Electronic TUBES

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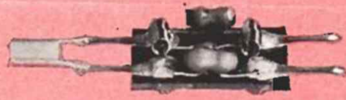
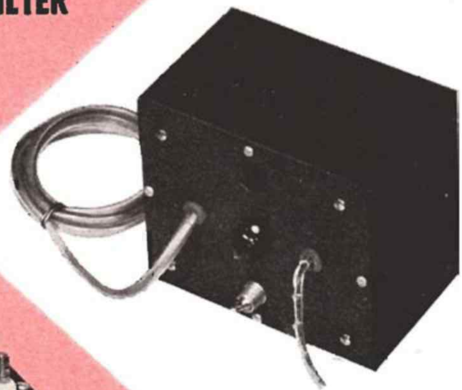
TIME-TESTED FAVORITES

. . . WITH EXTRA DATA

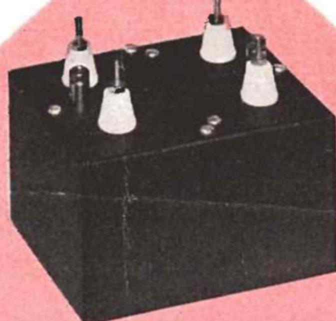


TVR HI-PASS FILTER

EMERGENCY-PORTABLE RIG



MOBILE MODULATOR



HARMONIKER

By popular demand, this issue contains additional design data on four widely used G-E HAM NEWS items, plus a digest of the original articles, that will help you tailor and construct this equipment to fit your individual needs. —*Lighthouse Larry*

CONTENTS

THE HARMONIKER

The Harmoniker (See G-E HAM NEWS, November-December, 1949, Vol. 4, No. 6) is a band-pass type filter to attenuate signals both higher and lower in frequency than the amateur band for which it is designed. Properly constructed and installed in a transmitter between the final amplifier output circuit and the antenna feed line, it is highly effective in reducing harmonic-type interference on nearby television receivers. However, it will not attenuate harmonics being radiated from an unshielded transmitter, or by unfiltered wiring that runs out of the transmitter enclosure.

The Harmoniker also will help prevent radiation of other spurious signals, particularly when a transmitter is fed into one of the increasingly popular all-band antenna systems. These signals include "pink-ticket" harmonics that fall outside an assigned amateur band, and signals that leak through a final amplifier from an exciter operating at a sub-multiple of the output frequency. The latter spurious signal frequently results on 14 megacycles from a 21-megacycle final amplifier driven by a frequency tripler stage from 7 megacycles.

This half-wave filter circuit is quite tolerant of impedance mismatch. The attenuation of harmonics is virtually unaffected by mismatch, and the very low insertion loss at the fundamental frequency increases but very little with mismatch ratio. A serious mismatch is apt to harm the filter only at high power levels where the maximum current and voltage ratings of the elements may be exceeded. Normally, the Harmoniker should only be inserted in a feed line having a standing-wave ratio lower than 2 to 1.

The loss through the filter is only about 0.1 db—that is, 1/60 of an "S" unit. The attenuation of harmonics is as follows: second, 31 db; third, 48 db; fourth, 59 db; etc. For higher order harmonics, the attenuation is about 30 db greater each time the frequency is doubled. The attenuation at half the design frequency is about 20 db.

HARMONIKER CIRCUIT

The limitation on standing-wave ratio makes it desirable to design two different Harmonikers—a low and a high impedance unit—for each band. The circuit diagram, shown in Fig 1A, is the same for both units, the main difference being that the high-impedance unit requires higher inductance and lower capacity for a given amateur band.

The input and output terminals are A—B and A′—B′, respectively, for balanced twinlead and open-wire feed lines. If the impedance of your transmission line is between 50 and 150 ohms, use the components listed in Table I for the 100-ohm Harmoniker. Similarly, the 300-ohm components apply for transmission line impedances between 150 and 600 ohms.

The connections for unbalanced feed lines, such as coaxial cable, are A—G and A′—G′ for input and output, respectively. Because only half of the Harmoniker

TABLE I—HARMONIKER CIRCUIT CONSTANT DATA

BAND	HARMONIKER CONSTANTS			MEDIUM POWER COILS			HIGH POWER COILS				
Mc	Impedance Ohms	Cx mmf	Lx uh	Miniductor No.	Air-Dux No.	Turns	Turns	Wire Size	Dia.	Length	Turns per In.
3.5	100Ω	840	2.1	3014	808	12	13	12	1	1 5/8	8
7.0	100Ω	450	1.1	3006	508	13	8	12	3/4	1	8
14	100Ω	220	0.55	3002	408	10	7	12	3/4	7/8	8
21	100Ω	150	0.37	3005	504	7	8	12	1/2	7/8	9
28	100Ω	110	0.28	3001	404	8	6	12	1/2	3/4	8
50	100Ω	60	0.155	3001	404	4	4	12	1/2	3/4	5 1/2
3.5	300Ω	280	6.3	3015	816	21	23	14	1	1 5/8	14
7.0	300Ω	150	3.3	3011	616	18	16	12	1	1 5/8	10
14	300Ω	73	1.65	3010	608	15	11	12	1	1 3/8	8
21	300Ω	50	1.11	3006	508	13	8	12	1	1	8
28	300Ω	37	0.84	3002	408	15	7	12	1	7/8	8
50	300Ω	20	0.46	3002	408	9	7	12	3/4	1 1/8	6

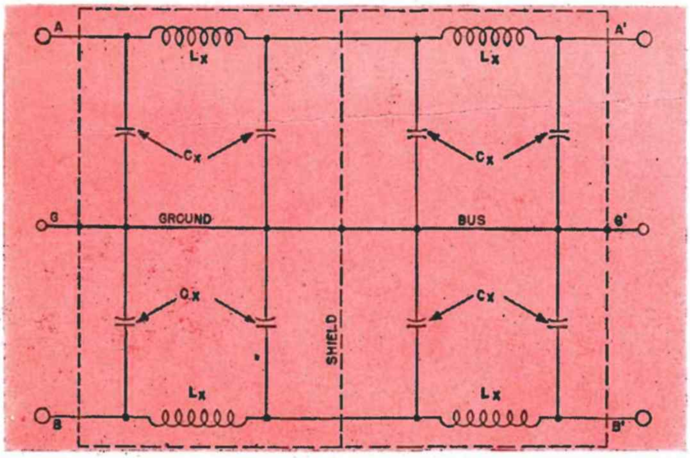


Fig. 1A. Schematic diagram of the balanced type Harmoniker. Only the portion of the circuit from the ground bus up is required for an unbalanced type Harmoniker for coaxial cable.

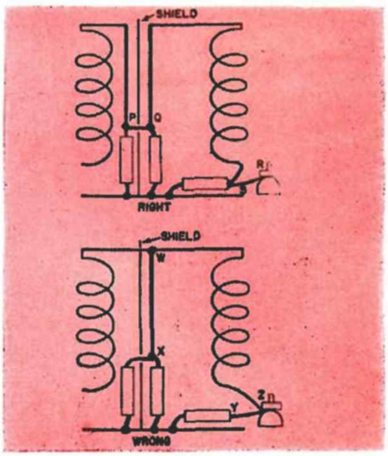


Fig. 1B. Sketch of correct and incorrect layout and connections at the inter-section shield as noted in the text.

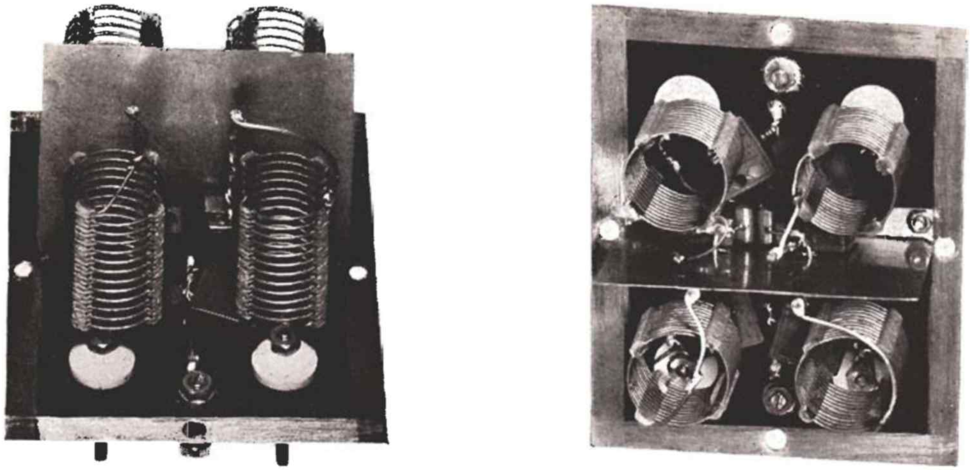


Fig. 2. Detail views of a 3.5-megacycle, 300-ohm balanced type Harmoniker. Ground posts G and G′ are located between each pair of coils, which are supported by their leads.

is utilized for unbalanced line, the 100-ohm unit then closely matches the popular 50-ohm coaxial cables. These circuit constants also are suitable for use with 72-ohm coaxial cables. Only the upper half of the circuit need be constructed for unbalanced feed lines.

SELECTION OF COMPONENTS

Good quality mica capacitors are necessary at all points marked "C_x." Disc ceramic capacitors usually are not sufficiently stable for this application. The values specified in Table I should be closely duplicated, either by paralleling two capacitors, or selecting by measurement a capacitor within 5 percent of the specified value. The power levels at which capacitors of various voltage ratings may be operated in the Harmoniker are given in Table II.

A Harmoniker designed to operate at power levels for which 500- or 1000-volt capacitors are adequate can use the plastic-insulated coils specified in Table I without excessive heating. A unit for a high-power AM transmitter usually will require the heavier coils made from No. 14 or No. 12 wire. Coils having more than 1 microhenry of inductance should be wound on ceramic forms, such as Centralab pillar insulators. The smaller coils are self-supporting when wound from No. 14 or No. 12 wire. The inductance figures specified in Table I include connecting leads for commercially-made coils. The actual number of turns in each coil also is shown, but allow enough extra wire at each end to make connections.

HARMONIKER CONSTRUCTION

A 3- x 4- x 5-inch Minibox or utility box is large enough to house all Harmonikers except the 300-ohm balanced unit for 80 meters. This unit will require a 4- x 5- x 6-inch box. The parts layout shown in Fig. 2 should be followed closely, including the placement of the inter-section shield. This shield may be fashioned from any handy metal and should be the maximum size that can be fitted into the box. Paint should be removed from the box joints and places where the inter-section shield, and terminals G and G′ are attached.

Connections to the center capacitors on both sides of the inter-section shield should be made as shown in the upper diagram of Fig. 1B. Note that separate leads are run from each coil to the capacitors at points P and Q, and not a common lead, as in W to X.

The leads between center capacitors may be run through a 3/8-inch diameter hole in the shield, or by means of small feed-through insulators. Connect the other end of each coil to a capacitor at point S, and not directly to the input or output terminals, as shown at Z. For minimum lead inductance, use heavy wire or copper strip for connections wherever possible.

TABLE II—POWER CAPACITY VS. C_X VOLTAGE RATING

WKG. VOL. C_X	BALANCED HARMONIKER				UNBAL. HARM.	
	CW-FM-SSB		AM		CW-FM-SSB	AM
	100Ω	300Ω	100Ω	300Ω	50Ω	50Ω
500 V.	1000w	250w	250w	62w	500w	125w
1000 V.	4000	1000	1000	250	2000	500
1500 V.	8000	2000	2000	500	4000	1000
2000 V.	16000	4000	4000	1000	8000	2000

The first vertical column lists the working voltage rating of capacitors Cx which should be used in a Harmoniker designed to handle the transmitter power output and types of emission listed in succeeding columns.

INSTALLATION AND OPERATION

The Harmoniker should be connected to the transmitter output stage with the shortest possible length of feed line, plus a heavy conductor to terminal G or G′. Otherwise, harmonics may be radiated from these connections before they can be attenuated by the Harmoniker. Better still, attach the Harmoniker directly to the transmitter shielding. (Surely you already must have shielded your rig.) If the transmitter is designed to operate on several bands, a separate Harmoniker must be constructed for each band. Some type of plug-in connectors should be used to switch in the desired Harmoniker. A selector switch is not recommended, or else harmonic signals may leak around the Harmoniker.

Generally, it will be unnecessary to change the transmitter output coupling system. However, if your transmitter is feeding a balanced transmission line from a link coupling coil with the center tap grounded, *remove this ground connection.* The balanced type Harmoniker will balance the feed line to ground automatically far better than a ground on the coupling coil.

Operate a Harmoniker only on the band for which it is designed. Otherwise, at least 99 percent of the transmitter power will be dissipated in the Harmoniker—very disastrous for the Harmoniker when connected to a high-power rig—and likewise for your signal reports with a low-power rig.

Other recent articles describing similar half-wave filters have been published as follows:

McCoy, "The Evils of Multiband Antenna Systems and the Cure," *QST*, March, 1957, page 26.

Hooton, "Adjustable Half-Wave Filters," *Radio and TV News*, April, 1957, page 62.

EMERGENCY-PORTABLE RIG

The Emergency-Portable Rig for 3.5 megacycles originally described in the March-April, 1950 issue of G-E HAM NEWS (Vol. 5, No. 2), the Mobile Modulator discussed on page 6 and the Mobile/Portable Power Supply (See G-E HAM NEWS, March-April, 1953, Vol. 8, No. 2) all are versatile companion units. In addition to the portable, emergency and mobile service for which they were designed, this gear will make a good stand-by transmitter for the home station.

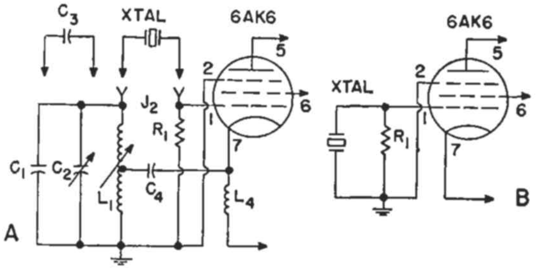


Fig. 4. Alternate oscillator grid circuits for (A) both crystal controlled and VFO operation, and (B) crystal controlled operation only, eliminating C_1, C_2, C_3, C_4, L_1 and L_4.

CIRCUIT DETAILS

Several mandatory features of any portable rig are, small size, low current drain, self-contained variable frequency oscillator, simple circuit using few low-cost parts, and as high a power output as is consistent with the primary power source, a 300-volt, 100-ma vibrator-type supply. The circuit diagram, Fig. 3, shows the final result, a 6AK6 electron-coupled oscillator, GL-2E26 final amplifier and an 0A2 voltage-regulator tube for the oscillator and amplifier screen voltage. Adequate oscillator isolation is achieved by operating the oscillator grid tank on 1.75 megacycles, then doubling in the plate circuit to 3.5 megacycles, plus selecting a well-shielded pentode tube with a separate suppressor-grid connection. Space and mechanical rigidity limitations ruled out the series-tuned Colpitts oscillator circuit, with its necessarily large inductance.

The oscillator may be adapted to crystal control by either of two modifications, shown in Fig. 4. At the left, a crystal socket is substituted for C_3, which is then fitted with pins and plugged into the socket for VFO operation. Crystals in the 3.5-megacycle range, when plugged into the socket, may be varied in frequency slightly by tuning C_2. The alternate crystal oscillator circuit, at the right, may be substituted when only crystal-controlled operation is desired.

Compared to most pentode power amplifier receiving tubes, the GL-2E26 has excellent isolation between the control grid and plate, making neutralization unnecessary. This feature, plus a low driving power requirement, made it the obvious choice for the final amplifier. The amplifier plate circuit is a pi-network having fixed input (C_1) and output (C_{11}) capacitors, with an adjustable inductance coil (L_3) designed to match a 50-ohm load. Link coupling also can be employed simply by eliminating C_{11}, R_3 and connecting the right-hand end of L_3 to ground. A 3- or 4-turn link coil is then placed around the ground end of L_3.

PARTS LIST, E-P RIG

C_1	400-mmf silvered mica
C_2	100-mmf variable (Hammarlund HF-100)
C_3, C_5, C_{10}	100-mmf silvered mica
C_4, C , C_{12}	0.002-mfd mica or disc ceramic
C_7, C_{11}	100-mmf mica
C_8	0.005-mfd mica or disc ceramic
J_1, J_2	Closed-circuit jack
L_1, L_2, L_3	38 turns No. 26 enamel wire on National XR-50 coil form L_1 tapped 6 turns from the bottom).
L_4, L_5	2.5 millihenry r-f choke
R_1	0.1 megohm, ½ watt
R_2	20,000 ohm, ½ watt
R_3	5000 ohm, ½ watt
R_4	5000 ohm, 5 watt (See Text)

CONSTRUCTION DETAILS

The transmitter is housed in a 4 x 5 x 6-inch utility box, with one removable side serving as a front panel. Bend a 3 x 5⅛-inch chassis from $\frac{1}{16}$-inch thick sheet aluminum with a 1¼-inch high rear flange, and a ½-inch front flange. Mount all major components in the locations pictured in the rear view, Fig. 5. Holes also must be drilled in the box top and rear plate for tuning the coils. The connection between the ungrounded end of L_1 and the stator of C_2 is made with small coaxial cable, with the shield grounded at the point which passes through the chassis. Other wiring and small parts locations can be seen in the bottom view, Fig. 6. Silvered mica capacitors are recommended for C_1, C_3, C , C_{10} and C_{11}. Disc ceramic or regular mica types will suffice for all other capacitors. The 38 turns of

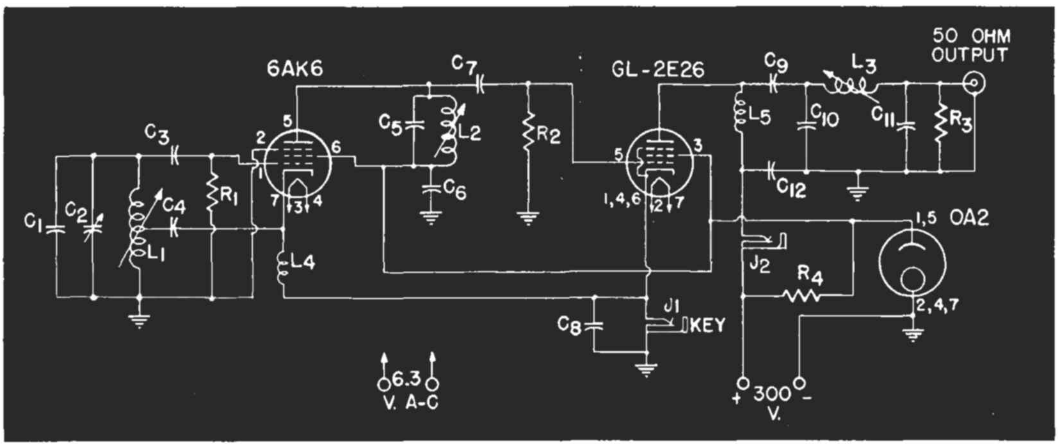


Fig. 3. Schematic diagram of the Emergency-Portable Rig. Jack J_2 is for measuring the GL-2E26 plate current.

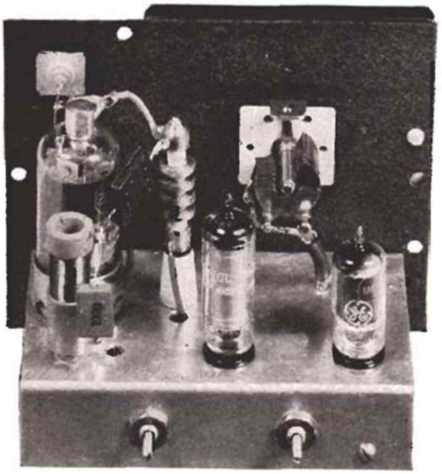


Fig. 5. Back view of the E-P Rig. Coils L_1 (right) and L_2 (left) are tuned through holes in the cabinet rear plate. The GL-2E26 plate coil, L_3, mounts directly behind this tube.

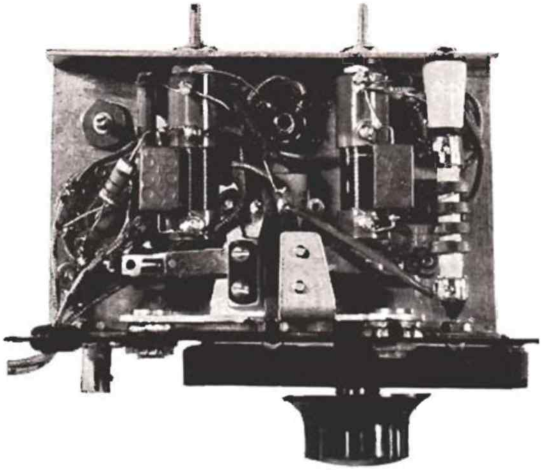


Fig. 6. Under-chassis view of the Emergency-Portable Rig. Midget phone jacks can be substituted for the larger jacks.

wire specified for L_1, L_2 and L_3 should just fill the coil form in a single layer. Select a resistance value for R_4 which limits the OA2 regulator tube current to 30 ma with the key jack, J_1, open.

TUNE-UP ADJUSTMENTS

Insert the 6AK6 and 0A2 tubes, apply heater and plate voltage and adjust L_1 until the oscillator covers either 3.5—3.9 megacycles for CW, or 3.55 to 4.0 megacycles for phone operation. Plug a 0—100-ma DC meter into J_1, insert the GL-2E26, and short the coaxial output connector. Tune L_2 for maximum brilliance of a neon lamp held close to pin 5 on the GL-2E26, then tune L_3 for a dip in plate current on the meter. These adjustments usually will hold over a 100-kilocycle range on the VFO. Remove the meter from J_1 and measure the current through the 0A2 tube, which should not exceed 30 ma. With the keying jack shorted, the 0A2 current should be at least 5 ma and a glow should still be present within the tube.

Remove the short from the coaxial cable connector and connect a 50-ohm dummy load—or a real, live antenna having this impedance—to the transmitter. Total current drain, as measured in the keying jack, should be about 60 to 80 ma with the GL-2E26 working into a load.

TVR HI-PASS FILTER

Can TVI be eliminated from a television receiver for less than half a dollar? The answer is very likely yes, if the TVR Hi-Pass Filter, originally described in the March-April, 1951 issue of G-E HAM NEWS, is installed at the antenna terminals of the TV set. The TVR filter is merely a balanced constant-K high-pass filter, designed for 300-ohm transmission line, with a cutoff frequency of 44 megacycles. It is capable of greatly attenuating signals below this frequency, and passing all higher frequencies, including the television channels. A single TVR filter will cure most TV receiver overload problems, but tough cases may require two filters in series. A schematic diagram is shown in Fig. 7.

TVR FILTER CONSTRUCTION

The "chassis" for the TVR filter is simply a piece of $\frac{1}{16}$-inch thick bakelite, lucite, etc. insulating board 1 x 1¼ inches in size. Drill five holes, four of which should be ¼ inch in from each corner, and the fifth at the exact center. Drill and tap each hole for a 4-40 brass screw, which are then assembled with soldering lugs under the heads. Solder the capacitors in place as shown in Fig. 8, at the same time bonding the soldering lug to the machine screw heads.

Cut two 15-inch lengths of No. 30 enameled copper wire for the coils and fold each double. Remove about 1 inch of insulation at the fold, solder the wires together and bend the soldered portion at right angles. Measure out 6⅜ inches from the bend, cut the wire and tin ⅛ inch at the ends.

Wind the coil, starting at one end of the wire, on a rod *exactly* ⅛ inch in diameter. Place the completed coil in position, trim the center tap until it just overlaps the center screw and solder in place. Then bend all coil end wires with tweezers so that they can be soldered to the corner screws. Run brass hex nuts on the machine screws and the TVR filter is complete. Keeping the coils so small that direct pickup is negligible eliminates the need for shielding the TVR filter.

Even though the radio amateur is not required to install high-pass filters on neighboring television receivers, the TVR filter, plus judicious public relations, usually will solve most TVI problems.

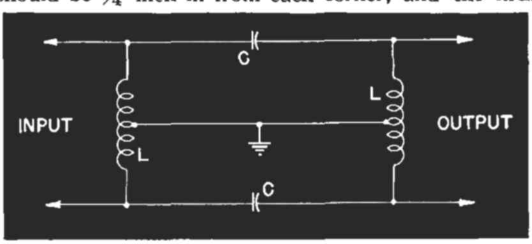


Fig. 7. Schematic diagram for the TVR High-Pass Filter. Capacitors C are 12-mmf general-purpose ceramics. Coils L are 1.08 uh, 28 turns, No. 30 enameled wire on a ⅛-inch diameter form. (See text for coil winding details.)

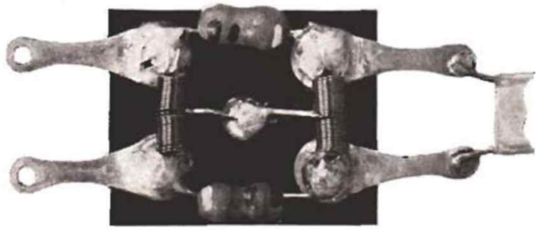


Fig. 8. Construction details of the TVR filter.

MOBILE MODULATOR

The companion modulator (originally published in G-E HAM NEWS, July-August, 1950, Vol. 5, No. 4) for the Emergency-Portable Rig has a total static current drain of only 20 ma, rising to about 50 ma on voice audio peaks. Thus, the 60-ma current drain of the E-P Rig, plus the modulator drain, is easily supplied by a 300-volt, 100-ma vibrator type power supply. Both distortion level and current drain are lower than with most other modulators having comparable power out-put.

Driven by a carbon microphone through a step-up transformer, three twin-triode tubes are used as push-pull voltage amplifier, cathode-coupled driver, and class B amplifier stages respectively. Only three capacitors and eight resistors are required for the entire circuit, shown in Fig. 9. Note that the cathode current for the 12AT7 driver flows through the 22½-volt bias battery. The bias is thus divided between the driver and class B stages, 7 to 8 volts, and 15 volts, respectively. Potentiometer R_1 serves as a gain control by varying the DC microphone voltage a limited amount.

Although the 12AU7 class B stage will deliver more than 10 watts peak voice output, the 12BH7A twin triode has a higher plate dissipation per section (3.5 watts, as against 2.75 watts) and may be substituted when maximum power output is required.

Since small modulation transformers can vary greatly in efficiency, a loss of 3 decibels (one half the audio power) is not unusual. The transformer specified for T_2 is a component made especially for this modulator, although any transformer having the proper impedances and power rating will serve. (Stancor A-3891, Thordarson T-21M52 and UTC S-18.)

CONSTRUCTION DETAILS

All components except the phone—CW switch are mounted on a 4⅛ x 5⅛-inch flat sheet metal plate, as pictured in Fig. 10. Matching holes for this switch, gain control shaft, microphone plug and power cables are then drilled in the front panel of a 4 x 5 x 6-inch utility box in which the modulator is housed. The chassis plate is fastened to the inside of the front panel with 1¼-inch long metal spacers at the four corners.

TESTING

After applying heater, bias and plate voltages, check the bias on the driver and modulator tubes, as previously mentioned. The no-signal modulator plate current should be about 15 ma. Temporarily connect a 5000-ohm-10-watt resistor across the secondary of T_2 before applying an audio signal to the modulator input.

Though designed primarily for operation from a storage battery, the Mobile Modulator may be run from an AC power source by disconnecting wire "X" from the battery lead and connecting it instead to a 6.3-volt filament transformer. From 4 to 6 volts DC for the microphone is then fed into the battery lead. Regardless of the purpose for which it is built, this high quality little modulator should find many uses around the ham shack.

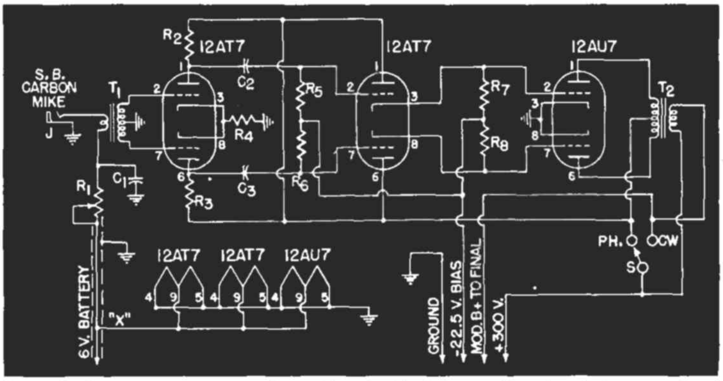


Fig. 9. Schematic diagram of the Mobile Modulator. The 6-volt battery lead should be of heavy shielded wire, with a switch to turn off heater power.

PARTS LIST

C_1	500-mfd, 15-volt electrolytic
C_2, C_3	1000-mmf, 500-volt ceramic
J	Open-circuit jack
R_1	250-ohm potentiometer
R_2, R_3	0.1 megohms, ½ watt
R_4	2200 ohms, ½ watt
R_5, R_6	0.47 megohms, ½ watt
R_7, R_8	10,000 ohms, ½ watt
S	SPDT toggle switch
T_1	S.B. mike to push-pull grids
T_2	Class B output transformer primary 10,000 ohms; secondary, 10,000 ohms, tapped at 5000 and 7000 ohms, 60 ma DC; Model No. BC-334 ($3.60), made by Ballastran Corporation, 1701 North Calhoun Street, Fort Wayne 7, Indiana.

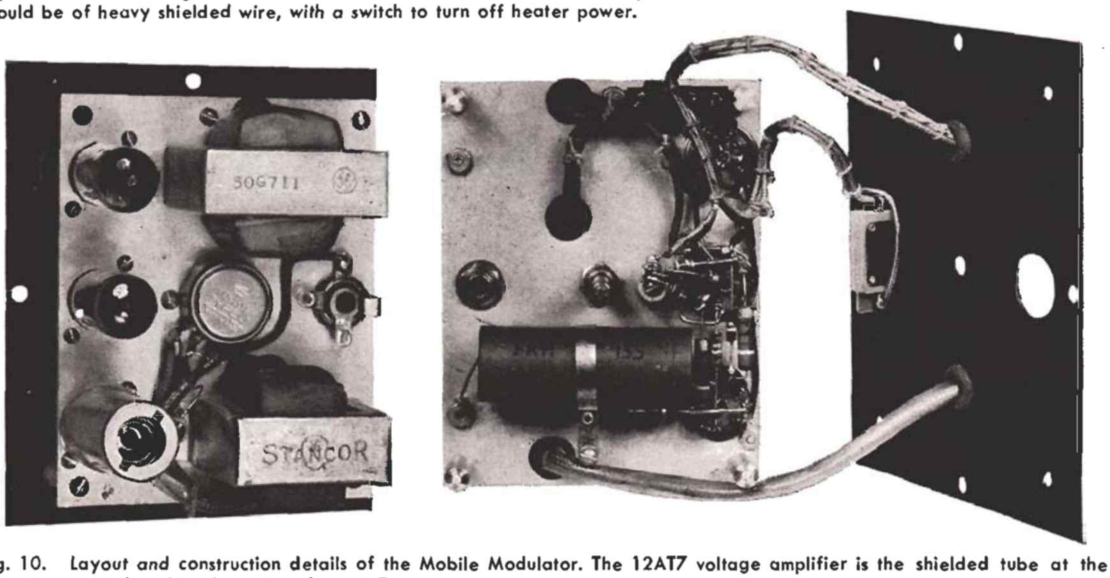
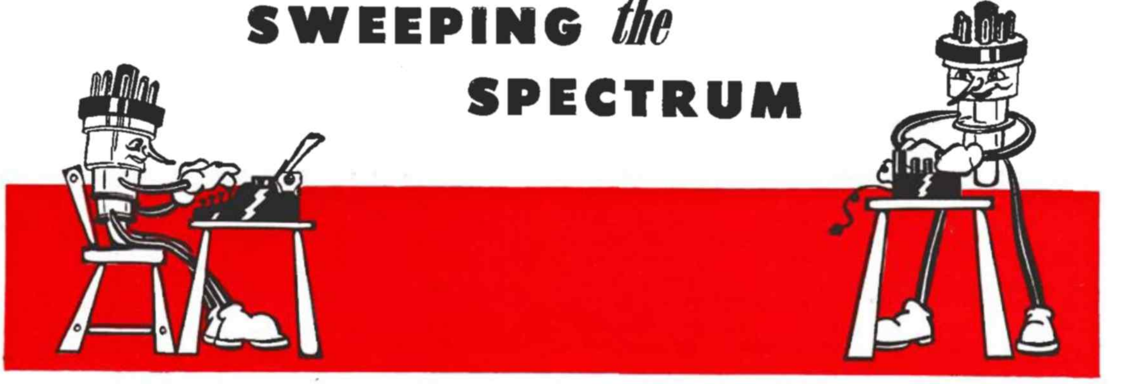


Fig. 10. Layout and construction details of the Mobile Modulator. The 12AT7 voltage amplifier is the shielded tube at the bottom next to the microphone transformer, T_1.

SWEEPING *the* SPECTRUM



Boy! What would we hams do for rag-chewing topics if new technical developments were not constantly coming along for us to hash over! Lately, one of the most popular topics for discussion—on the air, at radio club meetings, or wherever a group of amateurs congregate—is double-sideband, suppressed-carrier transmission and reception (DSB)[1].

Undoubtedly the big advantage of both SSB and DSB signals over conventional AM is that absence of that old heterodyne-producing carrier. Spacewise, the *two* sidebands of AM and DSB signals normally will make these signals twice as broad as that from a ***properly-adjusted*** SSB transmitter having adequate unwanted sideband suppression (30 db or greater). Overdriving a linear amplifier following either a SSB or DSB exciter usually results in a much too-broad signal containing an abundance of distortion products. (We've heard this condition far too often lately, so watch that gain!)

To many amateurs the big decision seems to be, "Should I convert my present AM rig to SSB or DSB?; and, which system offers the best results, plus the least complicated conversion?" The "best results" question is highly controversial[2], but two simple methods have been suggested for converting an AM transmitter to DSB, both of which utilize a greater portion of an existing AM rig than a similar conversion to SSB.

The same basic type of balanced modulator circuit is used in both DSB systems, but the DSB signal may be generated in either the final amplifier stage[3], or a low-level exciter stage[4]. The low-level DSB signal is then amplified by operating succeeding stages as linear amplifiers, as in an SSB transmitter.

In contrast, even a low-power, ***all-band*** SSB exciter is quite complex, and the amateur who has built his own really deserves a pat on the back! The abundance of commercially-built SSB exciters on the air verifies this fact.

However, a one-band SSB exciter can be quite simple (see SSB, Jr., G-E HAM NEWS, November–December, 1950, Vol. 5, No. 6) without the extra frequency conversion and spurious signal problems that usually arise when designing an SSB exciter for several bands. This is an easy way for the build-it-yourself radio amateur to get started on SSB, since the phasing type circuit in the SSB, Jr., can later be incorporated into a heterodyne-type exciter for two or more bands.

The reception of DSB signals on a garden-variety communications receiver (one that will respond to both sidebands at once) is not so delightfully simple, however. The carrier that you re-insert with the receiver's BFO should be exactly the same frequency and ***phase*** as the DSB transmitter carrier for best readability. Mis-tuning a DSB signal only a few cycles on such a receiver results in greatly reduced audio intelligibility[5]. This problem can be avoided by means of a receiver or adapter unit that has a complex carrier phase synchronization system. For the radio amateur, a much easier solution to receiving DSB signals is to use a SSB receiving adapter. This deliberately ignores one sideband of a DSB signal—and it lets you select the sideband on which there is least interference. Both SSB and DSB signals can be mis-tuned nearly 100 cycles on most receivers equipped with an SSB adapter and still be readable, even though the voice may sound like Donald Duck!

Thus, a DSB signal usually is as simple to generate as a conventional AM signal, and somewhat easier than generating an SSB signal. Conversely, DSB signals are more difficult to ***receive*** properly than AM or SSB signals without a special adapter on your receiver.

* * *

Now that we've briefly outlined the relative simplicity of the equipment required for SSB and DSB operation, let's talk a bit about what happens when you put either type of rig on the air. A lot of the SSB boys contact each other en-masse in round-table QSO's, some of which collect staggering numbers of participants! The ensuing conversations often greatly resemble the good old-fashioned party-line telephone circuits! Operating thusly practically requires all stations to be equipped for voice-controlled break-in operation.

After listening to—or operating in—one of these round tables, the advantages over the old system of long-winded alternate transmissions are obvious (and this applies equally to CW break-in). Being able to warn the other fellow instantly when some QRM lands on the channel is much easier than straining to maintain solid copy through heterodynes and other hash. It also eliminates note-taking—or relying on your memory—to be sure of commenting on all subjects the other fellow has covered. —And how many times have you patiently sweated out listening to a long transmission without being able to break in right after the XYL has told you that the steaks are on the table—and you had better get there fast before everything gets cold? Need I say more?

Of course, most boys using DSB transmitters also will want to equip their stations with voice-controlled break-in so that they can jump right into the round-table QSO's. There should be practically no detectable difference in sound between a SSB and DSB signal when copied on a SSB receiver, except that a DSB signal will be readable on both lower and upper sideband positions.

We seldom hear a roundtable QSO in which all three types of stations—AM, SSB and DSB—are participating. For this, it is simply desirable that all stations be within a few cycles of the same carrier frequency, and that voice-controlled or other means of fast break-in be employed. This could and should be a good way to make new acquaintances—as well as renew old ones—among amateurs using other modulation methods, and similarly increase your enjoyment of amateur radio as a hobby. Finally, let's coin an appropriate slogan, which obviously is: "Live modern—supress that carrier and install rapid break-in at your station."

—*Lighthouse Larry*

[1] Costas, "Synchronous Communications," *Proc. IRE*, December, 1956, page 1713.
[2] Costas, "Single-Sideband: Is It Really Better than Amplitude Modulation?" *CQ*, January, 1957, page 26.
[3] Najork, "100-Watt DSB Mobile," *CQ*, March, 1957, page 52.
[4] Stoner, "DX-100 to DSB," *CQ*, April, 1957, page 54.
[5] Grammer, "Suppressed-Carrier AM," *QST*, March, 1957, p. 21.

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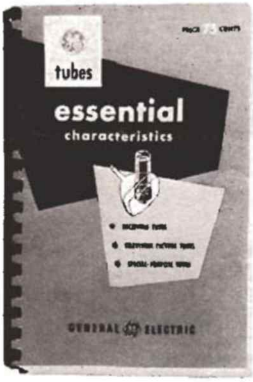

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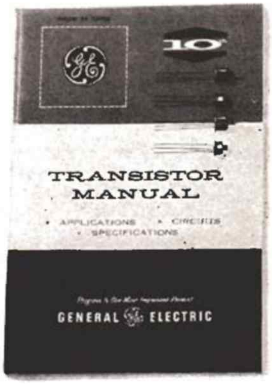
—*Lighthouse Larry*



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