BUREAU OF SHIPS

RADIO AND SOUND BULLETIN

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RADIO AND SOUND BULLETIN

NAVY DEPARTMENT,
BUREAU OF SHIPS,
January 1, 1943.

NEW MODEL TCK SERIES TRANSMITTING EQUIPMENT

A new transmitting equipment is now being issued to the service in which some distinctly new features have been incorporated. The most outstanding of these is the single dial control of all major tuning adjustments. By virtue of this new feature the time required for tuning and frequency checking operations is kept to a minimum.

This new equipment is designed for both ship and shore applications. It provides a nominal power output of 400 and 100 watts on A1 and A3 emission, respectively, and covers a frequency range of 2,000 to 18,100 kc.

Basically, the equipment consists of a master oscillator stage employing a type 837 vacuum tube, an intermediate power amplifier stage employing a type 837 vacuum tube and a power amplifier stage employing two type 813 vacuum tubes in parallel.

For A3 emission, grid modulation of the power amplifier is accomplished by the use of a two-stage speech amplifier employing a type 6SK7 first speech amplifier and a type 6SQ7 second speech amplifier and modulator.

Construction is of the sub-assembly type. The transmitter frame is constructed of chrome-moly steel aircraft tubing welded to form an extremely strong, yet lightweight, structure. The size of this equipment is such that it may be passed, without disassembly, through a door 20 inches wide by 38 inches high with 10-inch radius at the corners. It is also capable of passage through a hatch 25 by 20 inches under the same conditions. Figure 1 illustrates the general appearance and construction of the transmitter unit.

In order to provide for conditions of extreme shock or vibration, four rubber shock absorbers are fastened to the bottom of the transmitter unit. In addition, two rubber shock absorbers are mounted on the back corners near the top of the transmitter unit to provide stabilization, thus preventing excessive sway of the unit.

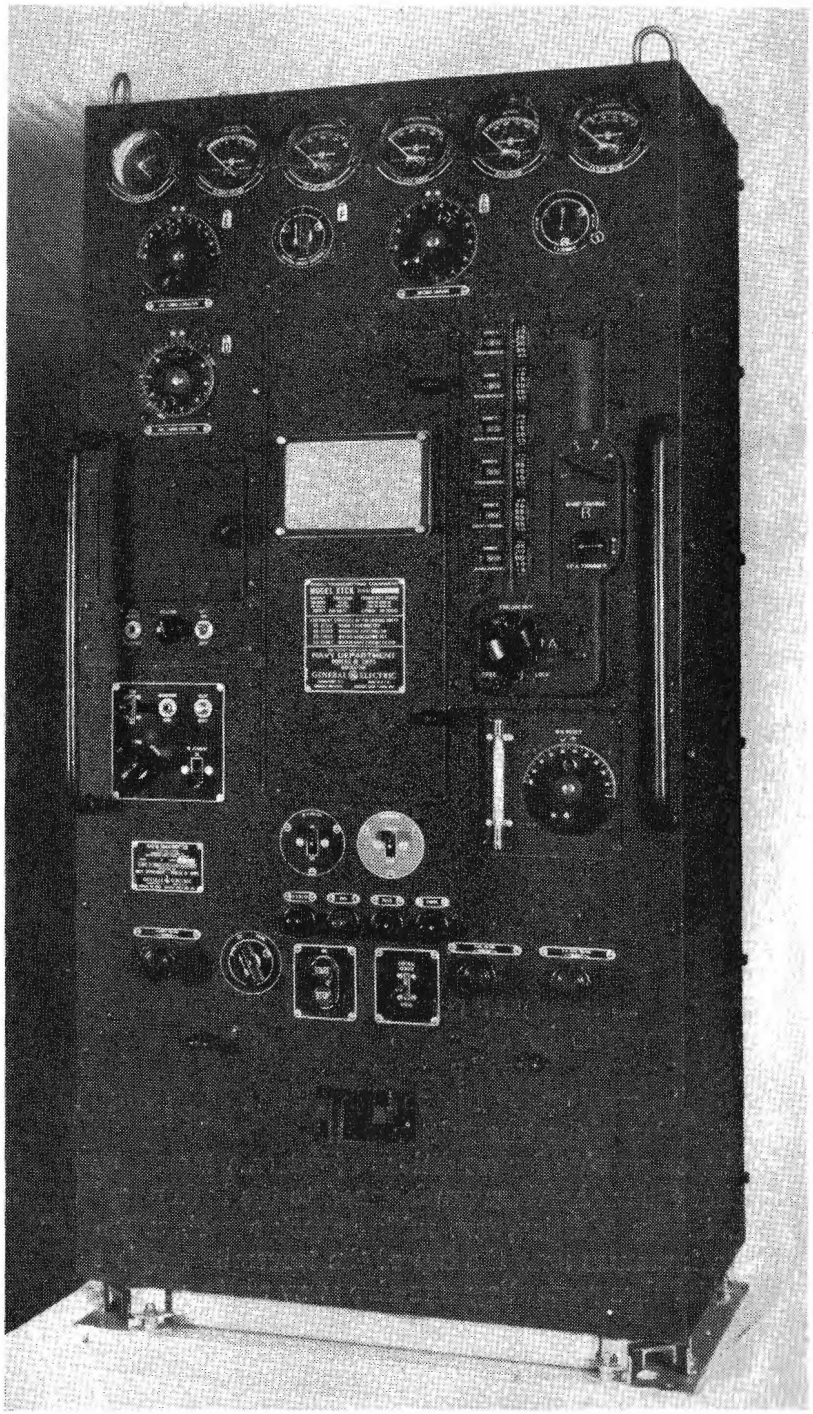

FIGURE 1.—Front view of the model TCK transmitter. The single tuning control appears on the right side of the panel.

The power supply for this equipment consists of a motor generator set capable of supplying all the necessary voltages for operation of the transmitter and associated equipment. Motor generator equipment for operation from 220/440/3/60 A. C. or 115 or 230 volts D. C. is available. The use of rectifier power equipment for A. C. applications is contemplated in future equipments.

Standard control circuits are employed which permit operation with the Navy type 23211 or 23172 radiotelephone units.

The master oscillator is designed to provide continuous frequency coverage over the frequency range of 2,000 to 18,100 kc. by the use of six bands. Continuity of the frequency range is insured by an overlap of 1 percent between bands. A single control is employed to vary the frequency of the master oscillator and simultaneously tune the intermediate and power amplifier circuits. Tuning and adjustment of coupling in the antenna circuit is done in a conventional manner with separate controls. A band change switch is employed to select the operating band desired. A suitable dial calibrated directly in frequency is provided for each band.

The single dial control for tuning the master oscillator, intermediate amplifier, and power amplifier is obtained by a gang-operated four unit condenser so arranged vertically in the transmitter units that each tuning condenser is located in its respective compartment. The arrangement of the gang condenser assembly is illustrated in figure 2. The main tuning control knob drives through to a worm and worm gear to the gang condenser assembly. Indication of frequency is accomplished by means of positive geared Veeder counters coupled to the tuning condensers.

A stop mechanism is provided to prevent damage to the capacitors and mechanisms at the ends of rotor travel. The stop mechanism exerts a braking action which is applied before the main end stop is reached. This slows down the control before reaching the positive end and serves as a warning that the operator is beyond the band limit.

Special precautions have been taken in the design of the uni-control and dial mechanism to reduce and hold the backlash to a minimum by employing split gears wherever necessary. Precision ball bearings have been used throughout the uni-control mechanism, including counters and capacitors, to insure free running and long life.

A crystal frequency indicator, incorporated in the transmitter unit, is employed as a means of obtaining a series of check points, every 100 kc., for resetting the calibration of the frequency indicating dials for a high degree of accuracy. This consists of a crystal oscillator and multivibrator which generates marker frequencies throughout the range of the transmitter. The output of the multivibrator is coupled to the grid of a detector tube; the transmitter signal is also intro-

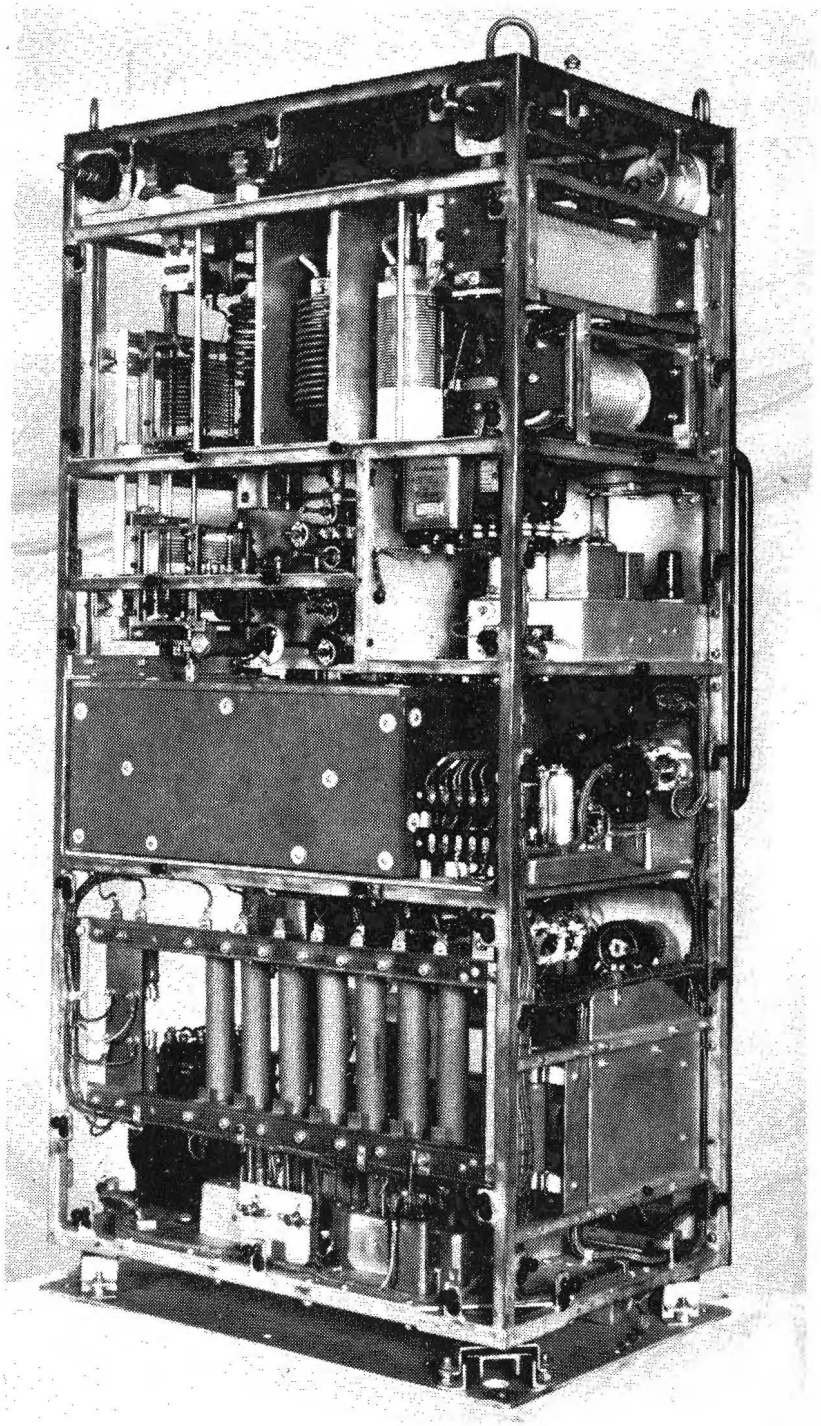

FIGURE 2.—Rear view of the model TCK transmitter showing internal layout.

duced to this grid by means of a pick-up coil located in the master oscillator plate circuit. The output of the detector is then amplified and delivered to a phone jack located on the front panel of the transmitter.

Checking the accuracy of the directly calibrated dials is accomplished by setting the dial at a marker frequency point nearest the desired frequency of transmission. The crystal frequency indicator is then turned on and a beat note with the marker frequency is heard. By means of a small trimmer condenser incorporated in the master oscillator stage the transmitter frequency is brought to zero beat. The dial calibration is then accurate to within 0.02 percent of the desired absolute frequency under average temperature conditions.

Two trimming capacitors, controlled by knobs on the front panel, are provided to trim the intermediate and power amplifier stages. The range of these trimmers is sufficient to resonate their respective stages but not large enough to allow the selection of an adjacent harmonic frequency.

The antenna tuning equipment is designed to feed a wide variety of antennas and in general will work satisfactorily into all antennas encountered in shipboard installations.

Operation of the transmitter as a whole is on a par with that obtained from other standard Navy transmitting equipment of comparable power output and frequency range. The increased flexibility resulting from uni-control of the dial mechanism has been accomplished with no apparent sacrifice of any other operational feature of transmitting equipment of this type and, in general, is considered to be a definite advancement in the constructional design of Navy transmitting equipment.

INSTRUCTIONS RELATING TO VACUUM TUBES

Chapter 31 of the Manual of Engineering Instructions (Revised) contains various instructions relating to vacuum tubes. These instructions have been altered from time to time since this publication was issued. Accordingly, the currently applicable procedures and requirements are listed in the following paragraphs for ready reference.

1. *Allowances.*—The exact quantity of vacuum tubes to be carried as spares at any radio station ashore or afloat shall be determined by the officer responsible for the maintenance of that station. Where practicable, it is suggested that established allowances be maintained. Vessels expecting to be absent from sources of supply of vacuum tubes for relatively long periods of time, as in extended special duty, should carry sufficient tubes to insure unbroken communication and search facilities.

2. *Types of guarantees.*—In the case of tubes covered by the Service Life Guarantee, the actual life of each tube must be determined in service operation. Such tubes are identified by the fact that there is imprinted on the tube itself and on its container the contract number, the serial number, and the number of hours guaranteed. Such tubes are required to be accompanied by Form N. B. S. 313 (Delivery Card) and N. B. S. 304 (Failure Report). In general, to be eligible for adjustment under the guarantee, a defective tube must have failed due to a manufacturing defect within 24 months from the date of its acceptance by an inspector of naval material. This date of acceptance is indicated on the Delivery Cards, Failure Report Forms, and/or on the tube containers.

The life of tubes purchased under Life Rack Guarantee is determined by life rack tests of random-selected samples conducted by the tube manufacturer. Any deficiency in life indicated by these life tests is compensated for by the contractor by the delivery of an additional quantity of tubes. Consequently, tubes purchased under this guarantee have no adjustment value upon becoming unfit for further use, and for this reason are not required to be accompanied by the aforementioned vacuum tube forms.

In certain instances, where life rack tests are not practicable and Service Life Guarantees are not justifiable, vacuum tubes are purchased without guarantees.

3. *Records.*—Ships and stations shall maintain vacuum tube records for determining the service life for each tube covered by a Service Life Guarantee. Where life hour meters are not provided, records should be maintained to enable a fair approximation of the service life.

4. *Forms.*—Two (2) copies of Form N. B. S. 313 (Delivery Cards) and four (4) copies of Form N. B. S. 304 (Failure Report) are furnished with each tube covered by the Service Life Guarantee. Form N. B. S. 313 should be executed promptly after completion of the initial test required by paragraph 12 and forwarded to the Bureau of Ships. A duplicate form (N. B. S. 313) is provided to be executed by the next recipient if the tube is later transferred. When tubes covered by a Service Life Guarantee are transferred or returned to stock for reissue, any pertinent life data should be passed on with the tubes, together with the remaining forms that originally accompanied them.

5. *Classifications of tubes*—For accounting purposes, vacuum tubes are classified according to value. Tubes valued at $5 and under are classified as Title "C" and those valued at more than $5 are classified as Title "B".

6. *Failure reports*—Except as noted in paragraph 10, all vacuum tubes may be destroyed immediately on failure. Complete failure reports should be submitted only when the tube is covered by a Service Life Guarantee and has failed within the guarantee period. Normal failures of conventional tubes and failures of tubes covered by Service Life Guarantee outside the guarantee period need not be reported at all.

7. *Special failure reports*—Other failures to be reported are recurrent abnormal failures of conventional types of tubes and failures of all special radar tubes. Types of tubes considered in the category of "special radar tubes" and on which failure reports are desired are listed in the Radar Maintenance Bulletin. However, since the majority of such tubes are not covered by Service Life Guarantees, and also are of new design or operated under unusual conditions, failure reports are for the Bureau's engineering information only. Accordingly, *one copy only* of failure report form N. B. S. 304–1 (see fig. 1) should be submitted to the Bureau of Ships. N. B. S. 304–1 is to be distributed to all ships, stations, and navy yards, but pending their delivery these special reports may be submitted by a single copy of Form N. B. S. 304 (N. B. S. 383 should not be used to report vacuum tube failures). As these forms constitute the only information the Bureau has on tube life, it is desired that reports be made from time to time on the failure of tubes that have given normal life; the reports should be so noted. In cases of recurrent abnormal failures, it is desirable that such tubes be retained for return to the manufacturer for engineering information. The failure reports of such tubes shall give all details surrounding failures. The Bureau will then direct disposition of such tubes. Attention is invited to the fact that the above-mentioned report forms have no security classification. Hence military information, such as fixed frequencies, should not be disclosed. However, failure due to shock from own gunfire should be stated.

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N.B.S. 304-1

NAVY DEPARTMENT

BUREAU OF SHIPS

REPORT OF VACUUM TUBE FAILURES

(For tubes NOT covered by Service Life Guarantee)

This form is furnished to ships and stations for purposes of reporting recurrent abnormal failures of conventional vacuum tubes and all failures of special radar vacuum tubes where such tubes are not covered by a Service Life Guarantee. One copy of this form is to be forwarded to the Bureau of Ships and another may be retained by the reporting ship or station.

Operated at _____ (Ship or station) Received from _____ (Activity)
Date received _____ Date installed _____
Date tested _____ Date failed _____

Operated in equipment model _____
Unit involved _____ (Type No.) Tube ckt symbol _____
Tube function _____
Filament clock used ( ) Yes. ( ) No.

Failed in _____ (Operating, installation, store or other—specify)

Tube type _____

Made by _____
Life hours _____

Type equipment operated in:
( ) Communication
( ) Radar
( ) Underwater sound
( ) _____ (Other—specify)

OPERATING CONDITIONS AT TIME OF FAILURE

Readings observed on ( ) tube which failed ( ) replacement tube

	VOLTAGES		CURRENTS	
	Key up	Key down	Key up	Key down
Plate circuit				
Grid circuit				
Screen circuit				
Filament circuit				

NATURE OF FAILURE AND DISPOSITION

Submitted by _____ (Activity)

FIGURE 1.

8. *Surveys.*—Survey reports for tubes covered by Service Life Guarantee shall state the type, contract number, serial number, guaranteed hours, and life hours obtained for each tube surveyed, in addition to the other information required to be submitted in the survey. The fact that survey has not been completed or finally been approved shall not prohibit requisitioning of replacement tubes.

9. *Retention and disposal.*—The only tubes that are to be retained after failure are those with exterior metal anodes and/or radiators (this does not mean conventional "metal" tubes or magnetrons). In many cases, such tubes can be reclaimed by the manufacturer, and the shortage of materials, such as are used in the anodes and radiators, causes such tubes to have high salvage value. Tubes so retained are to be turned into the nearest naval shore supply activity for eventual return to the manufacturer. The depots, on collecting a quantity of these types, will return them to the manufacturer involved at the manufacturer's expense. Since certain of these types are of classified nature, proper security shall be maintained by all activities handling the return of such tubes. The fact that such a tube has been retained for return to the manufacturer shall be stated on the failure report required under paragraph 7 and in survey report, if made. *These instructions do not apply to magnetrons. Disposition of burnt out and defective magnetrons shall be in accordance with the instructions outlined on page 4–5 of Radar Maintenance Bulletin, issue No. 9 or subsequent revision thereof. It is imperative that the secrecy of magnetrons be carefully safeguarded.*

10. *Demolition of tubes.*—When destruction of vacuum tubes is made, they shall be completely demolished by shattering the envelope and tube elements. Any common "metal" tubes demolished shall have the vacuum destroyed by opening the envelope. This is necessary to assure that the tube will sink immediately after being thrown overside.

11. *Circulation of stocks.*—Tubes should not be allowed to remain indefinitely in storage or inactive. Emergency or little used equipment should be advanced, if practicable, from such location into active equipment as replacements are required. The oldest tubes, as indicated by the dates of acceptance by the inspector of naval material, should be placed in active service prior to tubes having subsequent dates of acceptance.

12. *Testing.*—Each new tube received by a ship or shore radio station shall be tested immediately upon receipt. All activities shall test at least quarterly all vacuum tubes covered by Service Life Guarantee, including spare tubes and tubes held in store. Tubes should be tested preferably in standard equipments under rated operating conditions, which will provide the best indication of gas and

general tube condition. Since this method is not practicable for tubes carried in stock status at supply activities, tests in this case should consist of filament continuity check and a test for gas (except for mercury and gas-filled rectifiers), employing the vacuum tube gas detectors (violet-ray generators), where available. Tests should be conducted by qualified technical personnel.

13. *Exceptions.*—Since the exigencies of the service do not always allow complete compliance, it is suggested that those responsible for the carrying out of the above instructions use discretion in so doing. Departures from the above instructions will be acceptable to the Bureau where conditions make compliance impractical.

HAZARDS TO SECURITY RESULTING FROM USE OF ELECTRIC RAZORS IN NAVAL VESSELS

The Bureau has recently been questioned as to whether the use of electric razors in naval vessels might constitute a hazard to security. This question arose from the known fact that such devices do radiate to some extent, as evidenced by the interference created in radio receivers when operated in close proximity to electric razors.

While the Bureau was of the opinion that this radiation was minor in nature insofar as its distant propagation might be concerned, nevertheless the Navy Radio and Sound Laboratory, San Diego, was requested to conduct actual tests in a destroyer to determine definitely whether an actual security hazard existed.

The nine available razors which were compared for relative noise output are listed below, together with the approximate relative noise obtained from them at two frequencies.

No.	Make	Type	Relative noise output	
			200 kc.	3,300 kc.
1	Remington	Threesome	100	100
2	do	do		15
3	do	Triple head		60
4	do			60
5	Schick	Colonel	3	10
6	do	Captain	5	25
7	Hanley	Clipshave	3	25
8	Sunbeam	Shavemaster	2	1
9	do	do		1

The following details of the tests, as conducted by the San Diego Laboratory under different operating conditions are quoted below:

"In laboratory tests, the intensity of the radio interference created by the operation of the razors was not greatly different at widely separated frequencies. Shipboard noise measurements were made mostly at frequencies between 20 and 3,500 kcs., with a few observations throughout the range of the model OF noise meter (up to 20 mcs.).

"*Effect of opening compartment door on radiated noise.*—On shipboard it was observed that opening the door of a compartment in which a "noisy" razor was operating produced no measurable interference 10 feet outside if the razor was held 2 feet back from the door.

"*Radiation from electric clipper.*—An electric clipper of the universal motor type (New Racine Universal Motor Co.) produced less than 5 percent of the noise of razor No. 1 and constitutes no radio hazard.

From the above test, the San Diego Laboratory drew the following conclusions:

1. The radiation from electric razors when used inside metal enclosed compartments of a ship is less than one microvolt per meter outside the compartment even at a distance of 10 feet.
2. The radiation from electric razors when used inside metal enclosed compartments on a ship cannot be detected by radiation into the receiving antennas of the ship itself, if no antenna extends out of the compartment in which the razor is operated (radio noise voltage may be introduced into a ship's receiver from other compartments through conduction along wiring, as distinguished from antenna pick-up).
3. The radiation from an electric razor operated outside the compartments of a ship does not produce a signal which can be detected by a sensitive receiving system at any frequency at a distance of 1,000 feet.
4. It is clear that the operation of electric razors inside compartments of vessels creates no radio hazard to security.

The Bureau concurs in the above conclusions.

REVISED CROSS INDEX OF VACUUM TUBES

Radio electron tubes (vacuum tubes) are now being procured under Joint Army-Navy Specification JAN 1 for Tubes, Radio Electron, which was issued on February 4, 1943. The cross reference of table I correlates the several different type numbers by which tubes have been designated in order to facilitate the use by either service of the tubes used by the other, and to identify tubes procured under previous specifications. A dash indicates the absence of an equivalent designation. The data contained in this table supersedes and enlarges upon the information published in Radio and Sound Bulletin No. 7.

In table II those tubes whose old Navy type numbers differ from the new JAN numbers are listed to facilitate cross reference. Table III lists those tubes whose old commercial designations have been changed. Identification of tubes through Army VT numbers can be established by reference to table II, page 23, Radio and Sound Bulletin No. 7.

Radio tubes procured by the Army or the Navy under Joint Army-Navy Specifications are marked with the letters "JAN" (in the case of type-approved tubes, followed by the Manufacturer's code letters) and the "JAN" type number which is in most cases identical to the commercial number. In the case of "GT" tubes listed on the cross-reference some commercial types are branded "GT/G" rather than "GT" as shown; either marking is satisfactory.

In the fall of 1942 a new system of type designations for transmitting and special purpose tubes was evolved by the Radio Manufacturers' Association in collaboration with the Army and the Navy. Its purpose is to make type numbers somewhat descriptive of the tube, as well as to prevent duplication of type numbers. In general, these designations comprise three symbols: the first number indicates approximate heater power of the tube; the letter designates general class of tube structure; and the second number gives the serial order in which the type designation has been assigned (beginning with the No. 21 in order to avoid conflict with receiving tube designations).

Ranges of heater power and classes of tube structure, with the assigned symbols contemplated for inclusion in this system are given below:

First No.	Range of heater watts	Letter	Tube structure
1	0	A	Single element.
2	0 to 10	B	Diode.
3	10 to 2[illegible]	C	Triode.
4	20 to 50	D	Tetrode.
5	50 to 100	E	Pentode.
6	100 to 200	F	Hexode.
7	200 to 500	G	Heptode.
8	500 to 1,000	H	Octode.
9	Over 1,000	J	Magnetron.
		K	Velocity modulated.
		N	Crystal rectifiers and crystal detectors.
		P	Photo-emissive.

When an old commercial type is changed to the new system, double branding will be used for some time.

TABLE I.—*Listing by JAN numbers*

JAN No.	Old commercial No.	Army VT No.	Old Navy No.
0A4-G			0A4G.
0I-A	0I-A	VT-30	0I-A.
C1B	C1B		C1B.
1A3	1A3		
1A5-GT	1A5-GT	VT-124	
1A7-GT	1A7-GT	VT-147	1A7GT.
1B4-P	1B4-P		1B4P.
1C5-GT	1C5-GT	VT-125	
1C6	1C6		1C6.
1C21			
1D5-G	1D5-G		1D5-G.
1D8-GT	1D8-GT	VT-148	
1E1	1E1		
	1E5GT	VT-170	
1E7G	1E7G		1E7-G.
1F7-G	1F7-G		
1G4-GT	1G4-GT		1G4GT.
	1G6-GT		1G6-GT.
1H5-GT	1H5-GT	VT-223	
1H6-G	1H6-G		1H6-G.
1J6-GX	1J6-GX		1J6-GX.
1L4	1L4		1L4.
1LA4	1LA4		1LA4.
1LA6	1LA6		
1LB4	1LB4		1LB4.
1LC5	1LC5		1LC5.
1LC6	1LC6	VT-178	1LC6.
1LD5	1LD5		1LD5.
1LE3	1LE3	VT-239	1LE3.
1LH4	1LH4	VT-177	1LH4.
1LN5	1LN5	VT-179	1LN5.
1N5-GT	1N5-GT	VT-146	1N5-GT.
1N21			1N21.
1P23	PJ23		
1R5	1R5	VT-171	1R5.
1S4	1S4	VT-210	1S4.
1S5	1S5	VT-172	1S5.
1T4	1T4	VT-173	1T4.
1V	1V		1V.
2A3	2A3	VT-95	2A3.
2A5	2A5		2A5.
2AP1	2AP1		2AP1.
2B7	2B7		2B7.
2C21	1642-RK-33.		38233.
2C22	7193		7193.
2C26	D-10		
2E22			
	WL442 / D2RN1		2J21.
2J22	J1RF		2J22.
2J23-29			2J23-29
2J30-34	WL441	VT-251	2J30-34.
2V3-G	2V3-G		2V3-G.
2X2	2X2/879	VT-119	2X2.
3A4	3A4		
3A5	3A5		
3A8-GT	3A8-GT	VT-149	
3AP1	906-P1		3AP1.
3B21	EL302.5		38401.
3B22	EL-1C		38405.
3B23	RK22		38222.
3B24			3B24.
3BP1	3BP1		
3C24	HK24	VT-204	
3CP1	1808-P1	VT-248	
3DP1	3DP1		
3EP1	1806-P1	VT-226	3EP1.
3FP7	3FP7		3FP7.
3GP1	3GP1		3GP1.
3Q4	3Q4	VT-264	
3Q5-GT	3Q5-GT	VT-221	3Q5-GT.
3S4	3S4	VT-174	3S4.
	SN4		
4A1	4A1		4A1.
4B22	EL5B2.5		38402.
4B23	EL5B-HD		38403.
4B24	EL-3C		38404.
4B25	EL-6C		38674A.
4B26	WL289416 D. / WE289A / 189049		38116.
4B27	GE16X897		38897.
5AP1	5AP1		
5BP1	1802-P1		5BP1.
	1802-P2		5BP2.
5BP4	1802-P4	VT-111	5BP4.
5CP1	5CP1		5CP1.
	5CP4		5CP4.
5FP7	1812 P7		5FP7.
	5BP1/XXX		5GP1.
5HP1	5HP1		5HP1.
5HP4	5HP4		
5JP1	2529A5		
5LP1	5LP1		
5R4-GY	5R4G		5R4GY.
5T4	5T4	VT-114	5T4.
5U4-G	5U4-G	VT-244	5U4-G
5V4-G	5V4-G	VT-206A	5V4-G.
5W4	5W4	VT-97	
5W4-GT	5W4-GT		
5X4-G	5X4-G		5X4-G.
5Y3-GT	5Y3-GT	VT-197A	5Y3-GT.
5Z3	5Z3	VT-145	5Z3.
5Z4	5Z4	VT-74	
6A6	6A6		6A6.
6A7	6A7		6A7.
6A8-G	6A8-G	VT-151	
6A8-GT	6A8-GT	VT151B	
6AB7	6AB7 / 1853	VT-176	6AB7.
6AC7	6AC7 / 1852	VT-112	6AC7.
6AG5	6AG5	VT-247	
6AG7	6AG7		6AG7.
6AK5	731A		6AK5.
6B4-G	6B4-G		6B4G.
6B7	6B7	VT-68	6B7.
6B8	6B8	VT-93	6B8.
6B8-G	6B8-G	VT-93A	
6C4	6C4		
6C5	6C5	VT-65	6C5.
6C5-GT	6C5-GT		
6C6	6C6		6C6.
6C8-G	6C8-G	VT-163	6C8G.
6D6	6D6	VT-69	6D6.
6E5	6E5	VT-215	6E5.
6F5-GT	6F5-GT		6F5GT.
6F6	6F6	VT-66	6F6.
6F6-G	6F6-G	VT-66A	6F6-G.
	6F6-GT		6F6-GT.
6F7	6F7	VT-70	6F7.
6F8-G	6F8-G	VT-99	6F8-G.
6G6-G	6G6-G	VT-198A	6G6-G.
6H6	6H6	VT-90	6H6.
6H6-GT	6H6-GT	VT-90A	6H6-GT.
6J5	6J5	VT-94	6J5.
	6J5-G	VT-94A	6J5-G.
6J5-GT	6J5-GT	VT-94D	6J5-GT.
6J6	6J6		
6J7	6J7	VT-91	6J7.
6J7-G	6J7-G	VT-91A	

TABLE I.—*Listing by JAN. numbers*—Continued

JAN No.	Old commercial No.	Army VT No.	Old Navy No.
6J7-GT	6J7-GT		
	6K6-G	VT-152A	
6K6-GT	6K6-GT	VT152	6K6-GT.
6K7	6K7	VT-86	6K7.
6K7-G	6K7-G	VT-86A	6K7-G.
6K7-GT	6K7-GT	VT-86B	
6K8	6K8	VT-167	6K8.
	6K8-G	VT-167A	
6K8-GT	6K8-GT		
6L5-G	6L5-G	VT-213A	
6L6	6L6	VT-115	6L6.
6L6-G	6L6-G	VT-115A	6L6-G.
6L7	6L7	VT-87	
6L7-G	6L7-G	VT-87A	
6N7	6N7	VT-96	6N7.
	6N7G		6N7-G.
6N7GT	6N7-GT	VT-96A	6N7-GT.
6Q7	6Q7	VT-92	
6Q7-G	6Q7-G		6Q7-G.
6R7	6R7	VT-88	6R7.
	6R7-G	VT-88A	
6R7-GT	6R7-GT	VT-88B	
6SA7	6SA7	VT-150	6SA7.
6SA7-GT	6SA7-GT	VT-150A	
6SC7	6SC7	VT-105	6SC7.
6SC7-GT	6SC7-GT		
6SD7-GT	6SD7-GT		6SD7GT.
6SF5	6SF5		6SF5.
6SG7	6SG7	VT-211	6SG7.
6SH7	6SH7		6SH7.
6SH7-GT	6SH7-GT		6SH7-GT.
6SJ7	6SJ7	VT-116	6SJ7.
6SJ7-GT	6SJ7-GT		6SJ7-GT.
6SK7	6SK7	VT-117	6SK7.
6SK7-GT	6SK7-GT	VT-117A	
6SL7-GT	6SL7-GT	VT-229	6SL7-GT.
6SN7-GT	6SN7GT	VT-231	6SN7-GT.
6SQ7	6SQ7	VT-103	6SQ7.
6SQ7-GT	6SQ7-GT		6SQ7-GT.
6SR7	6SR7	VT-233	6SR7.
6SS7	6SS7	VT-199	
6ST7	6ST7	VT-205	
6U5/6G5	6U5/6G5	VT-98	
6V6	6V6	VT-107	
	6V6-G	VT-107B	
6V6-GT	6V6-GT	VT-107A	6V6-GT.
	6W5-G	VT-196	
6X5	6X5	VT-126	
6X5-G	6X5-G	VT-126A	
6X5-GT	6X5-GT	VT-126B	6X5-GT.
6Y6-G	6Y6-G	VT-168A	6Y6-G.
6ZY5-G	6ZY5-G		6ZY5-G.
7A4	7A4	VT-192	7A4.
7A5	7A5		7A5.
7A6	7A6		7A6.
7A7	7A7		7A7.
7A8	7A8		7A8.
7B4	7B4		7B4.
7B5	7B5		7B5.
	7B8	VT-208	
7BP7	1813-P7		7BP7.
7C5	7C5		7C5.
7C6	7C6		7C6.
7C7	7C7	VT-193	7C7.
7CP1	1811-P1		7CP1.
7E6	7E6	VT-188	7E6.
7F7	7F7	VT-189	7F7.
7H7	7H7	VT-190	7H7.
	7J7	VT-194	
7N7	7N7		7N7.
7V7	7V7		7V7.
7W7	7W7		7W7.
7Y4	7Y4		7Y4.
7Z4	7Z4	VT-181	7Z4.
9LP7	GL455		
10	10	VT-25	10.
12A6	12A6	VT-134	12A6.
12AH7-GT	12AH7-GT	VT-207	
12C8	12C8	VT-169	
12DP7			
12GP7	ZP-488		
12H6	12H6	VT-214	12H6.
12J5	12J5	VT-135A	
12J5-GT	12J5-GT	VT-135	12J5-GT.
12K8	12K8	VT-132	12K8.
12SA7	12SA7	VT-161	12SA7.
12SC7	12SC7	VT-268	12SC7.
12SD7-GT	12SD7-GT		
12SF5	12SF5		
12SF7	12SF7		12SF7.
12SG7	12SG7	VT-209	12SG7.
12SH7	12SH7	VT-288	
12SH7-GT	12SH7-GT		12SH7-GT.
12SJ7	12SJ7	VT-162	12SJ7.
12SJ7-GT	12SJ7-GT		12SJ7-GT.
12SK7	12SK7	VT-131	12SK7.
12SK7-GT	12SK7-GT		12SK7-GT.
12SL7-GT	12SL7-GT	VT-289	12SL7-GT.
12SN7-GT	12SN7-GT		12SN7-GT.
12SQ7	12SQ7	VT-104	12SQ7.
12SQ7-GT			12SQ7-GT.
12SR7	12SR7	VT-133	12SR7.
12SR7-GT	12SR7-GT		
14F7	14F7		14F7.
14N7	14N7		14N7
15-E	15E		15E.
15-R	15R		15R.
	FG-17		38217. (0517).
19	19		19.
22	22	VT-26	22.
24A	24A	VT-28	24-A.
25L6	25L6	VT-201	
25L6-GT	25L6-GT	VT-201C	25L6-GT.
25Z5	25Z5		25Z5.
27	27	VT-29	27.
30	30	VT-27	30.
31	31	VT-31	31.
32	32	VT-44	32.
33	33	VT-33	33.
34	34	VT-54	34.
	RK34	VT-224	
35	35	VT-35	35.
35L6-GT	35L6-GT		35L6-GT.
35Z5-GT	35Z5-GT		35Z5-GT.
36	36	VT-36	36.
37	37	VT-37	37.
38	38	VT-38	38.
39	39	VT-49	39.
40	40	VT-40	40.
41	41	VT-48	41.
42	42		42.
43	43		43.
45	45	VT-45	45.
46	46	VT-63	
47	47	VT-47	47.
50	50	VT-50	50.
53	53		53.
53-A	53-A		
56	56	VT-56	56.
57	57	VT-57	57.
58	58	VT-58	58.
59	59		59.
71-A	71-A		71-A.
72-R	RKR-72		RKR-72.
73-R	RKR-73		RKR-73.
75	75	VT-75	75.
76	76	VT-76	76.
77	77	VT-77	77.
78	78	VT-78	78.
79	79		79.
80	80	VT-80	80.
81	81		81.
82	82		82.
83	83	VT-83	83.
83-V	83V		83V.
84	84	VT-84	84.
85	85		85.
89	89	VT-89	89.
100TH	100TH	VT-218	
112-A	112-A		112A.
114-B	HY114B	VT234	
120	ZB120, C120		38220.

TABLE I.—*Listing by JAN. numbers*—Continued

JAN No.	Old commercial No.	Army VT No.	Old Navy No.
128-A	128-A		
203-A	203-A		203A.
204-A	204-A	VT-22	204A.
207	207	VT-34	207.
211	211	VT-4B, VT-4C	211.
212-E	212-E		38112.
	215-A		38015.
217-C	217-C		217C.
227-A	227-A		227-A.
250TH	250TH	VT-220	
	250TL	VT130	
274-B	274-B		274-B.
282-B	282-B		38282.
304TH	WL535, 304TH	VT-254	304TH.
304TL	WL525, 304TL	VT-129A	
307-A	WE307A	VT-225	
312-A	WE-312A		38412.
316-A	WE316A	VT-191	316-A.
327-A	327-A		327-A.
	WE350A	VT-230	
371-A	WE371A	VT-166	
393-A	WE393-A		
394-A	WE394A		
	WL417	VT277	
450TH	450TH, WL450	VT-108	19.
464	ZP464		22.
471-A	GL471A		24-A.
	ZP486	VT-256	
	SS-501		
	WL530	VT122	
	WL531	VT-141	
	ZG-532, WL532		
532-A	WL532A, GL532-A		
	575A, GL512, UE975	VT-187	
615	HY-615	VT-235	615.
	631P1		
	648P1		
700-ABCD	WE700-A BCD.		
700AY-DY	WE700A Y-DY.		
701-A	WE701A		701A.
702-A	WE702A		702A.
703-A	WE703A		703A.
704-A	WE704-A		704-A.
705-A	8021, WE705A	VT-255	705A.
706-AY-GY	WE706A GY, WL-443		706AY-GY
707-A	WE707-A		707A
708-A	WE708A		708A.
709-A	WE709A		709A.
	WE710A	VT-240	
713-A	WE713A		713A.
714-AY	WE714AY		
715-A	WE715A		715A.
715-B	WE715-B		715B.
717-A	WE717A	VT-269	717A.
718AY-EY	WE718A Y-EY.		
719A	WE719A		
721-A	WE721-A		721A.
722-A	WE722A		722A.
723-A	WE723A		
	WE724A		724A.
726-A	WE726A		
	WE729A		729A
800	800, RK-30	VT-64	
801	801A/801	VT-62	801, 801A.
803	803, RK28-A, WE322A	VT-106	803.
805	805, UE905, WE331A	VT-143	805.
807	807, RK39, HY-61/807	VT-100, VT-100A	807.
808	808		808.
809	809		809.
811	811	VT-217	811.
812	812		
813	813	VT-144	813.
814	814, RK-47	VT-154	814.
815	815	VT-287	
816	816	VT-216	
826	826		826.
829	829	VT-259	829.
	829A		829A.
832	832	VT-118	832.
	832-A	VT-286	832 A.
833-A	833A		833A.
	834, WE 304B, UE-B W11, UH-50		
836	836	VT-236	836.
837	837	VT-101	837.
838	838		838.
841	841	VT-51	
842	842	VT-72	842.
843	843	VT-73	843.
845	845, UE-945, R845, WE284D	VT-43	845.
846	846, F-346A		846.
849	849, UE-949		849.
850	850	VT-60	850.
851	851, UE-951	VT-41	8 5.
852	852, UE-952		852.
857B	857B		857B.
858	858, F-358A		858.
860	860	VT-17	860.
861	861	VT-19	861.
862	862		862.
864	864	VT-24	864.
865	865	VT-55	865.
866-A	866A/866	VT-46A	866A.
868	868		868.
		VT-39A	869A.
869-B	869B		
870-A	870A		870A.
871	871		871.
872	872	VT-42A	
872-A	872A, UE-972A, F353A, WE319A		
874	874		874.
876	876		876.
878	878		
884	884	VT-222	884.
885	885		
886	886		886.
893	893		893.
902	902-P1		902-P1.
918	918	VT-246	918.
921	921		
923	923	VT-252	923.
927	927		927.
953-B	HK953B		
954	954	VT-120	954.

TABLE I.—*Listing by JAN numbers*—Continued

JAN No.	Old commercial No.	Army VT No.	Old Navy No.	JAN No.	Old commercial No.	Army VT No.	Old Navy No.
955	955	VT-121	955.	2051	{2051 / WL630 / R4410}	VT-109	
956	956	VT-238	956.				
957	957	VT-237	957.	7193	7193		7193.
958	958	VT-212	958.	8005	8005		
958-A	958A		958A.	8011	{WL538 / Br. VT90}		8011.
959	959		959.	8012	8012	VT228	8012.
991	991		991.	8014-A	8014A		8014A.
1005	CK1005	VT-195	1005.	8016	8016		
1006	CK1006			8020	{8020 / GL-451 / WL578}		8020.
	E1148	VT-232		8025	8025		
1201 (7E5)	1201	VT-241	1201.	9001	9001		9001.
1203-A (7C4)	1203A	VT-243	1203A.	9002	9002	VT-202	9002.
1291 (3B7)	1291	VT-182	1291.	9003	9003	VT-203	9003.
1294 (1R4)	1294	VT-184	1294.		9004		9004.
1299 (3D6)	1299	VT-185	1299.	38111-A			38111A.
1613	1613	VT-175		38142		VT-52	38142.
1616	1616	VT-266	1616.	VR-75-30	VR-75-30	VT-260	38275.
1619	1619	VT-164		VR-90-30	VR-90-30	VT-184	38290.
1624	1624	VT-165	1624.	VR-105-30	VR-105-30	VT-200	38205.
1625	1625	VT-136	1625.	VR-150-30	VR-150-30	VT-139	38250.
1626	1626	VT-137	1626.	VT-25-A		VT-25A	
1629	1629	VT-138	1629.	VT-67		VT-67	
1630	1630		1630.	VT-153		VT-153	
1635	1635		1635.	VT-250	EF-50	VT-250	
1636	1636		1636.				
1641	1641						
	S-836		1960.				
2050	2050	VT-245	2050.				

TABLE II.—*Listing by old Navy designations*

Old Navy No.	JAN No.	Old Navy No.	JAN. No.
1201	1201 (7E5).	38250	VR-150-30.
1203A	1203A (7C4).	38275	VR-75-30.
1291	1291 (3B7).	38278	Obsolete.
1294	1294 (1R4).	38282	282-B.
1299	1299 (3D6).	38290	VR-90-30.
38015	Obsolete.	38401	3B21.
38111-A	38111-A.	38402	4B22.
38112	212-E.	38403	4B23.
38116	4B26.	38404	4B24.
38120	Obsolete.	38405	3B22.
38142	38142.	38412	312-A.
38205	VR-105-30.	38674	Obsolete.
38217 (0517)	Obsolete.	38674-A	4B25.
38220	120.	38897	4B27.
38222	3B23.	RKR-72	72R.
38233	2C21.	RKR-73	73-R.

TABLE III.—*Listing by old commercial designations*

Old commercial No.	JAN. No.	Old commercial No.	JAN No.
C-120	120.	WL443	706A.
CK-1005	1005.	WL525	304TL.
CK-1006	1006.	WL535	304TH.
D-10	2C26.	WL289416D	4B26.
EF-50	VT-250.	ZB-120	120.
EL-1C	3B22.	ZP488	12GP7.
EL-3C	4B24.	1201	1201 (7E5).
EL-6C	4B25.	1203A	1203A (7C4).
EL-5B-HD	4B23.	1291	1291 (3B7).
EL-5B2.5	4B22.	1294	1294 (1R5).
EL-302.5	3B21.	1299	1299 (3D6).
GE-16X897	4B27.	1642	2C21.
GL-451	8020.	1802-P1	5BP1.
GL-455	9LP7.	1802-P4	5BP4.
HK-24	3C24.	1808-P1	3EP1.
HY-114B	114B.	1811-P1	7CP1.
HY-615	615.	1813-P7	7BP7.
J1RF	2J22.	1852	6AC7.
PJ23	1P23.	1853	6AB7.
RK-22	3B23.	189049	4B26.
RK-30	800.	2529A5	5JP1.
RK-33	2C21.	2X2/879	2X2.
RKR-72	72-R.	5BP1/XXX	5BP1.
RKR-73	73-R.	731A	6AK5.
VT90 (British)	8011.	8021	705A.
WE289A	4B26.	906-P1	3AP1.
WL441	2J30-34.		

THE FORUM

AN INFORMAL DISCUSSION OF COMMUNICATION MATERIAL MATTERS OF INTEREST TO THE SERVICE

The discussions contributed to this section of the Bulletin are of great value to the Bureau. Most of the contributions in the past have been very thorough, indicating considerable time and thought on the part of the author. The Bureau realizes that the requirements of wartime service leave little time for carrying out research projects or for preparing reports. Nevertheless, the observations of personnel on the performance of Radio and Sound equipment under wartime operating conditions are of great importance.

It is hoped, therefore, that suggestions, comments, experiences, difficulties, and other matters of interest will continue to be sent in by the service. They may be prepared as briefly and informally as necessary. They should be addressed to the Bureau of Ships via the commanding officer.

* * *

FAILURE OF D. C. EXCITER GENERATOR

The following report has been received from the Commandant, U. S. Naval Station, Tutuila, Samoa:

"Failure of one of the power units used with Type SCR 271-A radar recently occurred because of a developed fluctuating voltage from the 30-kw A. C. generator. A steady voltage could be obtained only by reducing the output voltage from 210 to about 170.

"By interchanging parts from an adjacent duplicate power unit, the cause of the trouble was definitely traced to the frame of the D. C. exciter generator, which apparently was being operated in an over-saturated condition. Examination of the frame revealed sand holes extending the full width of the yoke, leaving it quite porous in places. Oxidation in the porous section further increased the reluctance of the magnetic path between poles to the point of over saturation, where a considerable portion of the magnetic field was through air and subject to slight variation. This trouble was rectified by fitting a soft iron band, ½ inch thick and 5½ inches wide, about the outer circumference of the exciter generator frame. The result was a perfectly steady voltage."

Bureau comment.—The analysis and remedy of the difficulty shows unusual intelligence and ingenuity on the part of the operating personnel. Concise reports of this type are appreciated by the Bureau.

* * *

DRAINAGE OF PROTECTIVE CONDUIT

The following item is taken from the Radio Installation Bulletin:

"Upon removal of the ⅞-inch concentric transmission line of a model TBS series installation from the protective conduit on the mast to locate a ground, the line was found to be flattened for a length of sev-

eral feet. It had been flattened to an extent where the center conductor and outer tubing were making contact between each insulating bead, and the outlines of the beads were visible. On investigation it was found that water had formed in the lower end of the protective conduit, either from leakage or condensation, and had frozen, the expansion in freezing having caused the flattened condition of the transmission line. This experience indicates that the lower end of the conduit should not be sealed or suitable drainage holes should be provided."

* * *

AN EMERGENCY TRANSMITTER

Navy Yard, Charleston, submits a brief description of a three-watt transmitter developed for use as a means of emergency communication. Because of its extreme simplicity and inexpensive construction, the transmitter may have application elsewhere.

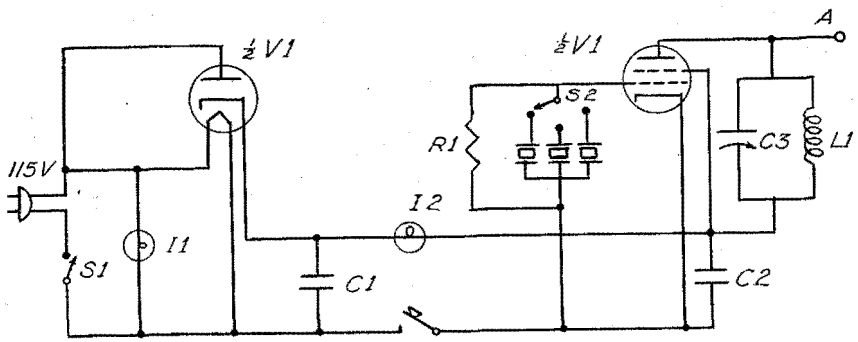

FIGURE 1. A three-watt emergency transmitter.

The circuit is given in figure 1. Because no power transformer is employed, it is recommended that all parts be insulated from the chassis, and the chassis should not be used for ground. Using a 160-meter tank coil (L1), it is necessary to short out six turns in order to operate between 2,656 and 2,844 kilocycles.

PARTS LIST

V1	117L7GT
I1	Pilot.
I2	6.2-volt flashlight bulb.
C1	16 mfd. 150-volt electrolytic.
C2	0. 01 mfd. 600-volt paper.
C3	100 mmfd. midget variable.
R1	50,000 ohms, 1/2 watt.
S1	115-volt A. C. switch.
S2	Rotary band switch.
L1	160-meter oscillator coil.

TECHNICAL PAPERS

The following technical papers on radio and sound subjects have been listed by the Navy Research Laboratory as received from November 15, 1942, to January 15, 1943. Requests are received from time to time by the Bureau and the Naval Research Laboratory for copies of these papers. However, there are no provisions for circulating the publications containing these articles. This list is published for the purpose of keeping interested personnel informed on the current literature in the field.

(NOTE.—Asterisk (*) preceding entry indicates that an abstract only is available in the library.)

Aircraft:

Arrangement for communication between a trailing aircraft and a trailed aircraft. Bergtold. Hochf. tech. u. Elek. akus. 59; 61; February 1942. Microfilm 17 (OSS 10–102).

Method of improving the sharpness of indication of an equi-signal guiding beam. Wen. Hochf. tech. u. Elek. akus. 59; 63–64; February 1942. Microfilm 17 (OSS 10–102).

An aircraft marker receiver, U. H. F. test oscillator. McKee. Communications. 22; 5–7; November 1942.

Aircraft radio compass and communication receiver. Green. AWA Tech. Rev. 6; 17–35; No. 1; 1942.

A low-power aircraft transmitter. Honnor. AWA Tech. Rev. 6; 37–41; No. 1; 1942.

Ultra-high frequency radio-range and marker receivers for aircraft. Builder. AWA Tech. Rev. 6; 1–15; No. 1; 1942.

Aircraft communications. McKee. Comm. 22; 22–26; December 1942.

New uhf landing system at LaGuardia. Electronic Ind. 1; 62–64; January 1943.

Snowstorm shifts radio beam. Electronic Ind. 1; 47; January 1943.

Amplifiers:

A design for new technical amplifiers. Schlechtweg. E. N. T. 19; 41–44; March/April 1942. Microfilm 70 (OSS 218).

Graphical determination of power amplifier performance. Sarbacher. Electronics. 15; 52–56; December 1942.

Circuit for the differential automatic-amplification-control of two or more different frequency bands. Boucke. Hochf. tech. u. Elek. akus. 59; 63; February 1942. Microfilm 17 (OSS 10–102).

Diminution of variations of amplification by negative feedback, referred to the same amplification factor. Peters. Hochf. tech. u. Elek. akus. 59; 46–50; February 1942. Microfilm 17 (OSS 10–102).

High efficiency R. F. amplifiers. Radio-craft 14; 146–147; December 1942.

High-sensitivity D. C. amplifiers. Hay. W. W. 49; 9; January 1943.

Behavior of a balanced D. C. amplifier. Spencer. R. S. I. 14; 10–14; January 1943.

Response of video amplifiers. Preisman. Comm. 23; 29–32; January 1943.

Comparison of voltage and current-feedback amplifiers. Schulz. I. R. E. 31; 25–28; January 1943.

Antennas:

Aircraft antenna characteristics. Holmes. Electronics. 15; 46–48; December 1942.

Shunt condenser aerial coupling. Amos. WE; 19; 549–554; December 1942.

**On the optimum design of two-element radiation-coupled directive aerials.* Sammer. Arch. f. Elektrot. 36; 331–332; May 1942. WE 3584.

On the determination of the radiation diagrams of radiator groups. Kleinwachter. T. F. T. 30; 341–347; Dec. 1941. Microfilm No. 23 (OSS 76) WE. 3586.

The measurement of the electric rotating field in the near field of a transmitter. Grosskopf. Hochf. tech. u. Elek. akus. 59; March 1942. Translation in NRL Microfilm No. 31 (OSS 104).

Radiation from curved high-frequency conductors. Williams. Penn. State Coll. Eng. Exper. Sta. Series. No. 55; 1942.

Response of video amplifiers. Preisman Comm. 22; 16–20; December 1942.

**Analyzing amplifiers diagrams.* Chadbourne. Int. Projectionist. 17; No. 10/11; 7–9; October 1942.

New circular FM antennas. Radio-craft 14; 201; January 1943.

Polar diagrams of ultra-short wave horizontal transmitting aerials. Banerjee. Indian J. Phys. 25; 211–218; August 1942.

Bridges:

Inexpensive portable capacity bridge. Poling. Radio News. 29; 26–27 February 1943.

A variable ratio-arm conductivity bridge. Luder. R. S. I. 14; 1–3; January 1943.

Broadcasts:

Broadcast station safety. Sabotage protection data. Phillips. Comm. 22; 16; and 34; September 9, 1942.

WABC-key station of the Columbia broadcasting system. Ostlund. Elect. Comm. 21; 61–72; No. 1; 1942.

Cathode followers:

The performance of the cathode follower circuit. Electronic Engg. 15; 290–93; December 1942.

The cathode follower. Lockhart. Electronic Engg. 15; 287; December 1942.

Cathode ray tubes:

A new frequency-comparison circuit for the cathode-ray tube. Rawcliffe. I. E. E., J. 89; Pt. 3; 191–194; December 1942.

Circuits:

The steady state response of circuits. Part II. Waidelich. Communications 22; 13–14; November 1942.

A push-pull circuit for D. C. voltage amplification. Kerkhof. Zeitschr. f. Phys. 119; 43–48; March 1942. Microfilm 40; (OSS 116).

Coaxial conductors:

A special type of concentric line as ultra-short-wave resonator. Steyskal. Zeitschr. f. tech. Phys. 23; 103–107; 1942; Microfilm 46; (OSS 122).

On the skin effect in coaxial cables. Wiechowski. Hochf. Tech. u. Elek. akus. 59; 174–179; June 1942. WE 3488 Microfilm No. 59 (OSS 224).

The measurement of the characteristics of concentric cables at frequencies between 1 and 100 megacycles per second. Jones. I. E. E. J. 89; 213–220; December 1942.

Coils:

The optimum damping of coils with compressed-power coils. Lohrmann. Hochf. tech. u. Elek: akus. 59; 150–151; May 1942. Microfilm No. 51 (OSS 153).

Condensers:

A simple and effective condenser tester. Bertin. Radio-craft 14; 82–83; November 1942.

Distribution of D. C. potential in the series connection of ceramic condensers. Lieblang. E. T. Z. 63; 387; August 1942.

Condenser smoothing. Banner. Wireless world. 48; 190–1; August 1942.

Converters:

Limits of performance of hot-cathode converter tubes. Kluge. E. T. Z. 63; 201–207; May 1942. Microfilm 31; (OSS 104).

Detectors:

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