. And the 807 will always be usable as a driver, avoiding the problem of obsolescence when going QRO.

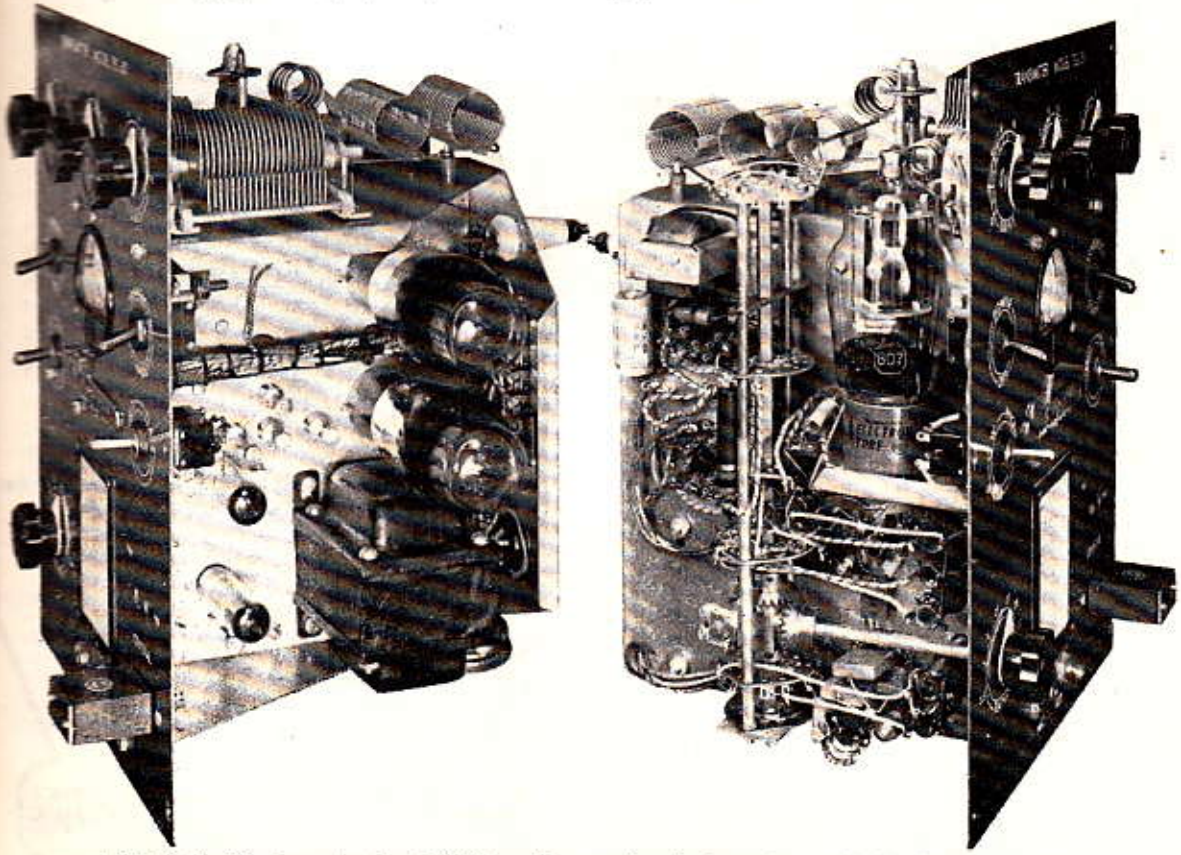
Whenever the problem of a new transmitter design comes up, one of the first questions is, "What tubes shall it use?" This is broken down into tubes for the excitation stages, tubes for the final stage, and tubes for the modulators. As the final amplifier tube will determine almost completely, or at least decidedly influence the decision on all remaining parts of the transmitter, it by itself is most important. It was decided to use the tried and true 807 in the final socket. It is an inexpensive tube and it has a reasonably high plate dissipation allowing inputs of 50 watts up to 60 mc. Being a beam power tube, it has very low driving requirements. It is also capable of some output on frequencies as high as 150 mc. For the driver stages, it was decided to use a 6AQ5 as a crystal oscillator in a harmonic generating circuit and a second 6AQ5 as a frequency multiplier. These tubes have recently been rated for amateur use as transmitting tubes, are small and compact, and operate well on high frequencies because of the small lead inductance and the absence of any base. Because of the low driving requirements of the 807 and the relatively high output of the 6AQ5, the use of broadly resonant plate circuits in the 6AQ5 tubes are extremely practical.

In an experimental breadboard layout, this tube line-up was tried out, together with broadly resonant tank circuits in the plate leads of both 6AQ5s. These were found to perform very well, and if an excitation control was used to set the 807 grid excitation, it was found possible to secure more than sufficient excitation for the 807 for 40 watts input on all bands from 3.5 through 29.7 mc without any retuning, assuming the broadly resonant tanks initially tuned to the center of the band. The 807 was found to work equally well on the 50-54 mc band except that here efficiencies start to fall off and the broadly resonant tank allows sufficient 807 grid current over only about half the band without retuning. This same situation holds on the 144-148 mc band where the 807 was also able to put out a smaller but adequate amount of power as a doubler.

These experiments show that no tuning is required up to the plate circuit of the final over any of the more popular bands; merely set the switch for the band desired and plug in the proper crystal.

With the input to the 807 established at about 40 watts, the choice of modulators becomes easy—a pair of 6L6s operating in Class AB_1. These can be driven directly by a single-button carbon microphone through a microphone transformer having the proper step-up ratio.

Preliminary circuits are aligned at the approximate center frequencies. Starting with the highest frequency band, the 6AQ5 oscillator uses an 8.1-mc crystal, tripling in the plate circuit to 24.3 mc. The plate inductance is adjusted with a brass slug and tunes to 24.3 mc with the distributed capacities of the tubes and circuit. The 6AQ5 multiplier triples the frequency again to 72.9 mc and is adjusted to this frequency. Note that the 6AQ5 multiplier plate inductance is in the circuit at all times; this is a must in order that the coil can begin at the plate terminal of the socket and be bypassed with short leads at the B+ end, otherwise too much inductance will be in the leads, and the 72-mc output will be negligible.



Left: Right side view showing 6AQ5 oscillator and multiplier tubes and 6L6G modulators.
Right: Left side view showing 807 final amplifier, band switch assembly and final tank coils.

The 807 acts as doubler to 146 mc. It is very inefficient under these conditions, but does produce a watt or two of r.f., which at that frequency is sufficient for a good signal. The 146-mc tank is also in the circuit at all times and is series tuned by the same tank condenser which parallel tunes all the other coils. The 146-mc tank also acts as a parasitic choke on the lower frequency. A separate antenna terminal is provided for this band which does not affect the other bands except for a slight amount of additional circuit capacity.

On the next lower frequency band, operation becomes more conventional. A 5.7-mc crystal is used and the first 6AQ5 triples to 17.1 mc. The same coil is used with sufficient additional capacity connected by the bandswitch to raise the frequency from 24.3 to 17.1 mc. The multiplier plate tank inductance is added to L10 and tuned to 51.2 mc., so that the 807 becomes a straight amplifier with L14 in its plate circuit parallel tuned. As we progress to lower frequencies, the operation is much the same. The power output with 400 volts on the 807 is about 20 watts on 54 mc and 25 watts on 3.5 mc.

A switch actuated by the bandswitch is used to cut in additional resistance in the oscillator plate and screen lead to prevent driving the multiplier too hard on the lower frequencies. Full voltage is thus available to the oscillator on the two highest frequency bands.

An antenna coupling method of the simplified pi type is used in the 807 plate. The capacities and inductances are proportioned so that the transmitter can be loaded into any non-reactive load of 50 to 500 ohms on any frequency. On the lowest two bands an external variable condenser may be inserted from antenna to ground if required for low resistance loads.

One meter is switched to read grid current or cathode current of the final and supplies all information necessary to properly tune and load the transmitter.

A PHONE-C.W. switch allows quick selection of the type of emission. In the c-w position, the modulation winding is shorted, the short is removed from the key jack, and the voltage removed from the modulation screen and plates.

Two terminal strips are provided at the rear allowing many variations of operation. A power supply voltage of 400 volts for the final and modulators has been selected as the normal value, and 300 volts for the oscillator and multiplier. The plate power requirements are about 250 ma at either 300 or 400 volts.

On the 144-148 mc band, because the efficiency of the final is so low, it is not advisable to run much more than 300 volts. For this voltage, which of course can be used on any band, no dropping resistor for the 6AQ5s is needed.

This transmitter makes an excellent exciter for a higher power stage. It will drive a pair of 4-125A or similar tubes to a kilowatt input, or a triode like the 811 or 75TL to 200-300 watts input. The 6L6 modulators can also be used as Class B drivers and there is a 15-ohm output winding provided for feeding a line to grid transformer.

Two front panel toggle switches are provided which may be connected in any desired way. The POWER ON switch may be connected in series with the primary of an a-c pack to light the heaters, or in series with the heaters directly if a battery is used. The standby switch may similarly be used in any convenient way to turn off the B supply while receiving. A 3-circuit microphone jack is used with the control lead brought out so that the transmitter may be arranged for press-to-talk operation.

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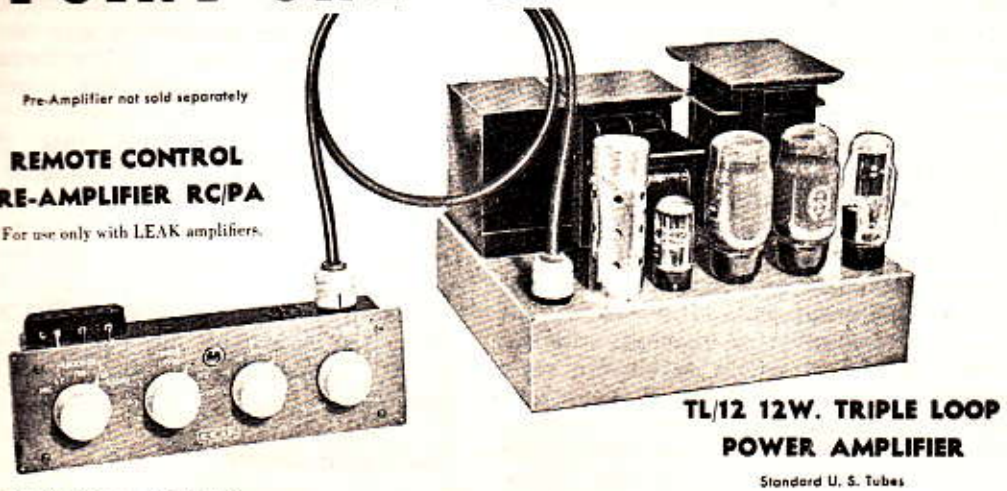

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- Sensitivity: 160 mV.
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  Output impedances: 2ω: 7-9ω: 15-20ω: 28-36ω.
  Phase margin 20° ± 10°: Gain margin 10 db + 6 db.

25 W. model available.

The Leak triple loop feedback circuit (the main loop giving 26 db feedback over 3 stages and the output transformer) results in the following major advantage:

In the TL/12 amplifier the hum and noise levels fall within −80 db and −72 db relative to 10 watts. This amount of power, as hum and noise, is inaudible from the most efficient loudspeakers. Notice particularly that feedback is taken from the low side of the output transformer. Many circuits show it as taken from the anode side, which will result in higher hum levels than without feedback.

In this amplifier, due to magnitude of feedback, there can be no rise of voltage to cause "boom" in the loudspeaker at the frequency of bass resonance, and the capability of a loudspeaker to reproduce transients, especially low-frequency transients, is astonishingly improved.

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SUPER MODULATION

Some Notes on the System

By **D. ABBOTT**

The principle of "Super Modulation" is being more and more discussed on both sides of the Atlantic. Fundamentally, it enables a high level of modulation to be obtained with reasonable output but low audio power ; this is one of the factors that make Super Modulation an attractive proposition from the amateur point of view.—Editor.

WITH any normal method of amplitude modulation the average power used when modulating 100 per cent. is one-and-a-half times as much as that used in the unmodulated condition. For this reason it is impossible, whatever system is used, to get "something for nothing". The additional power must come either from the modulator in the form of audio, or from the HT unit which supplies the power amplifier.

The four usual methods of modulation are effected by altering, at audio frequency, the voltage which exists on the control grid, the screen grid, the suppressor grid or on the anode. The last of these methods, which is the best, is unfortunately much the most expensive.

For the past 18 months, the writer has been carrying out experiments with various systems which fall under the heading of what is now colloquially called "Super Modulation". Attention was at first directed to the methods of Doherty, Terman and Woodyard. Fig. 1 shows a simplified circuit diagram of one of Doherty's methods. The general principle is that V1, which is called the carrier valve, supplies the unmodulated carrier, and V2, known as the peak valve, supplies about half of the positive peak of the modulation cycle and also during this part of the cycle lowers the anode load of V1, thereby enabling V1 to supply the other half of the positive modulation.

During the negative half of the audio cycle V2 is idle and contributes nothing while V1 is controlled by the modulated RF grid drive.

The operation of the circuit is involved and will not be given in full in this article. For any reader who is interested enough to wish to try out this system, it can be pointed out that L3 acts as a quarter-wave transformer and introduces a $\pi/2$ phase shift between the anodes of V1 and V2, hence the necessity of the phase shift network in the grid circuits. V1 is biased to cut-off and V2 is biased so that it just draws no anode current with unmodulated drive. It is not possible to give component values as these depend on the frequency to be used. The data below Fig. 1 will enable them to be worked out, however.

It will be appreciated that changing frequency from one amateur band to another will, unless extensive alterations are made in component values, result in different phase relationships between V1 and V2, thereby upsetting the whole system. Although this type of circuit is capable of excellent results on one spot frequency, for the reasons just mentioned it seems of little use to the average amateur.

The Taylor System

In all "Super Modulation" systems the procedure is the same, in as much as they employ a carrier valve and a peak valve. Various methods have been advocated for changing the power on the peak valve. The best known is that due to Taylor, which has received some publicity in the U.S.A. When the Taylor system is used on frequencies such as 14 and 28 mc it has the disadvantage that the two valves are in parallel.

In the method to be described, although the valves cannot accurately be said to run in push-pull as they work asymmetrically, the advantage is that their inter-electrode capacities are in series across the tuned circuits.

Fig. 2 shows a normal push-pull power amplifier using two 807 valves running at about 100 watts. It must be emphasised that when employing 807's there is a danger of parasitic oscillations occurring, and for this reason it is recommended that the circuit of Fig. 2 be wired up first and thoroughly tested out for any instability before proceeding

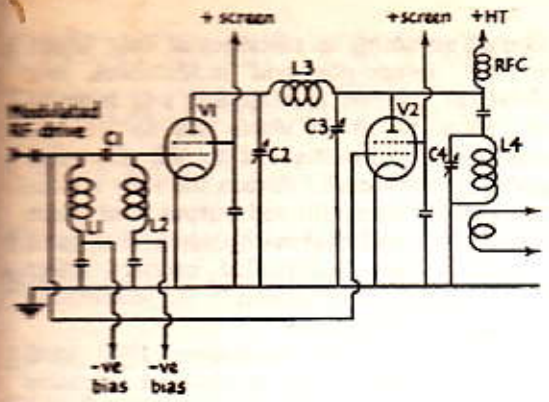


Fig. 1. If the effective load of L4, C4 with aerial connected is Rl ohms, then $\omega L3 = 2R$; $1/\omega C2 = 2R$; and $1/\omega C3 = 2R$. If the grid input resistance of V1 is Rg ohms, then $\omega L1 = Rg$; $\omega L2 = Rg$; and $1/\omega C1 = Rg$. There should be no mutual inductance between L1 and L2.

further. The usual screening precautions should be taken including metal "collars" placed round the lower parts of the 807's. The use of spilt-stator grid and anode condensers and the symmetrical placing of components is essential. The anti-parasitic chokes may consist of 20 turns of 30-gauge enamel on 100-ohm ½-watt resistors. The particular lay-out will, of course, control the self-inductance and capacity of the wiring, and a slight change in the APC's may be necessary.

Complete stability must be obtained without any neutralising being used as when the circuit is modified for "Super" modulation the valves do not work symmetrically and any form of neutralising will be rendered ineffective.

The Modifications

Having got the normal PA working absolutely satisfactorily the necessary alterations should be made to convert the circuit to that of Fig. 3. To start with, condenser C6 should be omitted and the modulation transformer secondary impedance adjusted to work into an impedance of about 15,000 ohms. With a grid drive of 6mA, and using a dummy load in place of the aerial, the HT should be switched on and the anode tuning condenser rapidly tuned to resonance by watching for a dip in the reading of the milliammeter in the cathode of V1, which is the carrier valve. The coupling to the load should then be varied until V1 draws about 75 mA. It will be noticed that V2 takes very little current due to the fact that its screen is at earth potential.

If audio power is now supplied from the modulator, the cathode current of V1 will fall slightly, but that of V2 will increase considerably. It will be very convenient if the RF output can be checked on an oscilloscope. If sufficient audio is applied the modulation will expand the envelope satisfactorily but it is improbable that a perfect trapezoidal pattern will be obtained. The condenser C6 should now be connected in circuit and the variable resistor R5 adjusted for the best wave form.

If an oscilloscope is not available a phone monitor may be used. It should be borne in mind, however, that with this system, too much audio or an incorrect adjustment of R5 can cause serious overmodulation and distortion. For this reason an early check-up with an obliging local amateur should be carried out.

Only a comparatively few watts of audio are required and a 6N7 valve run in Class-B with zero bias and about 275 volts HT would make a suitable final valve in the modulator. Although it is not intended to give a detailed description of a possible modulator, the writer (using a transverse current microphone) employed a 6SJ7-6J5-6N7 line-up quite satisfactorily. For other microphones giving less output another stage of voltage amplification might be needed.

It will be realised that the load on the modulator over an audio cycle varies considerably and for this reason a fixed bleeder resistor, if placed across the modulation transformer secondary, will improve the speech quality slightly. This resistor should be 5-watt rating and values from 20,000 to 50,000 ohms may be tried. Altering this

Table of Values

Fig. 2. Push-pull 807 PA Circuit for Modification

C1, C4 = 50 + 50 μμF
C2, C3 = 0·001 μF
R1, R2 = 100 ohms
APC = Anti-parasitic chokes (*see text*)
RFC = RF choke 2½ mHy
M1 = 0-10 mA
M2, M3 = 0-100 mA
V1, V2 = 807

resistor will of course change the impedance into which the modulation transformer "looks" and it will be necessary to vary the ratio of the latter.

As different makes of 807 valves differ somewhat in their characteristics a further slight improvement in the speech quality may be effected by altering the 50,000-ohm resistor in the screen of V1 a little. Incorporating a speech clipper in the modulator would enable a high level of modulation to be maintained without the risk of going "over the top."

Some Results

Having described this method of modulation a few facts on its performance will be of interest. It will be noticed that the quiescent carrier power is only about 50 watts and a few of the QRO fraternity may look askance.

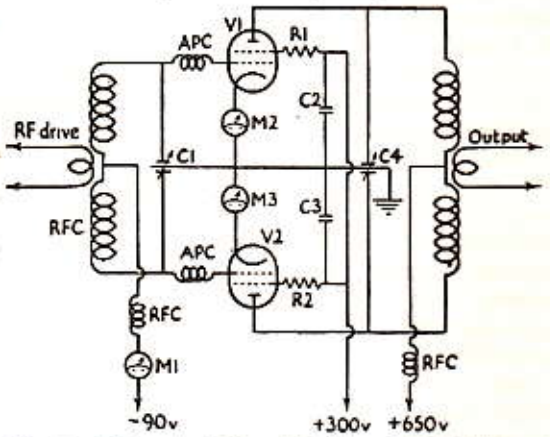


Fig. 2. Basic circuit to which Super Modulation can be applied by the modifications shown in Fig. 3. As explained in the article it is better to get this circuit working correctly before attempting the modifications—and the anti-parasitic chokes APC are essential.

However, it must be remembered that the difference, at a distant receiver, between 50 watts and 100 watts is only half an S-point.

Consider now what happens when modulation is applied. When using that 100 watts to a normal pair of 807's anode modulated with say 50 watts of audio and assuming an RF efficiency of 75 per cent., the aerial power will increase from 75 to 112½ watts when 100 per cent. modulation is taking place. In fact, the power being used to convey intelligence is 37½ watts. With "Super Modulation" however, assuming an efficiency of only 60 per cent. for screen-plus-grid modulation, our RF power on full modulation will increase from 30 watts to 45 watts due to V1 and from zero to 35 watts due to V2. In other words, the difference between the fully modulated and the unmodulated output is as much as 50 watts—and that with only a few watts of audio. This "controlled carrier" effect will be found most effective in minimising heterodyne interference.

During the period September 1949 until March 1950, the writer carried out extensive tests with two transmitters. The circuit just described was used in one and a normal anode-plus-screen modulated arrangement in the other. Although the quiescent carrier of the second was just double that of the first it was found that the transmitter using "Super Modulation" was nearly always considered easier to read by the distant station.

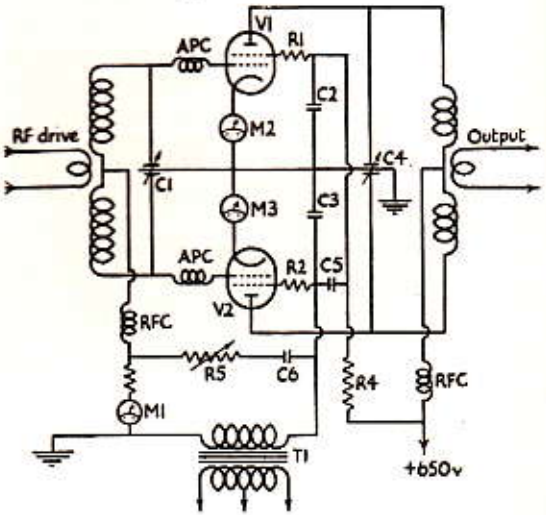


Fig. 3. Circuit modified for Super Modulation

C1, C4 = As Fig. 2
C2, C3 = As Fig. 2
C5 = 2 μF
C6 = 0·1 μF
R1, R2 = As Fig. 2
R3 = 20,000 ohms
R4 = 50,000 ohms
R5 = 20,000 ohms variable
RFC = As Fig. 2
APC = *see text*
T1 = Modulation transformer
M1, M2, M3 = As Fig. 2
V1, V2 = As Fig. 2

CHOICE OF CRYSTAL FREQUENCY IN VHF CONVERTERS

Elimination of Spurious Beats in the IF Range

By **G. B. MOSS**

One of the disadvantages of using a crystal-controlled oscillator in a VHF converter is the appearance of unwanted beat notes in the tuned IF range. This article suggests how the trouble can be largely overcome by proper choice of fundamental crystal frequency.—Editor.

THE opinion of leading VHF workers in this country appears to be as equally divided on the relative merits of crystal-controlled as opposed to self-excited oscillators in two-metre converters, as does that of their American counterparts upon the vexed question as to which form of polarisation they shall adopt in the design of their beam systems. Fortunately, in this country we have agreement on that. The writer, having deliberated the converter problem for some time, finally settled for the crystal-controlled type, using a Squier oscillator and dual-triode multiplier for the injection frequency

Now, it is not the present intention to add further fuel to the controversy as to which type is best, but to attempt to exonerate the crystal-controlled type from blame which can fairly be levelled at it under certain circumstances—namely, that of producing spurious beats from strong local signals. The writer is aware of at least two other cases in which this trouble is experienced.

The effect was tolerated until a DX contact was spoilt by spurious S5/6 signal wiping out the desired station. This, combined with the fact that more locals were coming on to two metres, and all improving their signals—better beams and so on, until spurious signals could be heard from at least five locals—convinced the writer that something had better be done, and quickly.

A quick check one evening using the 8 mc CO in the transmitter and the AR88 alone showed that the main receiver was beyond suspicion. The 8 mc signal was arranged to give an S9-plus signal and the image could only be detected with the BFO in

It was then noted that strong local stations produced spurious signals at various difference frequencies, and, not (as at first had been thought) by a fixed difference frequency. Stations low in frequency in the band produced spurious responses higher up, and in one case a signal well up in the band produced a lower frequency beat.

At this point it should be explained that an IF of 7·5 to 9·5 mc was in use as the means of covering 144 to 146 mc, and that the converter crystal had been carefully ground in order to measure received signals with reasonable accuracy. The injection frequency to the mixer was on the low side of the signal frequency and was therefore 136·5 mc.

Procedure

The next step was to log the frequencies of as many local stations as possible, with their spurious beats produced by the converter, and to record them for reference purposes.

TABLE 1

17·0625 mc
34·1250 mc
51·1875 mc
68·25 mc
85·3125 mc
102·375 mc
119·4375 mc
136·5 mc
153·5625 mc

Turning attention next to the crystal oscillator and its various harmonics, it becomes necessary to enumerate them to discover which may have any adverse effect. Remembering that the Squier oscillator was in use, and that it oscillates only at the third overtone of the fundamental crystal frequency, we have the harmonics shown in Table 1 all

present in varying degrees in the injection coil, when the fundamental crystal frequency is 5687·5 kc.

Those harmonics still higher in frequency need not be considered in this instance.

Clearly, any oscillator harmonic which beats with a signal in the band 144-146 mc to produce a difference frequency falling in the chosen variable IF range is going to cause trouble. In the case under discussion the 153·5625 mc harmonic will do so, and in Table 3 are set out some local signal frequencies showing calculated spurious response frequencies appearing at the points shown on the main receiver.

After preparing this table it was found that the calculated spurious responses agreed very closely with those previously logged. Apparently, the relatively small amount of RF produced at 153 mc was sufficient injection voltage to the mixer to produce in some cases unwanted signals of S5 to 6 !

Solution

It was decided that the most satisfactory solution lay in choosing a higher crystal frequency and so spacing the harmonics farther apart. Desiring to retain the same IF of approximately 8-10 mc, and so using an injection frequency of 136 mc, the next step is to 68 mc, then dividing by three twice from 22·66 mc to a fundamental of 7,555·5 kc. The harmonics are then as in Table 2.

TABLE 2

22·666 mc	
	45·333 mc
68·0 mc	
	90·666 mc
	113·333 mc
136·0 mc	
	158·666 mc

The 113 mc harmonic would produce an IF of approximately 31 mc, and the 158 mc harmonic an IF of about 14 mc with a signal frequency of 144 mc, and so should prove satisfactory.

It is possible that the 45 mc harmonic might cause TVI in the London area, but if the shielding is reasonably good and all power leads by-passed, it may not be troublesome. In any case no circuit is actually tuned to this frequency. The frequencies in bold type are those to which the various stages are tuned. The alternative is to use a crystal of the order of 5 or 6 mc with a different IF, working through the process as described until a frequency is found which clears the local TV channel and is free from spurious effects.

It was now necessary to prove whether the difficulty had been overcome and so a rapid search was made in the crystal box and one of 7,650 kc disclosed. This worked out to an inconvenient IF of approximately 6·4 to 8·4 mc, but was close enough to use without having to resort to major modifications. Surprisingly enough it oscillated correctly, in the original circuit by merely adjusting the oscillator trimmer. The multiplier stages were then lined up with the aid of the station "gimmick." In a matter of minutes the locals were again S9 plus—albeit on a different IF. And there were *no spurious signals.*

Although the process of deciding on a crystal frequency may appear somewhat laborious, it is not so in practice once the fundamentals have been grasped, and after a few false starts it becomes simplicity itself—especially where a pet IF range is in mind. If the slight disadvantage of tuning backwards on the main receiver dial is no trouble to some, then, of course, an injection frequency on the high side of the signal may be used which widens the scope of choice still more.

It should not be overlooked that the Squier circuit does not oscillate at *exactly* three times the marked crystal frequency, unless the crystal used is specifically calibrated for overtone use. This is because the mode of operation differs and the final injection frequency can be expected to be some 50 kc lower in frequency than calculated. This is of little consequence in such receivers as the one where a band set and a band spread dial are used, but in other receivers which have a main reading dial directly coupled to a logging dial, notably the AR88, it can prove annoying. If no crystal grinding can be contemplated the only solution is to obtain a crystal some 2 to 3 kc higher than estimated.

VFO DRIVER

An 807 Exciter

By **R. YOUNG (G3BTP)**

The author offers a design for what is in effect a two-stage all-band transmitter, in that the exciter unit described here will give sufficient output to drive a tetrode RF amplifier to 25 watts without the use of buffer stages. This is not usually held to be good practice, but it is also true that an under-run 807 in a suitable circuit, constructed for stability, can be made to give entirely satisfactory results.—Editor.

DURING the construction of some thirty different VFO drivers, one difficulty constantly experienced was the obtaining of sufficient power from existing packs to supply the buffers and doublers necessary to get RF output on all bands up to ten metres. To overcome the necessity of building additional power packs and yet retain the most desirable features of an all-band driver, the VFO described below was projected, and the results obtained found to give every satisfaction.

It provides a variable frequency drive on all amateur bands up to and including Ten, capable of driving an 807 PA to 25 watts.

Circuit Design

The driver consists of an 807 valve in a series-tuned Colpitts circuit, output being taken from the anode circuit via choke coupling. Due to the operation of the screen at RF earth potential, and the inherent isolating properties of the grid circuit, the frequency remains substantially constant under the normal variations encountered in in a driven stage.

Plug-in coils are used in the frequency-determining circuit, allowing this to operate either in the band 1·7-2·0 mc or 7·0-7·3 mc. The series condensers in this circuit are larger than usual in order to obtain good operation at 7·0 mc, but not so large as to effect the frequency stability to any extent.

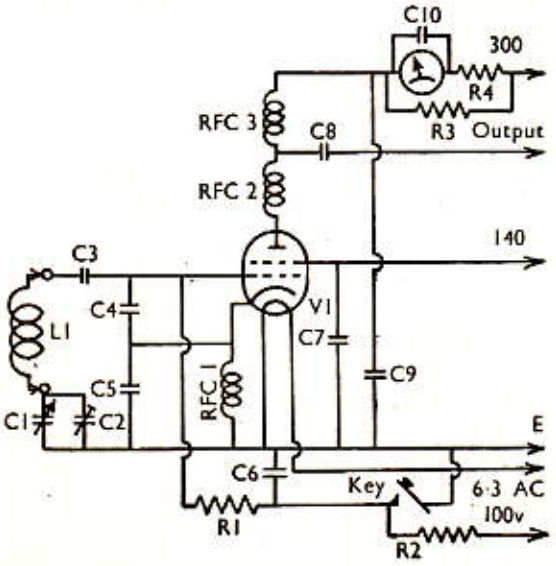
Two variable condensers are used, one to preset the frequency calibrated dial, and the other for the main tuning.

The calibrated dial is marked in 10-kc steps on the band 1·7-2·0 mc over one half, and in 20-kc steps on the band 7·0-7·3 mc on the other half, the main tuning condenser being capable of complete rotation. Direct drive is used on the frequency presetting condenser and a 4-to-1 reduction drive on the main tuning condenser.

The screen is fed from a stabilised source at 140 volts and the anode from a normally regulated power supply of 300 volts HT. Choke capacity coupling to the driven stage is used, a small parasitic stopper being included in the circuit.

Grid block keying with an over bias of 100 volts controls the operation of the VFO, together with the necessary decoupling network. Anode current is 26 mA with a voltage of 300, screen current being just under 1 mA.

(over)



Circuit of the 807 VFO driver unit described. By the use of two coils, for 1·7 and 7 mc, at L1, stable output is obtainable on all bands 1·7-28 mc to drive a following 807 to 25 watts.

Table of Values

Driver Unit Using Single 807 Oscillator

C1 = 140 $\mu\mu$F. tuning
C2 = 30 $\mu\mu$F. tuning
C3 = 200 $\mu\mu$F mica, high stability
C4 = 400 $\mu\mu$F, high stability
C5 = 500 $\mu\mu$F, high stability
C6 = 0·002 μF, paper
C7 = 0·001 μF, paper
C8 = 150 $\mu\mu$F, 600-volt wkng.
C9, C10 = 0·005 μF. mica
R1 = 27,000 ohms, 1-watt
R2 = 56,000 ohms, 1-watt
R3 = 470 ohms, ½-watt
R4 = 2,000 ohms, ½-watt
RFC1 = 2·5 mHy, pie-wound
RFC2 = 15 turns 20 DCC on 1-megohm resistor
RFC3 = As RFC1
L1 = 1·7 mc; ⅞-in. close-wound on 1½-in. form 24 DSC. 7 mc: 9½ turns 20 SWG enamelled on 1¾-in. former.
V1 = 807

Construction

The driver is built into the chassis and case of a dismantled Wilcox-Gay crystal multiplier —although any sturdy case lending itself to rigid construction would be suitable.

Existing components were used where possible, the tuning condenser and meter being retained *in situ*, but the valve holder and supports required inversion to bring the 807 anode above the chassis. Under chassis components are those associated with the screen and frequency-determining circuits, and those above the chassis with the output circuit. An exception is the plug-in coil, which is above the chassis, but no complications arose due to its position. Power is fed to the driver by the original Jones connector, which protrudes through the back of the case.

All wiring the vibration of which might cause frequency variation is carried out in 14 SWG tinned copper.

Setting Up and Operating

At the writer's station, the VFO driver is used to excite an 807 PA to 25 watts input. This PA has a tuned grid circuit capacity coupled to the driver, permitting doulbing in the PA grid circuit to obtain 3·5 mc drive from a 1·7 mc fundamental, and doubling to 14 mc or quadrupling to 28 mc from a 7·0 mc fundamental. To obtain drive at 7 mc it is usual to quadruple from 1·7 mc to keep the PA grid current to a reasonable figure.

The PA and driver are connected by 3 in. of large-diameter co-axial cable, a greater length seriously affecting the drive obtainable at 28 mc.

Results

In practice, no noticeable drift has been observed after a warm-up period of ten minutes. During this period the drift is some 300 cycles or less at 1·7 mc. No keying filters have been found necessary, the grid decoupling network being sufficient to reduce clicks to negligible proportions. The figures given in the table are representative of the drive obtained when operating an 807 PA with 80 volts fixed bias, 20,000-ohm grid resistor and choke, and 400 volts at the anode, the PA being unloaded.

To date, the only reports received, in more than five months' operation, have been T9 or T9x, with no sign of clicks or chirp on any band.

Conclusion

The construction and handling of the VFO have brought out three points not normally discussed in the considerations of VFO design. These are:

(1) That a dial of greater reduction ratio than 4-to-1 is a handicap in contest work;
(2) Buffers are not essential, providing that a power oscillator with good isolation is used, and
(3) An accurately calibrated VFO is not necessary, since the terms of an amateur licence call for an accurate independent frequency check on all transmissions.

Consequently, providing reasonable care is taken in the design and construction, a single-valve driver with moderate power drain will cover the most rigid requirements of the majority of amateur transmitters.

VFO Freq. Band	PA Grid Circuit	Grid Current	Output Freq.
1·7 mc	Choke only	2·5 mA	1·7 mc
1·7 mc	3·5 mc	5 mA	3·5 mc
1·7 mc	7 mc	2 mA	7 mc
7 mc	Choke only	1·5 mA	7 mc
7 mc	14 mc	2·5 mA	14 mc
7 mc	28 mc	1 mA	28 mc

MANUFACTURERS' CLEARANCE

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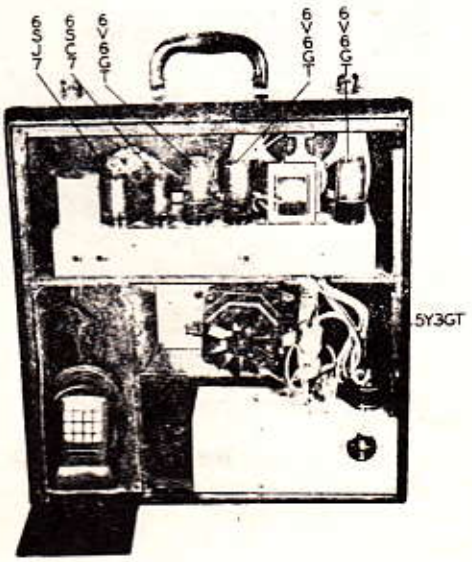

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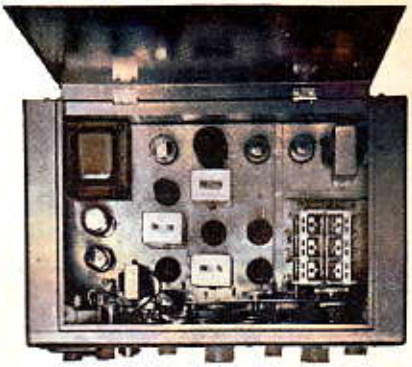

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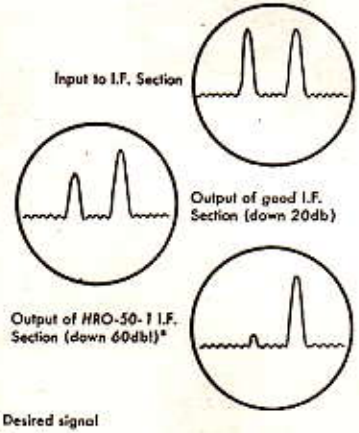

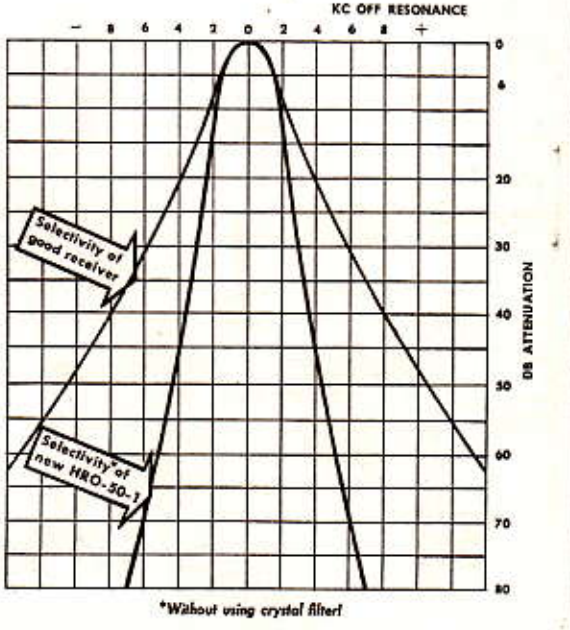

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DK-1-S*
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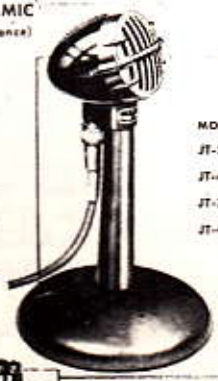

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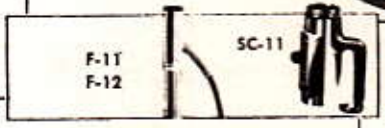

F-11
F-12
SC-11

CRYSTAL MODEL T-3
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T-3
T-3-S (With Off-On Switch)
GT-3 (With G-Stand)

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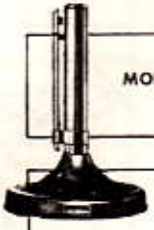

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DX PREDICTIONS

Prepared by C.B. McKee, Engineering Division CBC International Service

PREDICTIONS FOR MONTH OF OCTOBER, 1951

Skywire frequency predictions are for amateur communications on various circuits to almost any part of the world. These tables are for five major areas in Canada, and amateurs who are operating reasonably close to the cities indicated will find these predictions quite adequate.

Figures shown are in megacycles and indicate the band to be used. They are for normal F layer transmission and don't consider Sporadic E which may provide unusual DX openings!

Toronto to: EST	00	02	04	06	08	10	12	14	16	18	20	22
Europe	7	7	7	14	14	14	14	14	14	7	7	7
Africa	7	-	-	-	-	28	28	28	14	14	14	7
Caribbean	7	7	7	14	14	14	14	14	14	14	7	7
S. America	7	7	7	14	14	14	14	14	14	7	7	7
Australia	-	7	7	7	14	-	-	-	14	14	-	14
U.S. - West	14	14	14	7	14	28	28	28	28	28	28	14
U.S. - Central	7	7	7	7	14	14	14	14	14	14	14	14
U.S. - South	14	14	7	7	14	28	28	28	28	14	14	14
Vancouver	14	7	7	7	14	28	28	28	28	28	14	14
Watrous	7	7	7	7	14	14	28	28	28	14	14	14
Montreal	4	4	4	4	7	7	7	7	7	7	7	7
Sackville	7	4	4	7	14	14	14	14	14	14	7	7

Sackville to: AST	01	03	05	07	09	11	13	15	17	19	21	23
Europe	7	7	7	14	14	14	14	14	14	7	7	7
Africa	7	-	-	-	-	28	28	28	14	14	14	7
Caribbean	7	7	7	14	14	14	14	14	14	14	7	7
S. America	7	7	7	14	14	14	14	14	14	14	7	7
Australia	-	7	7	7	14	-	-	-	14	14	-	-
U.S. - West	14	14	7	7	14	28	28	28	28	28	14	14
U.S. - Central	14	14	7	7	14	28	28	28	28	28	14	14
U.S. - South	14	14	7	14	28	28	28	28	28	28	14	14
Vancouver	14	7	7	7	14	28	28	28	28	28	14	14
Watrous	14	7	7	7	14	28	28	28	28	28	14	14
Toronto	7	4	4	7	14	14	14	14	14	14	14	7
Montreal	4	4	4	7	7	14	14	14	14	7	7	7

Watrous to: MST	22	00	02	04	06	08	10	12	14	16	18	20
Europe	7	7	7	7	-	14	14	14	14	7	7	7
Africa	7	7	7	14	14	14	14	14	14	14	14	14
Caribbean	7	14	14	7	14	14	14	14	14	14	14	14
S. America	7	14	14	7	14	14	14	14	14	14	14	14
Australia	14	7	7	7	7	7	14	14	14	28	28	14
U.S. - West	7	7	7	7	14	14	14	14	14	14	14	14
U.S. - Central	7	7	7	7	14	14	14	14	14	14	14	7
U.S. - South	14	14	7	14	28	28	28	28	28	28	14	14
Vancouver	14	14	7	7	7	14	28	28	28	28	28	14
Toronto	7	7	7	7	14	14	28	28	28	14	14	14
Montreal	7	7	7	7	14	14	28	28	28	14	14	14
Sackville	14	7	7	7	14	28	28	28	28	28	14	14

Montreal to: EST	00	02	04	06	08	10	12	14	16	18	20	22
Europe	7	7	7	14	14	14	14	14	14	7	7	7
Africa	7	-	-	-	-	28	28	28	14	14	14	7
Caribbean	7	7	7	14	14	14	14	14	-	14	7	7
S. America	7	7	7	14	14	14	14	14	14	7	7	7
Australia	-	7	7	7	14	-	-	-	14	14	-	-
U.S. - West	14	14	14	7	14	28	28	28	28	28	28	14
U.S. - Central	14	7	7	7	14	14	28	28	28	14	14	14
U.S. - South	14	14	7	7	14	28	28	28	28	14	14	14
Vancouver	14	7	7	7	14	14	28	28	28	28	14	14
Watrous	7	7	7	7	14	14	28	28	28	14	14	14
Toronto	7	7	7	7	14	14	28	28	28	14	14	14
Sackville	4	4	4	7	7	14	14	14	14	7	7	7

Vancouver to: PST	21	23	01	03	05	07	09	11	13	15	17	19
Europe	7	7	7	7	-	14	14	14	14	7	7	7
Africa	7	7	7	14	14	14	14	14	14	14	14	14
Caribbean	7	14	14	7	14	14	14	14	14	14	14	14
S. America	7	14	14	14	14	14	14	14	14	14	14	7
Australia	14	7	7	7	7	7	14	14	28	28	14	14
U.S. - West	7	7	7	4	7	14	14	14	14	14	14	14
U.S. - Central	14	14	7	7	7	14	28	28	28	28	14	14
U.S. - South	14	14	14	14	14	28	28	28	28	28	28	14
Watrous	14	14	7	7	7	14	28	28	28	28	28	14
Toronto	14	7	7	7	14	28	28	28	28	28	14	14
Montreal	14	7	7	7	14	14	28	28	28	28	14	14
Sackville	14	7	7	7	14	28	28	28	28	28	14	14

HOW'S UR OBS IQ?

Official Bulletin Nr 311, Sept 20, 1951 F.C.C. has issued a public notice that amateurs who have filed operator and station license renewal applications prior to the normal expiration date may continue operating their amateur stations beyond that date pending receipt of notice of action on their applications. This privilege is called to the attention of amateurs to insure their continued participation in civil defense drills and other activities while the Commission processes a large backlog of pending applications. Amateurs should make appropriate notation in their station logs when application for renewal is filed and keep with the station records a copy of the application or a copy of the letter transmitting the application.

Official Bulletin Nr 313, Oct 4, 1951. You are cordially invited to take part in the Eighteenth A.R.R.L. Sweepstakes Contest, November 17,18,19 and 24,25,& 26. Awards will be given in each ARRL section, one to leading CW and one to leading phone entrant. Complete rules will appear in November QST. Send a postal or radiogram to A.R.R.L. Headquarters giving the call of the station from which you copied this message and you will receive gratis special Sweepstakes reporting forms.

Official Bulletin Nr 314, Oct 11, 1951. The National Production Authority has issued an order designed to keep U.S. amateur station equipment operative, and to encourage expansion in the number of amateur station participating in defense and security activities. Order M85 grants priority assistance to amateurs in obtaining controlled materials, components and equipment for maintenance and repair, for additions to existing stations, and for building new stations. An annual quota of two hundred dollars in rated orders will be granted to members of the Amateur Radio Emergency Corps, National Traffic System and National Emergency Net of the A.R.R.L., and to networks of the Radio Amateur Civil Emergency Service, M.A.R.S., Naval Reserve, Civil Air Patrol and U.S. Weather Bureau. Other amateurs will be limited to $100. of controlled items each year. Numerous equipment items of course continue to be available without recourse to the provisions of Order M85. Further information will appear in December QST.

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HAMADS

Skywire Hamads must pertain to amateur radio. Rates are 20 cents per word, per insertion for commercial advertisements for profit, and 4 cents per word for all non commercial, non-profit advertisements by experimenters or licensed radio amateurs! Full remittance MUST accompany copy! Print plainly and count address in the total. Do NOT send personal checks unless exchange is included. Mail to Skywire, Toronto!

LOOK WRL 40 watt CW-Phone transmitter as new, complete with tubes, coils. Bandswitching on 80, 40, 20, 10. Only key and crystal needed - $120.00. P.O. Box 128, VE5AY, Lancer, Sask.

TORONTO AREA HAMS - Have 12½ inch TV console - Walnut finish, Marçoni - and a hot performer in a poor signal area. This wasn't built for price war competition, but has the chassis you get good pictures from. Listed at over $400.00. Who has the best offer over $200.00 Let's talk about it. Ralph Finkle, 15 Barclay Rd, Wilson Heights.

EDDYSTONE Model 670 Marine receiver for sale. This is an AC-DC all bander covering 550 kc to 30 mc in 4 bands. Full dial with plenty of bandspread, and logging scale. Built for performance with built-in speaker. It's an FB buy at just $150.00. Write VE3WO. ALSO FOR SALE! - T-19 transmitter, 3 to 4 mcs, brand new, ready to go on 12vac filament supply - $18.00. VE3WO, 86 Invermay Ave., Wilson Heights, Ont.

COMPLETE STATION FOR SALE: The Receiver - Canadian Army R5101,- 21 tubes .55 to 18 mc with built-in xtal calibrator and S meter - RME HF-10-20 converter - Browning MJ-9 frequency meter-exciter, all bands, accuracy .05%.

Transmitter Sonar VFX 680 NBFM - AM, CW all bands. 807 driver with clamp tube, pp812 final, B&W plug in coils, all bands 375 watts, CW NBFM. Modulator includes clipper-filter, 807's Cl B - Cathode modulation 240 watts AM. Transmitter built in enclosed rack with castors and front doors that lock -to keep the kids out - well metered, good looking rig.

Station cost over $1000.00. Make offer for any item listed. May be inspected. D.A. Bamford - VE3ASC, Arnprior, Ontario.

Alert Receiver Gives Warning With the Speed of Light

Simple Instrument, Now Proposed for Use in Nation's Defense Plans, Proved Itself in 1949 Test.

DANGER of sudden attack on the United States brings to the fore the urgent need for adequate defense not only to ward off the attack itself, but to minimize loss of life and property. Of vital importance, therefore, is a system of warning that can cover wide areas with the greatest possible speed and dependability.

Radio communications provide the basis for such a system. As fleet as light, radio signals travel at 186,000 miles a second; they can carry virtually any type of information; they can be reliable to a point of perfection. The problem is to establish radio signalling networks in tactical defense areas—networks that can link civil defense control centers directly with all forces needed for immediate action when the alarm goes out.

General requirements of a suitable warning system are these: (a) that it communicate almost instantly over distances of several hundred miles at least; (b) that it be selective in reaching any one of several areas, or reach simultaneously all areas in danger; (c) that it be selective in reaching any one group in an area, or all groups in an area; (d) that it be simple and dependable; (e) that it be low in initial cost of equipment and inexpensive to maintain; (f) that it be susceptible to national standardization; (g) that it be capable of easily coordinated operation in civil defense plans.

When notice of a coming air raid reaches a Defense Control Center, it is essential that the warning be relayed at once to all proper authorities, as well as to all key defense personnel within the danger zone. These groups may include governors of states, mayors, law enforcement and fire officials, hospital and public works directors, transportation supervisors and civilian defense block wardens. The alert, to be effective, has to be complete.

Alerting Method Developed

Recognizing the need for a satisfactory civilian warning method, the Radio Corporation of America began research in this direction almost a year before the Japanese surprise assault on Pearl Harbor on December 7, 1941, alerted the Nation to the danger of sneak attacks from distant enemies.

Research had progressed to such an extent that by mid-summer, 1941, RCA staged a demonstration in which it revealed publicly for the first time the ability of the RCA Alert Receiver to serve as a means of defense warning. Participating as National Director of Civil Defense, the late Mayor F. H. LaGuardia of New York described the device as "of the greatest possible value to our national defense."

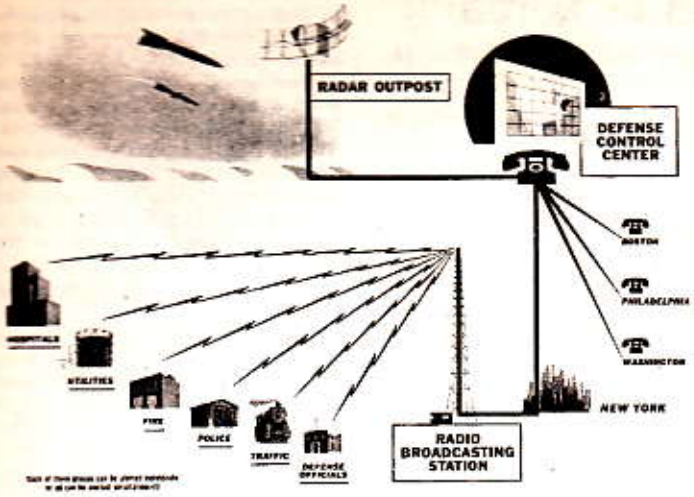
New Instrument Introduced

Brigadier General David Sarnoff, then President of RCA, briefly introduced the new instrument and discussed its usefulness with the Mayor, while a nation-wide audience, tuned into a network of the National Broadcasting Company, listened to the description of this new service to the public which had come out of RCA Laboratories.

The initial demonstration took place in the Administration Building at LaGuardia Airport. It consisted of a three-point hookup. Word that "enemy planes" had been sighted was relayed by telephone by Army officers at Mitchell Field to a Civilian Defense Officer in an NBC studio at Radio City. Immediately, this officer pressed a button that sent a robot, or sub-audible, signal riding over the station's waves. Within a second or two, the impulses turned on the Mayor's RCA Alert Receiver at the Airport. Lights glowed and a bell on the receiver rang to notify him that the

ALERTING APPARATUS AT TRANSMITTER IS COMPACT AND SIMPLE TO OPERATE.

FOUR EXPERIMENTAL MODELS OF THE RCA ALERT RECEIVER ARE SHOWN BY ARTHUR F. VAN DYCK (RIGHT) OF RCA LABORATORIES.



THIS DIAGRAM SHOWS HOW EACH DEFENSE GROUP CAN BE ALERTED INDIVIDUALLY OR ALL GROUPS IN CONCERT THROUGH THE USE OF RCA ALERT RECEIVERS INSTALLED AT STRATEGIC LOCATIONS.

network was ready from coast-to-coast to broadcast any message he might have as National Director of Civilian Defense.

With the end of the global conflict, interest in the Alert Receiver subsided. But less than four years later the "cold war" had made the international situation so critical that, once again, civilian and military forces began discussing defense plans, and the receiver made another appearance. On September 15, 1949, civil defense forces participating in "Operation Lookout" were called to action in New England by this ingenious alert method.

As more than a hundred Air National Guard pilots "raided" the East Coast from Maine to Delaware, a signal was sent from a command post of the Continental Air Command in New Hampshire to station WFEA, Manchester, N. H. There it was transmitted as an inaudible tone to station WBZ, Boston, and by that station to an RCA Alert Receiver in the air raid warning center of Montpelier, Vt. This signal, which arrived only a few seconds after its original transmission, warned the defense staff that the raid was in progress.

In an earlier stage of Operation Lookout, which was conducted under the Continental Air Command, the warning signal originated at a command post on Long Island. Passing over private wire to the transmitter of NBC's station WNBC at Port Washington, Long Island, the signal was added as an inaudible tone to the station program beams. It was received by an RCA Alert Receiver at Station WGBI, Scranton, Pa., and retransmitted to civil defense headquarters in that city.

Signal Warns Defense Staff

These demonstrations revealed the ability of the RCA alert system to work effectively over distances of several hundred miles and to provide defense authorities with the specific degree of emergency.

The RCA Alert Receiver transforms existing radio broadcasting facilities into a warning system of unsurpassed speed and scope. Through its use, entire communities, regions, or the Nation itself can be alerted within the space of a few seconds.

The instrument, about the size of a portable radio set, turns on automatically when it receives a special inaudible signal from a broadcasting station, rings a bell, turns on a red or yellow light according to the kind of alert being sent out, and a white light when the all clear signal is flashed.

The receiver is simply constructed, and its tubes require such negligible power that it can be operated twenty-four hours a day over long periods of time at low cost. It can use batteries or electric current.

The device may be fixed-tuned to any one broadcasting station. It is then receptive to the inaudible signal from that transmitter. A self-contained loudspeaker remains silent until the special signal is received.

Signal Operates Relay

When this signal arrives, it energizes an electric relay which clicks the loudspeaker into the circuit to reproduce the transmissions from the broadcasting station.

Simultaneously, the bell rings. This is to insure the summoning of the listener in the event that the alert occurs at night. The bell, if desired, may be located at a distance from the receiver, so that the listener, although in a different part of the building, will not miss the call.

Lights atop the instrument can carry the color signal denoting the type of alarm. For instance, colors that might be specified are: yellow, indicating preliminary warning of possible attack; red, indicating attack imminent, and white, announcing the all-clear.

At the transmitting station, the apparatus is very simple. It consists merely of a vacuum tube oscillator which generates the inaudible sound frequencies—one for each of the desired actions to be performed.

The signal generating unit is connected to the broadcast transmitter like a microphone. In fact the control room operator plugs the oscillator device into the microphone circuit. When a button is pressed it releases the "On" subaudible signal, which turns on all of the Alert Receivers equipped to be activated by it.

"Shoran" Used in Korea

Highly Accurate Electronic Bombing Aid of World War II Now Pin-Pointing Enemy Objectives in Far East.

SHORAN, the bomber pilot's distance-measuring "yardstick", which won distinction in the closing months of World War II as one of the most dramatic contributions of electronics to America's military strength, is being used in Korea, according to press dispatches from Fifth Air Force Headquarters.

Invented by Stuart W. Seeley, director of the Industry Service Laboratory of RCA Laboratories Division, and developed by scientists and engineers of the Radio Corporation of America as an outgrowth of the study of television "ghosts", shoran makes it unnecessary for airmen to see the target in order to make a pin-point strike. The system was used with devastating effect in "blind" bombing over European battlefields, where it was credited with uncanny accuracy in spotting targets at distances up to 250 miles, and under any condition of visibility, night or day.

Shoran, like radar, employs the echo-timing principle in which distance is measured by the elapsed time between transmission of a radio-wave pulse and the receipt of its reflection. In the military application of shoran, the bomber transmits individual signals to two widely separated ground stations whose locations in friendly territory are known with great accuracy. When the signals reach the ground stations, the pulses are retransmitted to the plane where special receivers and apparatus automatically compute the distance of the plane from each ground station. This information, together with the known distance between ground stations, determines the plane's location with respect to the target.

A Secret for Eight Years

Although RCA began work on the shoran project in 1938, it was not adapted to military use until late in World War II, when development for the Army Signal Corps was completed. Shoran remained a closely guarded military secret until 1946. First proof of its effectiveness in the last war came when shoran-aimed bombs demolished a 30-foot enemy bridge in Northern Italy which several runs by visual bombers had failed to destroy. Thereafter, it was widely used and with phenomenal results. Toward the end of the war in Europe, the amount of tactical bombing done in any area depended largely on the availability of shoran equipment.

Shoran bombing was employed not only against military targets, but with devastating effect against enemy personnel. On many occasions, rolling barrages of fragmentation bombs were laid down only a few hundred feet ahead of advancing Allied troops. Such barrages, delivered by planes completely hidden from the ground, had a tremendously demoralizing effect on opposing ground forces. Shoran is also well-suited for air support of landing operations, since planes equipped with the device can lay a barrage of aerial bombs precisely along a definite line, enabling air crews to release bombs at correct points for maximum impact along such a line.

Accuracy Shown in Field Tests

During World War II, field tests made of shoran-equipped planes during photographic reconnaissance flights showed that the probable error often was not more than 50 feet, independent of altitude distance, and without the necessity of establishing control points (known absolute positions) in the area to be photographed.

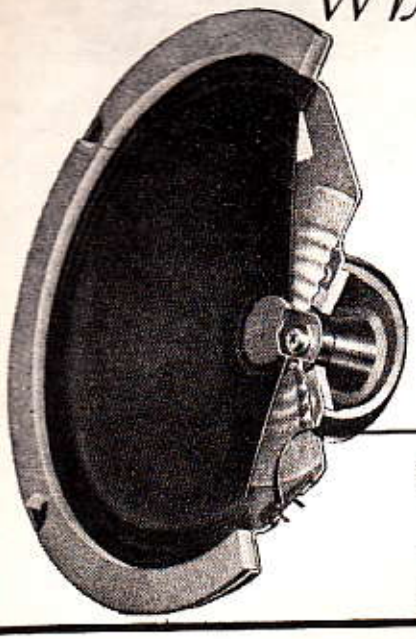
Shoran equipment, including ground stations, can be readily transported by air and set up in a few hours. Equipment in the plane requires only one operator, who may be an existing crew-member such as navigator or bombardier. Each ground station also can be operated by one man, and two ground stations can furnish shoran service to a number of equipped planes within range.

Other possible military uses of the system include shoran navigation of remotely controlled planes, and shoran position-indication for precise dropping of air-borne troops, weapons and supplies.

BRIG. GENERAL DAVID SARNOFF, CHAIRMAN OF THE BOARD, RADIO CORPORATION OF AMERICA, IS PRESENTED WITH A CITATION FOR DISTINGUISHED SERVICE TO THE AMERICAN RED CROSS BY E. ROLAND HARRIMAN, PRESIDENT OF THE RED CROSS, AS GENERAL GEORGE C. MARSHALL (CENTER), WHO RECEIVED A CERTIFICATE OF MERIT AT THE SAME PRESENTATION CEREMONIES, LOOKS ON. GENERAL SARNOFF HAS BEEN SERVING AS NATIONAL CHAIRMAN OF THE 1951 RED CROSS FUND CAMPAIGN.

R&A

What the Eye Doesn't See



. . . . the heart doesn't grieve over, or so the old tag says. But in loud-speaker design, as in other fields of engineering, virtue is mostly hidden.

A patented feature of all R. & A. Reproducers is that the voice-coil leads are in the form of beryllium copper strips moulded into the centring member and extended to a rigid terminal bracket on the chassis. This eliminates a common source of cone "break-up," and increases reliability.

Beryllium copper strips moulded into centring member.

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2 mfd	1000v	$1.25
4 mfd	1000v	$2.00
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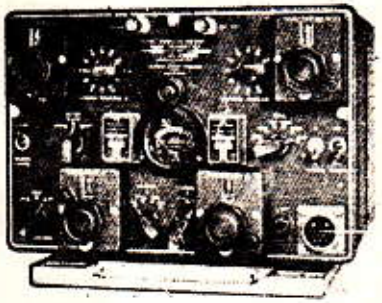

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In stock in our warehouse we have over 200 different types of terminal lugs, tinned, copper, shakeproof etcetera. A tremendous saving to you on all of the new material we have. A type for you from heavy duty AC cables to finer radio soldering lugs!!! Before you buy anywhere check your need with us and save money. We have extensive stocks of many other radio items so hard to get Write for OUR prices!

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#10353 - Copper Wire Prod 10H - 200 mils. 82 ohms - $2.00

#13238 - Copper Wire Prod 10H - 150 mils. 120 ohms - $1.75

#17935 - Jefferson Choke. 14H at 165 mils. 200 ohms - $2.00

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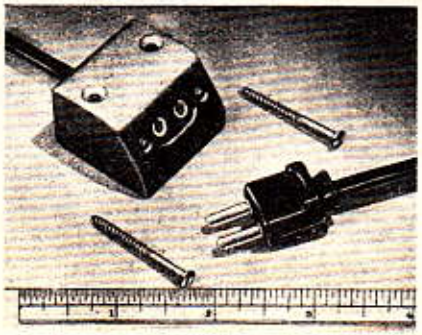
Belling and Lee New Components

THE new Belling and Lee plug, List No. 1.733/P, is specifically designed for unscreened balanced twin feeder as used with television or short wave reception. It fits the appropriate chassis mounting socket L.733/S or skirting board outlet L.739. These are shown above.

The twin feeder is loaded simply by pinching the wires in the spills provided and the ingenious black polythene moulding folds into shape where it is held together by means of the two bail headed studs.

The L.739 Outlet Box, illustrated below, is designed for use with 1.733/P plug and as a skirting board termination for unscreened balanced twin aerial feeder.



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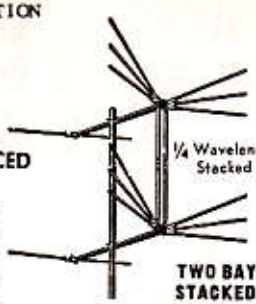

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Television Goes Abroad

Crews of RCA Technicians, Transporting Special Equipment, have Demonstrated American Television in Ten Foreign Countries.

By Richard C. Hooper

Manager,
Shows and Exhibits Department,
RCA Victor Division.

WHILE television has become a household word to Americans, it still symbolizes mystery to millions outside the United States who read about its wonders, but cannot enjoy them regularly. However, through the activities of the RCA Victor Shows and Exhibits Division, more than 9,000,000 people in 10 foreign countries have actually viewed telecasts for the first time. To carry on this missionary work, teams of technicians, acting as emissaries rather than salesmen, have traveled more than 500,000 miles to date, introducing the new medium abroad through on-the-spot demonstrations.

On the average of once a week, a Service Company demonstration crew is somewhere "on location," in this country or abroad, telecasting a parade, ship launching, religious ceremony, sports event, public affair, or surgical operation. Attired one day in hip boots and the next in tails and cummerbund, these nomadic technicians who transport RCA equipment to South America, Sweden, Italy and other far places stand apart from their desk-bound fellow workers.

The recent introduction of television in Sweden, at the internationally famous Nobel Prize Award ceremony, was a typical overseas assignment. The crew took off for Stockholm on extremely short notice, with 6,800 pounds of broadcast equipment and 56 pieces of personal luggage. Two TV field cameras; two "life-size" projectors, which give 6- by 9-foot pictures; and an array of 16- and 19-inch receivers were used to set up operations in Stockholm's Concert House.

When King Gustav VI presented the coveted awards to the world's leading physicists, chemists, medical scientists, and writers, 3,500 spectators witnessed the event, approximately half of them on RCA television sets installed outside the auditorium. In order to give complete coverage to the 2½-hour ceremony, one camera was set up in a box on the right side of the stage to obtain a picture of the presentations as seen by the audience. A second camera was mounted on a balcony at the rear of the stage to cover the entire audience.

To enable the King, his royal family, and others seated in the orchestra to observe the technical perfection with which the ceremonies were reproduced on television, a 16-inch receiver was installed at the base of the speaker's rostrum, facing the audience. Other direct-view receivers and two projection models were installed outside the main hall to accommodate the overflow crowd. Additional equipment was placed in Stockholm's Cinema Royal, which was filled to its 1,000-seat capacity.

As is often the case with foreign assignments, the crew faced a technical problem before it could proceed with the actual telecast. Sweden uses 50-cycle electric power, while RCA equipment is designed

RCA TELEVISION CAMERAS AND RECEIVERS, INSTALLED IN STOCKHOLM'S CONCERT HOUSE, BROUGHT A CLOSE-UP VIEW OF THE FAMOUS NOBEL PRIZE AWARD CEREMONY TO THOUSANDS OF EAGER SPECTATORS INSIDE AND OUTSIDE THE AUDITORIUM.

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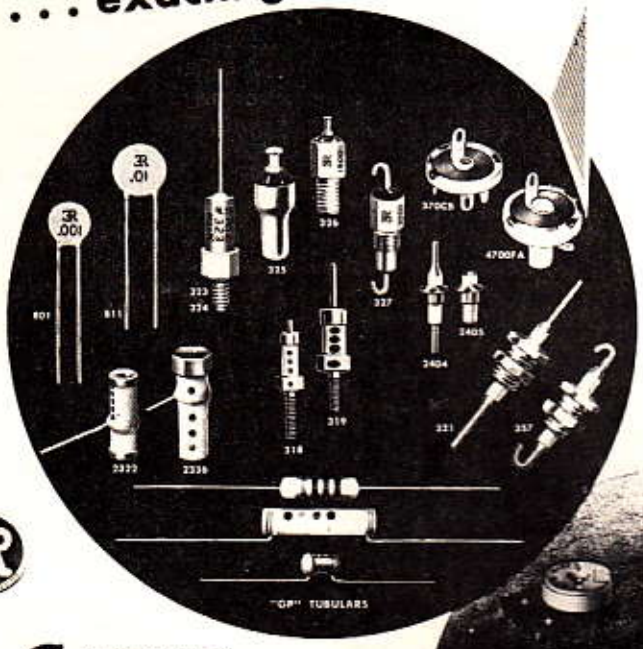

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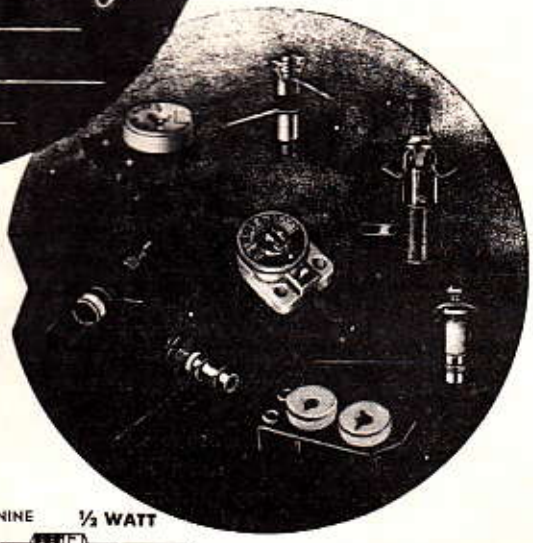

9 ERIE CERAMICON TRIMMERS

This large and versatile family of plastic and temperature compensating ceramic trimmer capacitors is the product of many years experience in design and application. Erie engineers will work with you on tuner and frequency converter problems involving high quality trimmers.

ERIE RESISTORS

Erie Types 504-B and 518-B, ½ watt and 1 watt ratings are insulated molded carbon resistors. The electrical characteristics of Erie Resistors are outstanding and they will give superior service not only in home receivers, but also in specialized communications and test equipment where requirements are more rigid.

Size: Type Nine - ½ watt - .250" X .625"
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to operate on the 60-cycle power used in the United States. As a solution to this situation, the technicians provided their own source of electricity by borrowing two gasoline-driven generators from the Swedish Navy.

Although telecasting the Nobel Awards ceremony was the group's chief task on this assignment, it was not the only one. The engineers gave King Gustav a private show in his palace; put on a demonstration for the Riksdag (legislature); televised a heart operation at the Sabbatsberg Hospital, and an abdominal surgery at Stockholm's Karolinska Hospital.

Crew Worked Long Hours

With only four hours of daylight —it was winter in Stockholm—the technicians went to bed and got up in the dark, working nearly around the clock, scarcely knowing that the sun shone, when it did. At the request of government officials, the RCA group produced several special programs, one of which covered the operation of recently-developed weapons. Another demonstrated the use of TV in the classroom as an aid in the teaching of physics, science, electronics and home economics. Before the crew embarked for home it had shown American television to approximately 25,000 residents of Stockholm.

While this RCA group was at work in "the land of the midnight sun" another crew—almost halfway around the world—was demonstrating television to several thousand government leaders, doctors and nurses gathered in Havana's General Calixto Garcia Hospital.

The Cuban demonstration was one in a series of four conducted by RCA in Latin America, in cooperation with E. R. Squibb & Company. A total of 149 pieces of equipment, weighing 8,500 pounds, was transported from Peru (the first stop) to Colombia, to the Dominican Republic, and finally to Cuba to stage the dramatic surgical telecasts.

In each demonstration, which lasted approximately two hours, the procedure was much the same. A camera was suspended directly over the operating table to pick up the operating field and the hands of the surgeon and his assistants.

RCA TELEVISION EXPERTS BOARD A PLANE FOR SWEDEN TO INTRODUCE THE NEW MEDIUM IN THAT COUNTRY.

A second camera, on a level with the doctors, gave an over-all picture of the action. Adjacent to the surgery, the crew set up a small studio in which doctors held discussions on surgical methods, patients' symptoms and case histories. Camera No. 2 was wheeled into position to cover the studio, and back to the surgery for the actual operation.

In Lima, the cameras, which were set up in the modern Hospital Obrero, covered 14 operations presented under sponsorship of the Seventh Inter-American Surgical Congress. Physicians from all parts of South America were among the audience of approximately 7,500 persons.

Surgery Televised in Bogotá

The Bogotá operations were televised in the Hospital of San Jose, and receivers were made available in a nearby medical school for approximately 6,000 spectators.

At Ciudad Trujillo, about 3,000 persons watched similar demonstrations conducted in the Professor Marion Military Hospital.

Surgery is frequently selected as the subject for such demonstrations because it dramatically illustrates that television is not merely an entertainment medium. People everywhere have heard of American comedy, drama and juvenile shows, but few are aware of television's potential as an instrument of education and public service.

When TV made its Canadian debut in 1949, technicians set up RCA cameras and receivers in the Saskatoon General Hospital, in Saskatchewan for the Medical Association's annual convention. This demonstration impressed its Canadian spectators to such a degree that RCA crews were called back on subsequent occasions to televise non-medical conventions in Toronto and Montreal.

These travelling members of the RCA Service Company are as adept at maneuvering a TV camera in a "corrida de toros", or bullring, as they are in an operating room. In fact, one of the Division's first foreign assignments was a junket to Mexico City, in 1946, to telecast a series of bullfights from the 60,000-seat Plaza Mexico. On this occasion the program was transmitted by microwave radio relay to the Hotel del Prada, six miles away, where an additional 7,500 spectators viewed the event on RCA receivers.

In the summer of 1948 RCA television cameras were focused on similar bullfights in Madrid, during a series of demonstrations conducted by RCA to acquaint the Spanish people with American television.

RECONVERTED STUDIO 8-H IN RADIO CITY HAS 300,000 CUBIC FEET OF SPACE AND CAN ACCOMMODATE SIX TELEVISION CAMERAS IN OPERATION.

Famous Studio Rebuilt for TV

NBC has Invested over $1,000,000 in Converting 8-H into the World's Most Modern and Best Equipped Television Studio.

THE National Broadcasting Company's renowned Radio City Studio 8-H, caught up in the sweep of the times, has had its face lifted for television.

Representing an investment of over $1,000,000, 8-H has been reconverted into the most modern, the most versatile and the largest television studio in the world.

A swarm of engineers, production men, technicians, and workmen in a little over three and a half months have descended on 8-H, ripped it apart from wall to wall and converted it into a glistening TV studio which can do more things than any other studio in the country.

Studio 8-H now looks out on the coaxial cables with a spanking new facade, including:

1. The most modern and most extensive lighting system in the world, incorporating all the lighting requirements ever needed in any other studio;

2. A platform or "island" hanging from the ceiling from which lights and television cameras will operate;

3. Six television cameras operating on the floor;

4. Three control rooms — the most modern and most workable control rooms ever built for a television operation;

5. A completely-equipped stage for theatre-type presentations, using no elevation;

6. A stage which can be completely "struck" in an hour and a half to make the whole studio available for dramatic presentations;

7. Fifteen separate dressing rooms;

8. The most modern make-up room in television;

9. An over-all size of 300,000 cubic feet, making it the largest single unit of television studio production space in the country;

10. A series of new special-effects, especially constructed for this studio;

11. The largest rear projection screen ever used in television.

From the standpoint of lighting, no studio of any kind has ever been so completely nor so extensively equipped as 8-H. The lighting system incorporates everything ever needed in any television studio, whether for a stage or dramatic-type presentation. Each lighting unit can be adjusted at any height from five to 27 feet.

Remote-Control Light System

The ceiling of 8-H is literally paved with lights. More than 1,000 individual lamps, ranging in wattage from 100 to 5,000, have been installed in 8-H and every individual light is remotely controllable from the control room. Such a system has never been used before in any kind of studio.

The control rooms, the most modern and workable in television, also are located on the ninth floor. They comprise a lighting control room where the dimmers and circuits are housed; a video control room, and the audio control room. The latter two are separated by a glass curtain which can be opened or closed, depending upon whether the two rooms are to be connected or separated for any individual show.

To afford every modern convenience the producer, director and technical director will sit in the video control room, supplied with eight viewing monitors.

The directorial staff will face nine monitors, including one for each of the six cameras, one preview monitor, one on-the-air monitor and a ninth for possible outside or film transmissions.

Most Modern TV Control Room

The audio control room also is the most modern in TV. Located there are one master console and three sub-masters for intricate controlling and switching of microphone booms, microphones and other audio effects. Each of the secondary consoles is equipped with red, white and green lights to indicate to the engineer the control which has been switched on.

An innovation which is part of 8-H is the placement of a camera just off the ceiling. The special platform or "island" suspended from the studio's ceiling will support spotlights and special lighting effects for stage-type presentations. In addition, a television camera will be stationed there for high shots and other trick effects which directors may specify.

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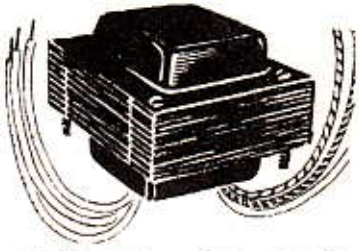

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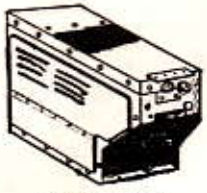

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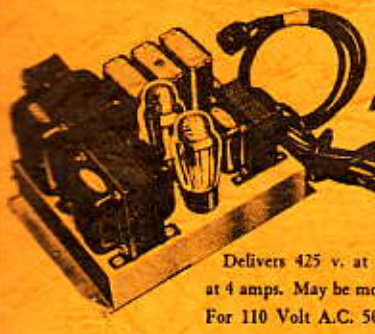

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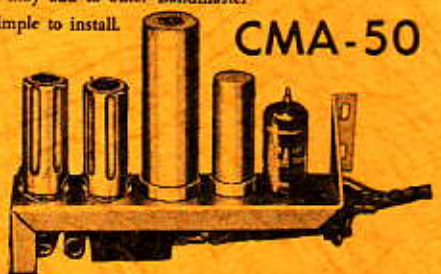

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