WAR DEPARTMENT TECHNICAL MANUAL

TM-E 30-480

This manual supersedes TM 30-480, 21 September 1942.

HANDBOOK ON JAPANESE MILITARY FORCES

WAR DEPARTMENT • 1 OCTOBER 1944

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CONTENTS

NEW INTRODUCTION by David C. Isby
AFTERWORD by Jeffrey L. Ethell

FOREWORD

1. This handbook on Japanese Military Forces (TM-E 30-480) has been prepared by the United States War Department, with the assistance and cooperation of representatives from the following headquarters:

British War Office.
General Headquarters, Southwest Pacific Area.
Southeast Asia Command, and General Headquarters, India.
Headquarters, United States Army Forces in South Pacific Area.
Headquarters, United States Army Forces in Central Pacific Area.
Allied Land Headquarters, Australia.

In general, it represents the agreed views of these headquarters at the time this hand book was written.

For the most part, the material contained in this handbook is based on information obtained in operations to 30 June 1944. This has been supplemented by study of Japanese Army manuals and other official and unofficial documents published by the Japanese before and after the beginning of hostilities, and by reports and observations of American and British military attachés and obseervers.

2. **PURPOSE AND SCOPE.** The purpose of this handbook, which constitutes a revision of TM 30-480, 21 September 1942, is to give in a single publication the broad outlines as well as pertinent details of the organization, equipment, and training of the Japanese Army. In addition, Japanese tactical doctrines and techniques, as set forth in their manuals and observed in action, are discussed. The handbook is not intended to be complete or final; detailed information on particular subjects may be found in the special publications already available or in preparation by the various agencies and commands concerned.

3. **LANGUAGE DIFFICULTIES.** In cases where confusion might result, Romaji or the romanized form of the Japanese terms is given, together with the translation. A Japanese-English and English-Japanese glossary of the more important items is also included.

Because of differences in American, British, and Japanese terminology for certain army units, a translation of the Japanese terms has been used throughout. Thus units of all arms and services are called regiments, battalions, companies, platoons, and squads (sections). For American readers the change in terminology should cause no particular confusion except that some Japanese regimental organizations, especially in the Cavalry and the Engineers, correspond more closely to battalions in that they contain only three or four companies.

Since the handbook is intended for use by both American and British forces, commonly accepted or understood military terms of both nations have been used. Where no common term exists, both British and American terms appear, the British in parentheses.

4. **REVISIONS.** It is intended to keep the handbook up to date with necessary revisions and corrections as further information becomes available. In order that this may be facilitated, it is requested that all suggestions for changes or additions be communicated to the Military Intelligence Division, War Department, Washington 25, D. C.

Figure 1. Japanese infantry soldier.

Section IV. SIGNAL EQUIPMENT

1. **GENERAL.** The following data have been derived from the examination of Japanese signal equipment.

2. **RADIO EQUIPMENT. a. Ground.** (1) The Japanese place most emphasis on wire communication. However, radio is used initially where communications must be established rapidly or where other means are not practicable. After wire communications have been established, radio assumes a secondary role as a stand-by communication link except where other means cannot be employed.

(2) Apparatus, to date, is of obsolescent design. Circuits and components are comparable with those used by the Allied Nations between 1935 and 1937. Transmitters and receivers almost invariably have wide frequency ranges and use plug-in coils to cover the various bands. In regiments or smaller units, transmitters generally vary from approximately 1 to 50 watts. High-powered sets (500 watts and above) are used primarily for Army administrative traffic and air/ground liaison. Simple Hartley oscillator circuits, connected directly to the antenna, are used. The smaller receivers employ regenerative detectors without radio frequency amplification. While such arrangements are simple to service and maintain, the frequency stability suffers greatly. It therefore would be difficult to "net" these radio sets and keep them on frequency.

(3) A great variety of small transceivers and transmitter-receiver combinations of 1 to 2 watts power are in operation. Such sets are usually manpack. The transceivers are contained in one case which is carried on the chest; the batteries are carried in another case on the back. In the small transmitter-receiver models, the transmitter, receiver, batteries, and the hand generator for transmitter power, are all carried in separate cases, making it necessary for two to three men to pack and operate a set. Sets of from 10 to 50 watts power are usually of the portable type, and are carried in 4 or 5 separate cases. Power connections are made by means of plugs and cables. The sets, in general, have a complexity of control which does not permit ease of operation. The many controls of the Direction Finder and Intercept Receiver, Model 94 (1934), Type 1, indicate that a comparatively long time is necessary to obtain an accurate "fix" on a transmitter. It must be borne in mind, however, that Japanese operators are well trained and capable of making good use of their equipment.

(4) Most of the transmitters have provision for crystal operation, and, although few crystals have been found, it is reasonable to assume that crystal operation is used extensively. All crystal operated Army ground sets also can be employed as master oscillators.

(5) Since many ammeters, both for antenna and power, are supplied with separate shunts, the same meter movement can be used for many different sets.

(6) Examination of equipment shows that there is little indication of moisture- or fungus-proofing.

(7) All phone transmitters are amplitude modulated, and there is no evidence of frequency modulation.

(8) Technical characteristics and photographs of sets used by Japanese ground forces are illustrated in figures 337 to 354.

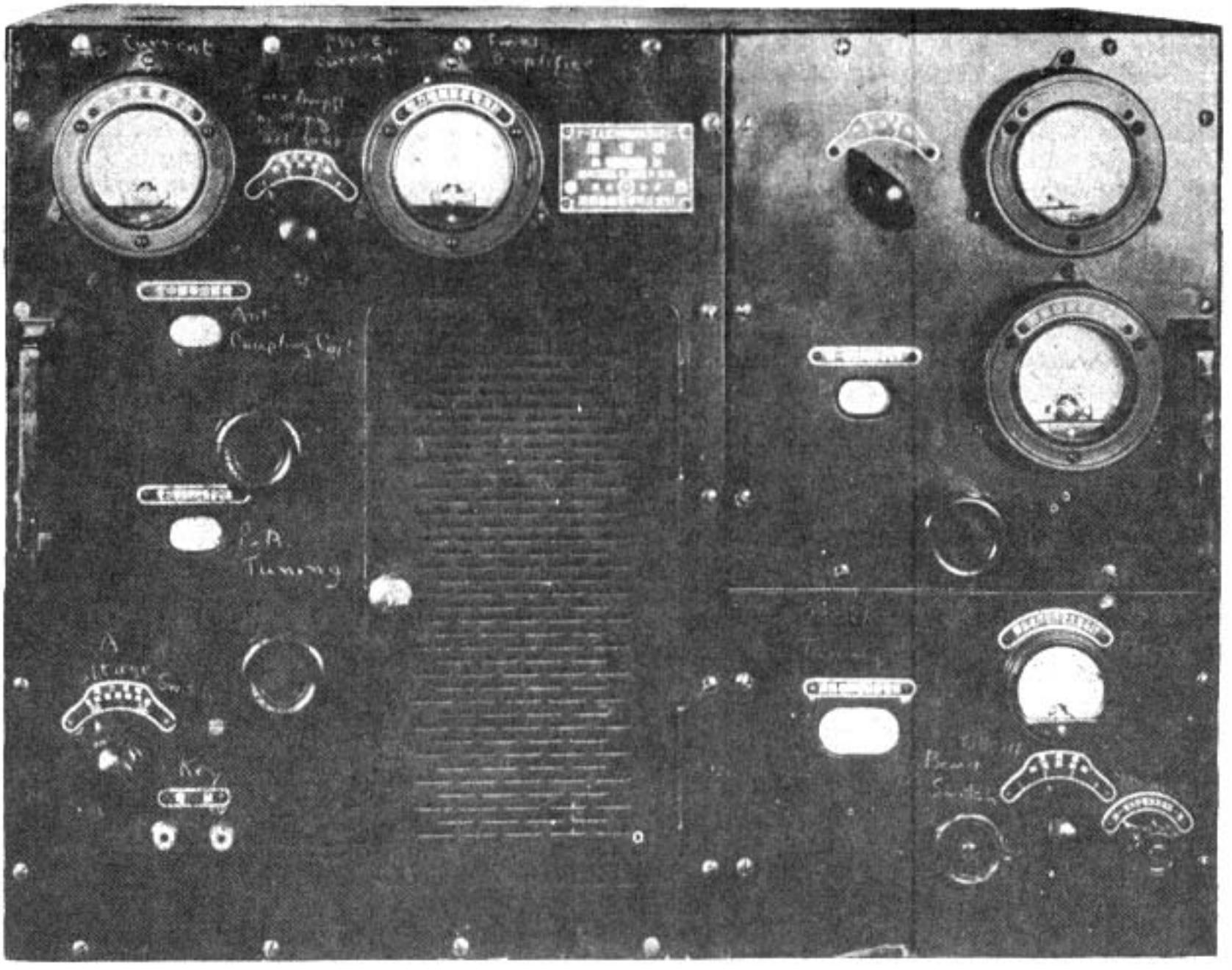


Figure 337. Model TE-MU Type 2. Transmitter. Front view.

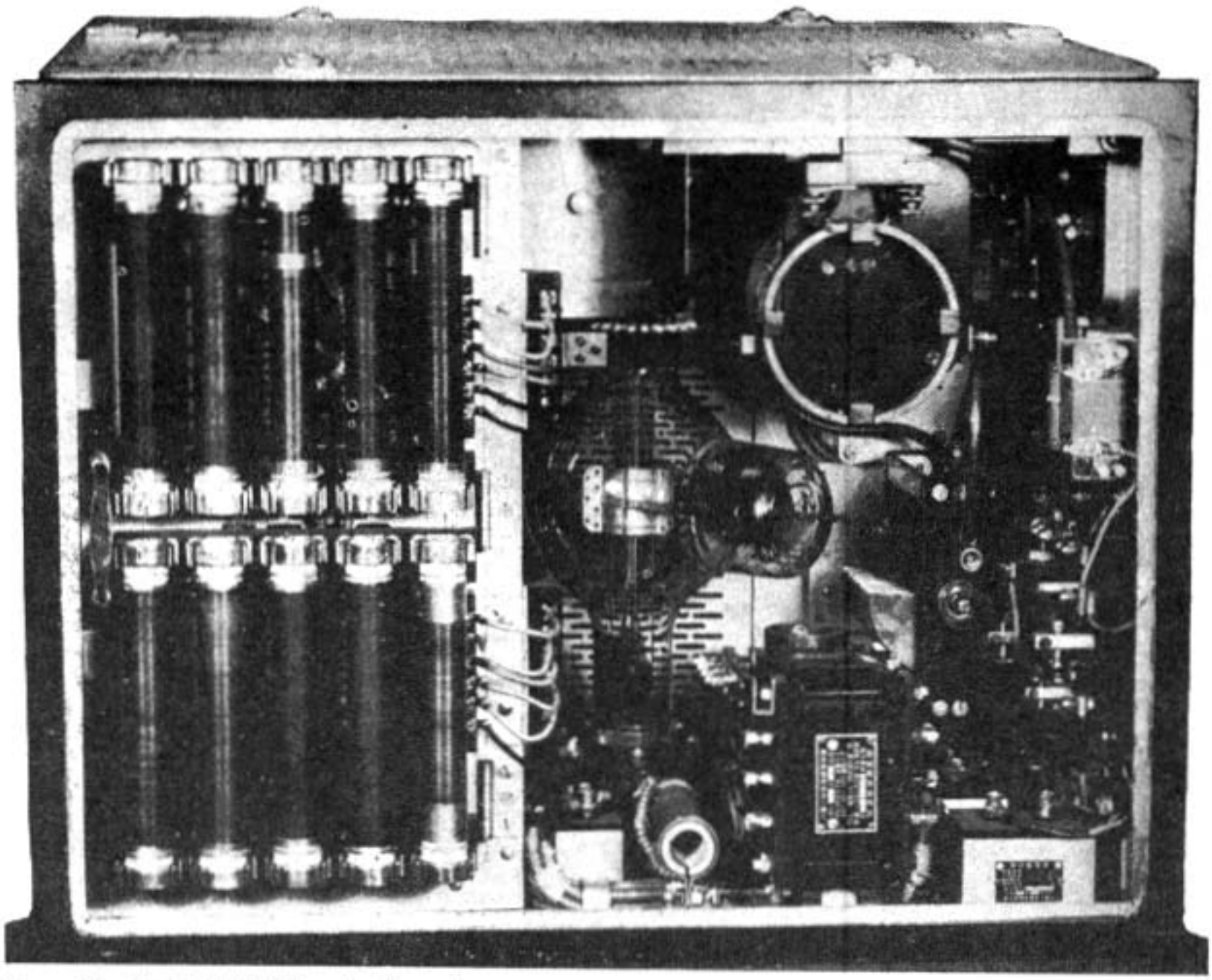


Figure 338. Model TE-MU Type 2. Transmitter. Rear view. Tube shown is Japanese Type UV812, Mfgd. by Tokyo Electric Co.

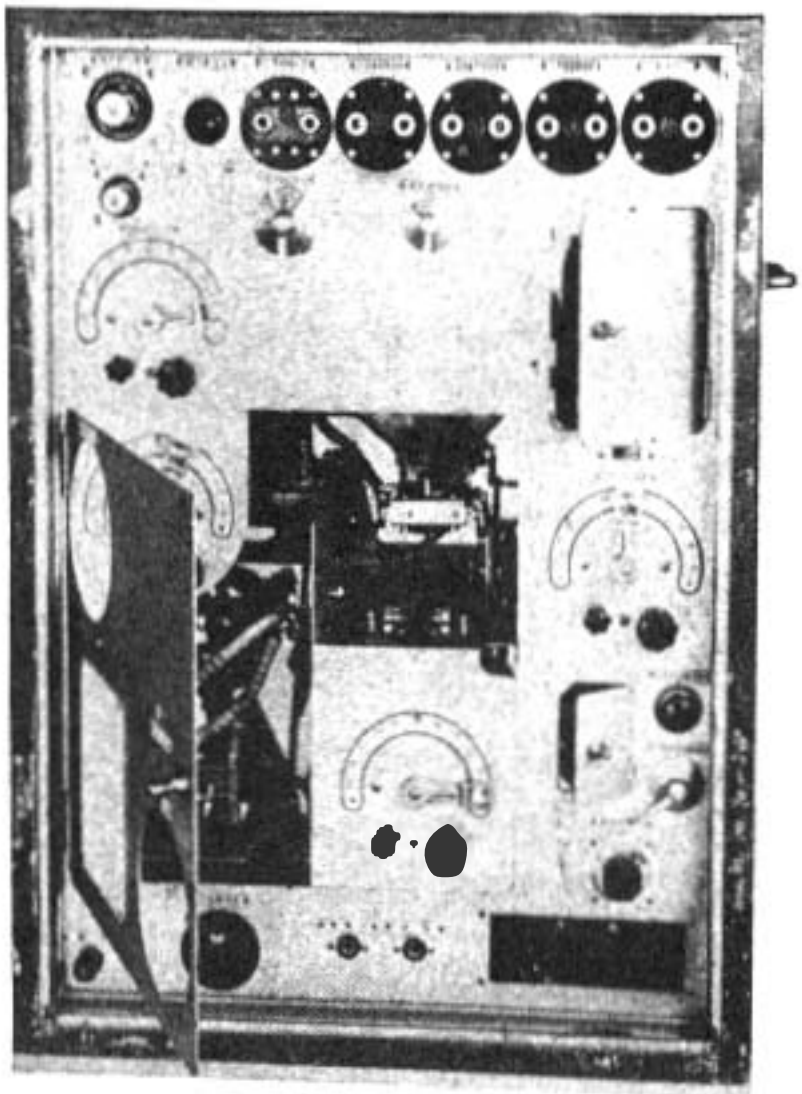


Figure 339. Model 94 Type I. Transmitter. Front view. 140-15000 KC. MOPA. 275 watts.

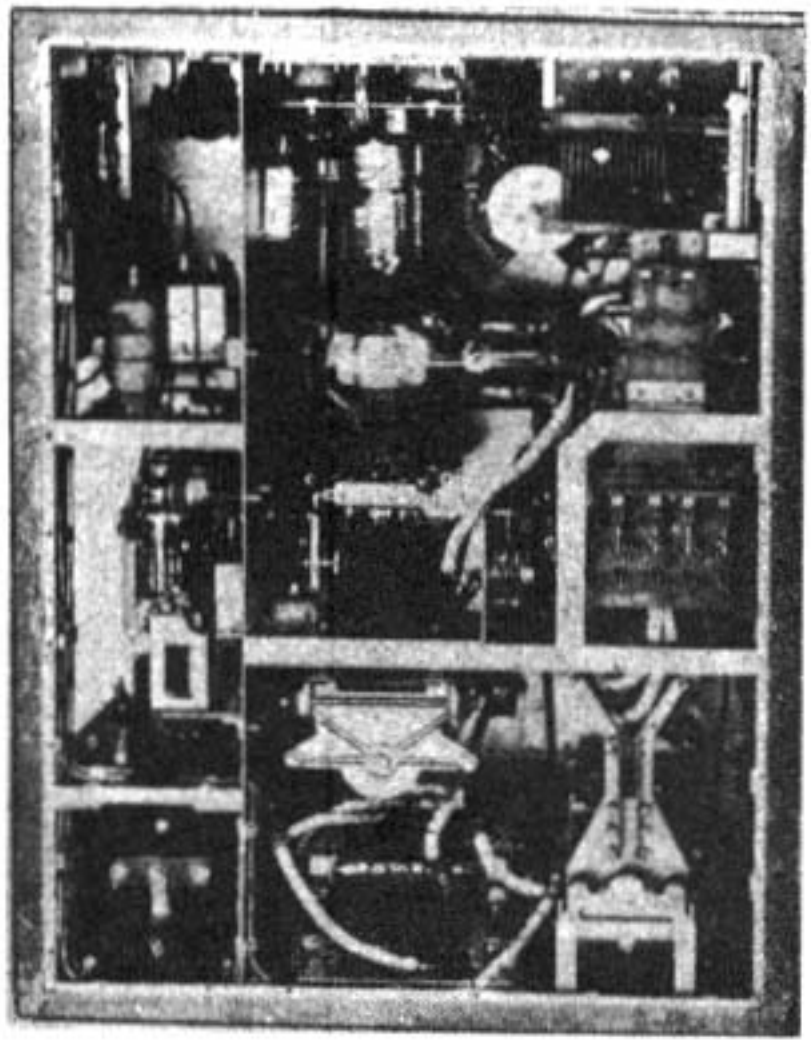


Figure 340. Model 94 Type I. Transmitter. Rear view. 140-15000 KC. MOPA. 275 watts. Tube at left of photo is Japanese Type UY511-B master oscillator. Two screen grid tubes in center are parallel connected PA Tubes, Japanese Type UV812.

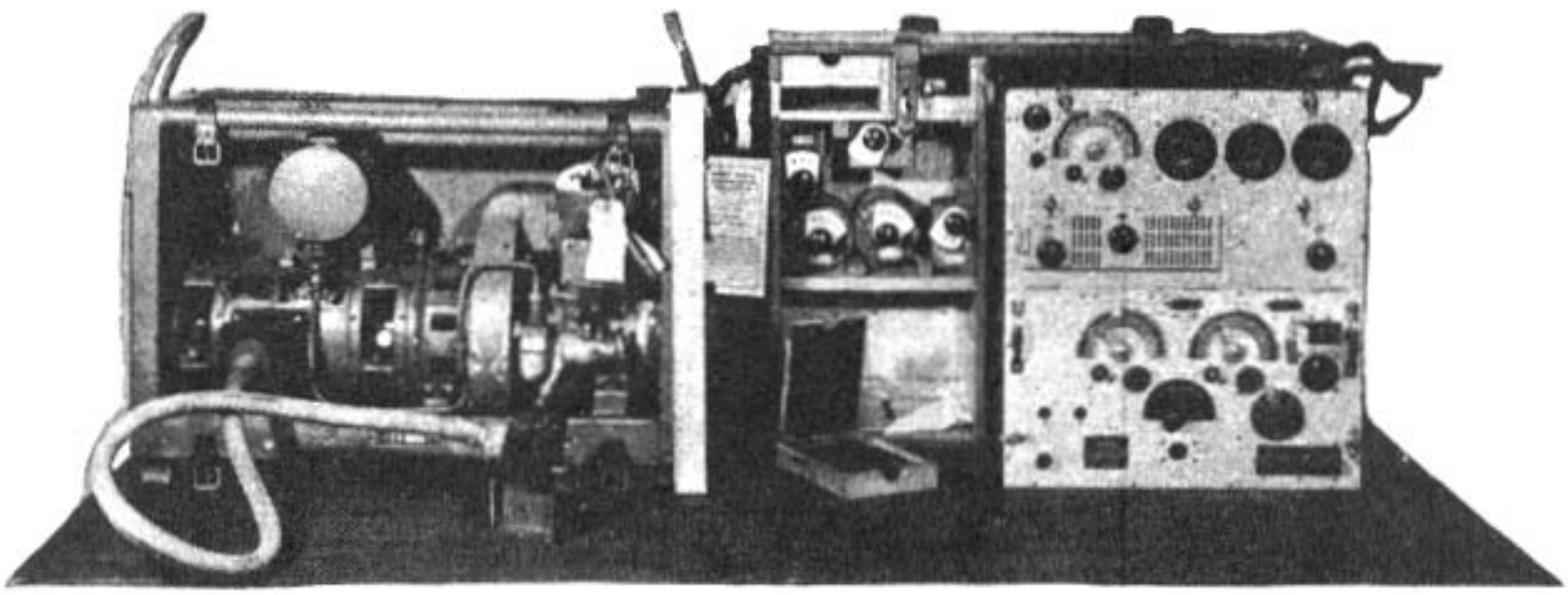


Figure 341. Model 94 Type 2B. Transmitter-receiver. No. 55-D Transmitter. 950-6675 KC. 200 watts. Shown with power supply. Gas driven motor generator delivers 1300 volts DC.

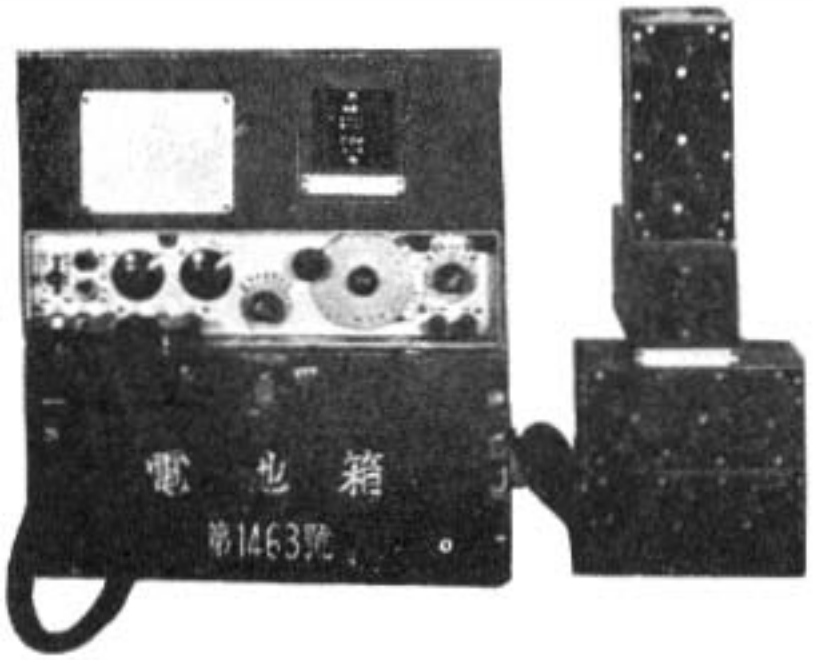


Figure 342. Model 94 Type 2B. Transmitter-receiver. No. 27 receiver. 140-15000 KC. 7 plug-in coils. Power supply—batteries.

Figure 343. Model 94 Type 5. Transmitter-receiver Model 32. Transmitter. Operates CW or phone. Used with receiver shown below.

Figure 344. Model 94 Type 5. Transmitter-receiver Model 32. Receiver. Used with transmitter shown above.

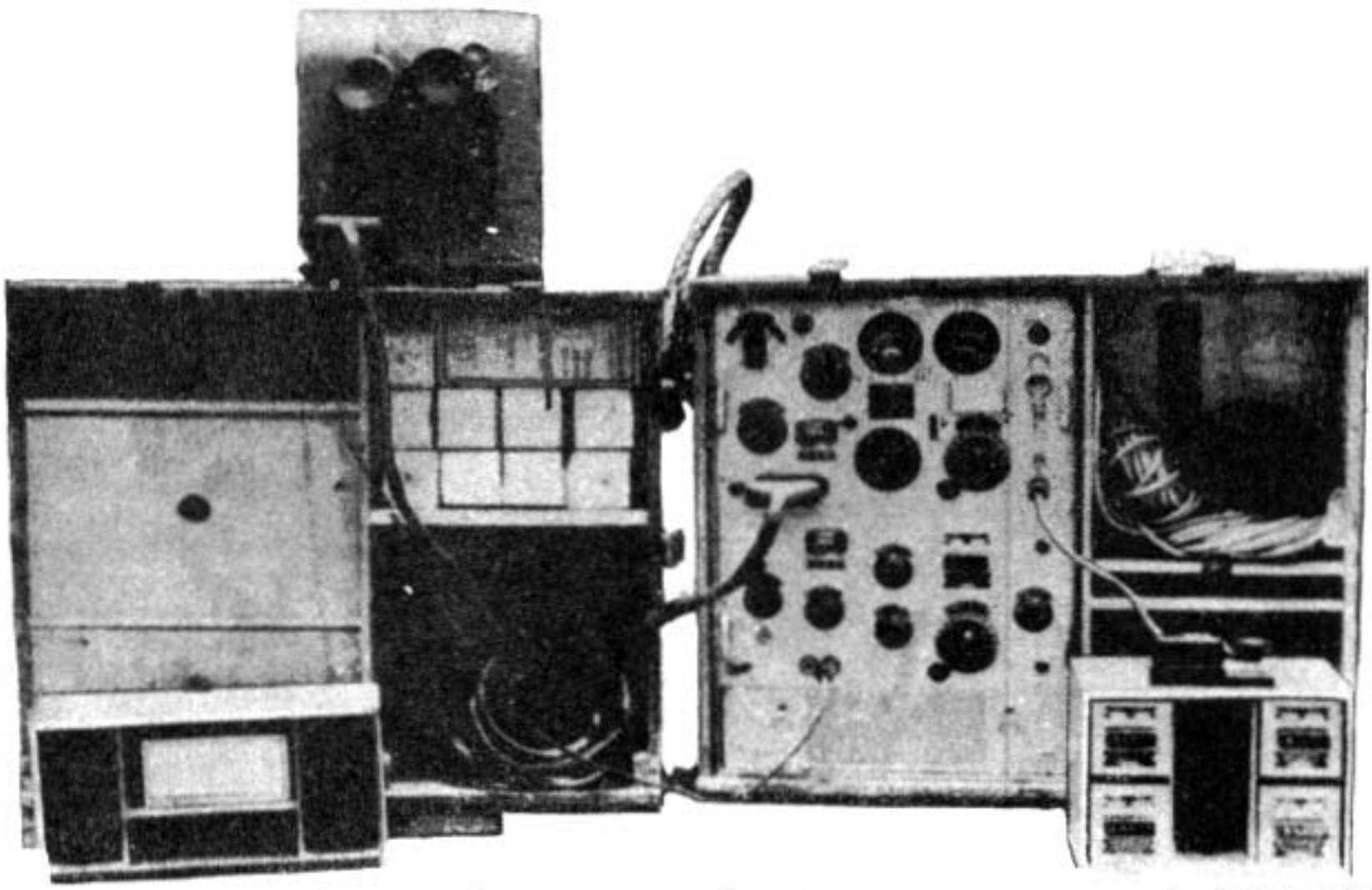


Figure 345. Model 94 3A No. 20. Transmitter-receiver. Transmitter. 400-5700 KC. 15 watts. CW only. Power supply—hand generator. Receiver. 350-400 KC. Power supply—batteries.

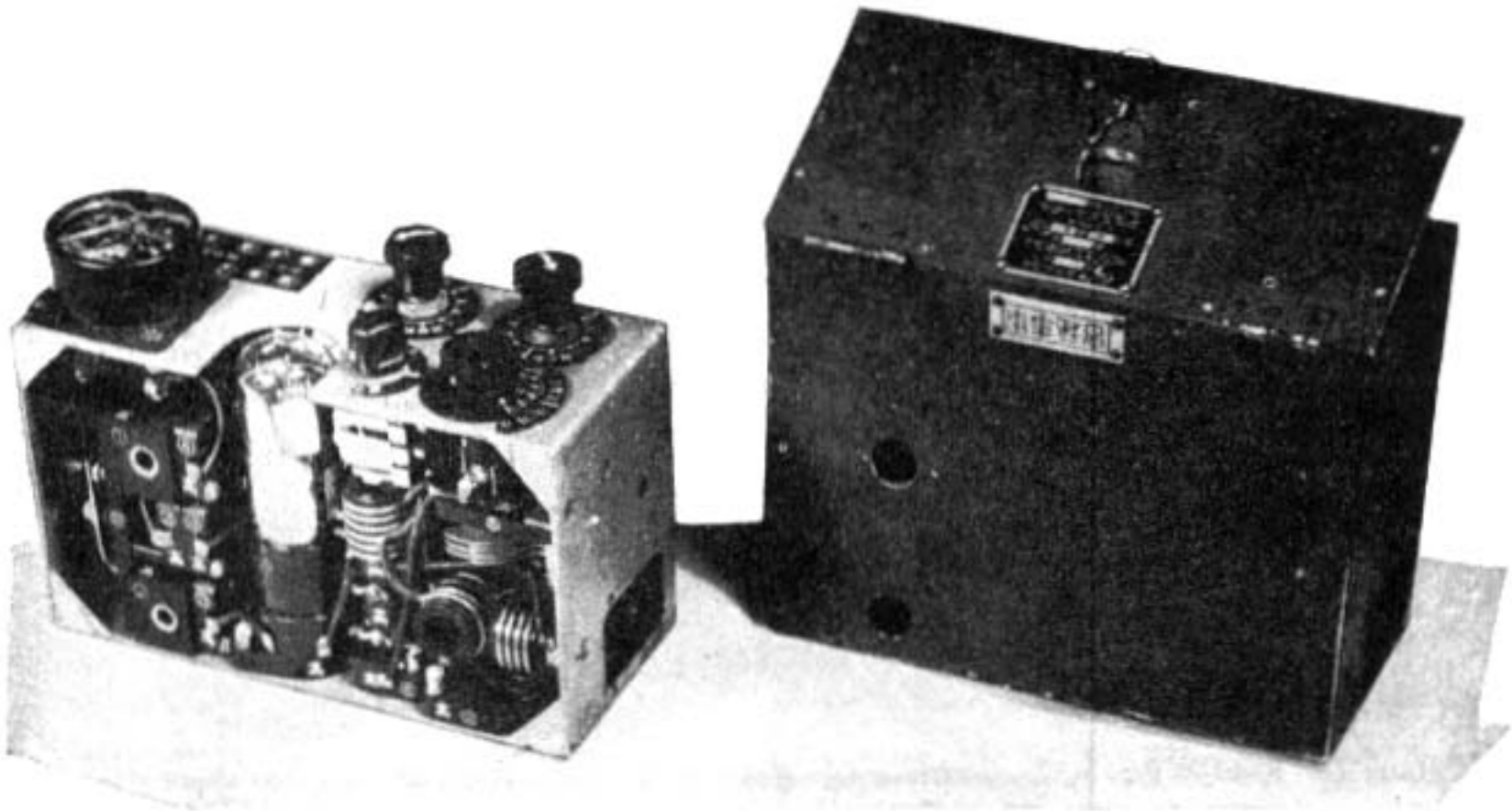


Figure 346. Model 94 Type 6. Transceiver. No. 23 Model H. Date: April 1940.

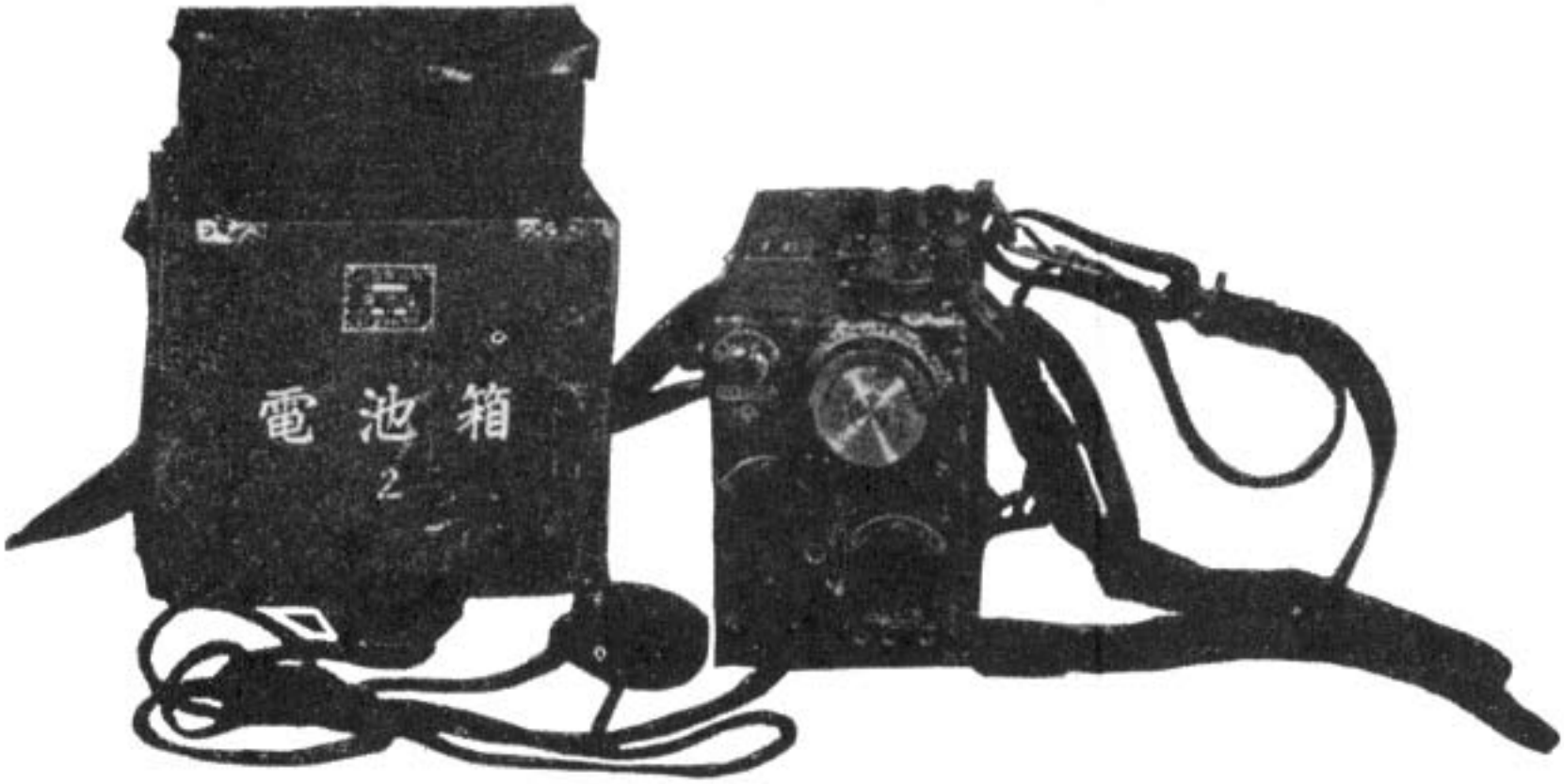


Figure 347. "Walkie Talkie" Type 66. Transceiver. Model A. 2500-4500 KC. Power supply—batteries.

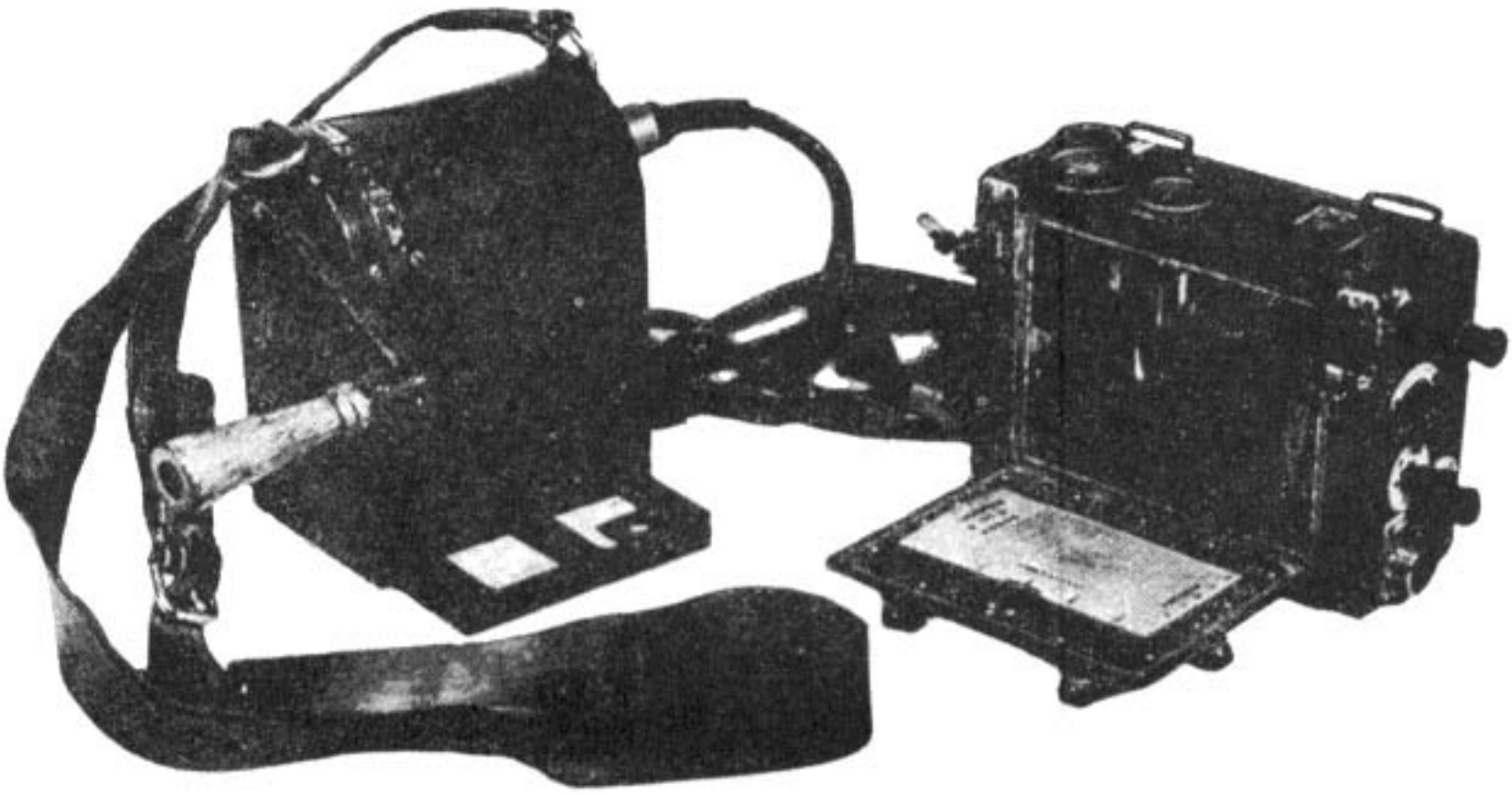


Figure 348. Model 97 Type 3. Transceiver, with hand generator. Pack type. Dipole elements of antenna fasten to wing nuts at ends of case.

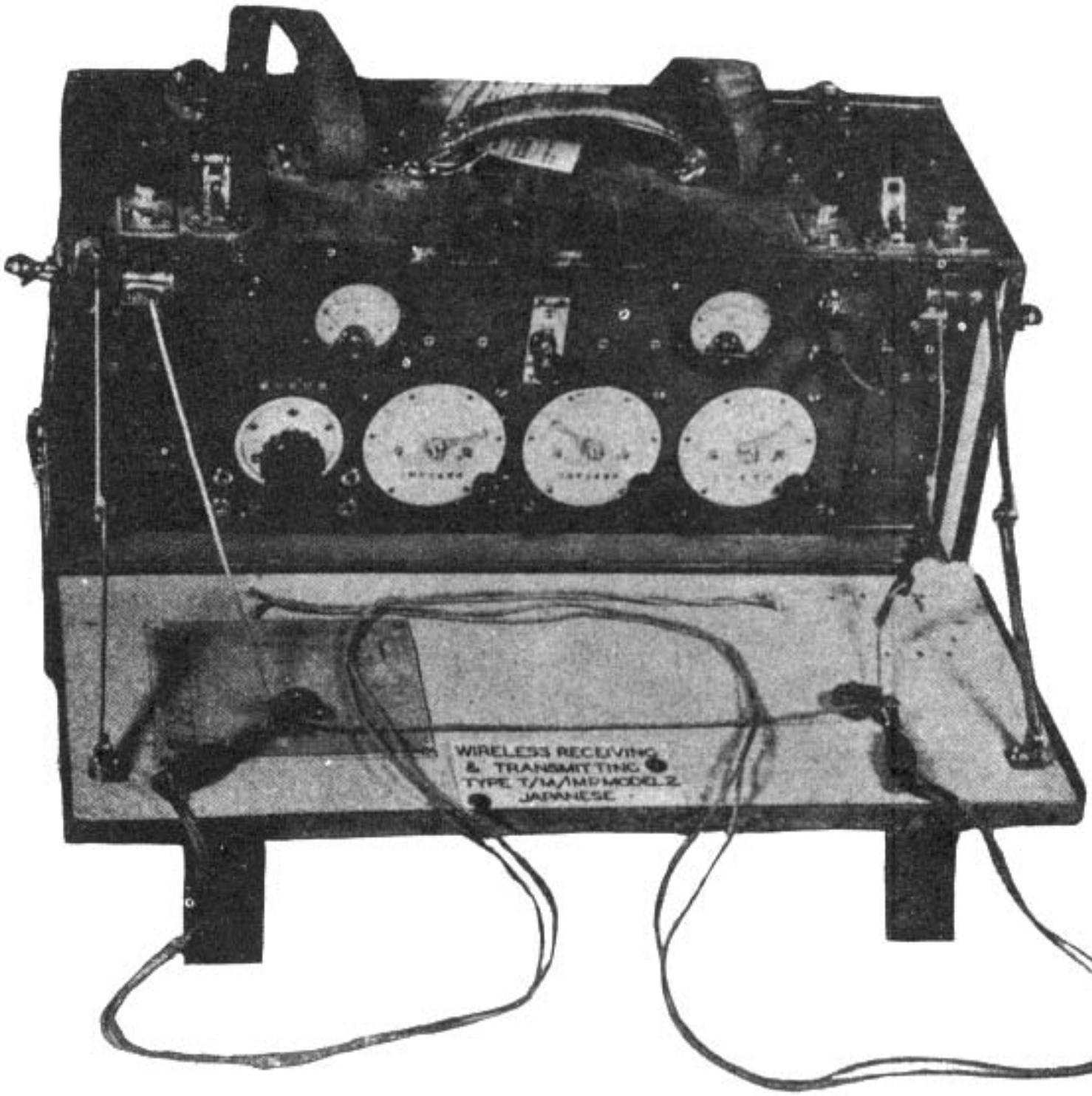


Figure 349. Model TM Type 2. Transceiver, 4000–12000 KC. CW only. Power output about 1 watt. (Also reported as 2.5 watts.)

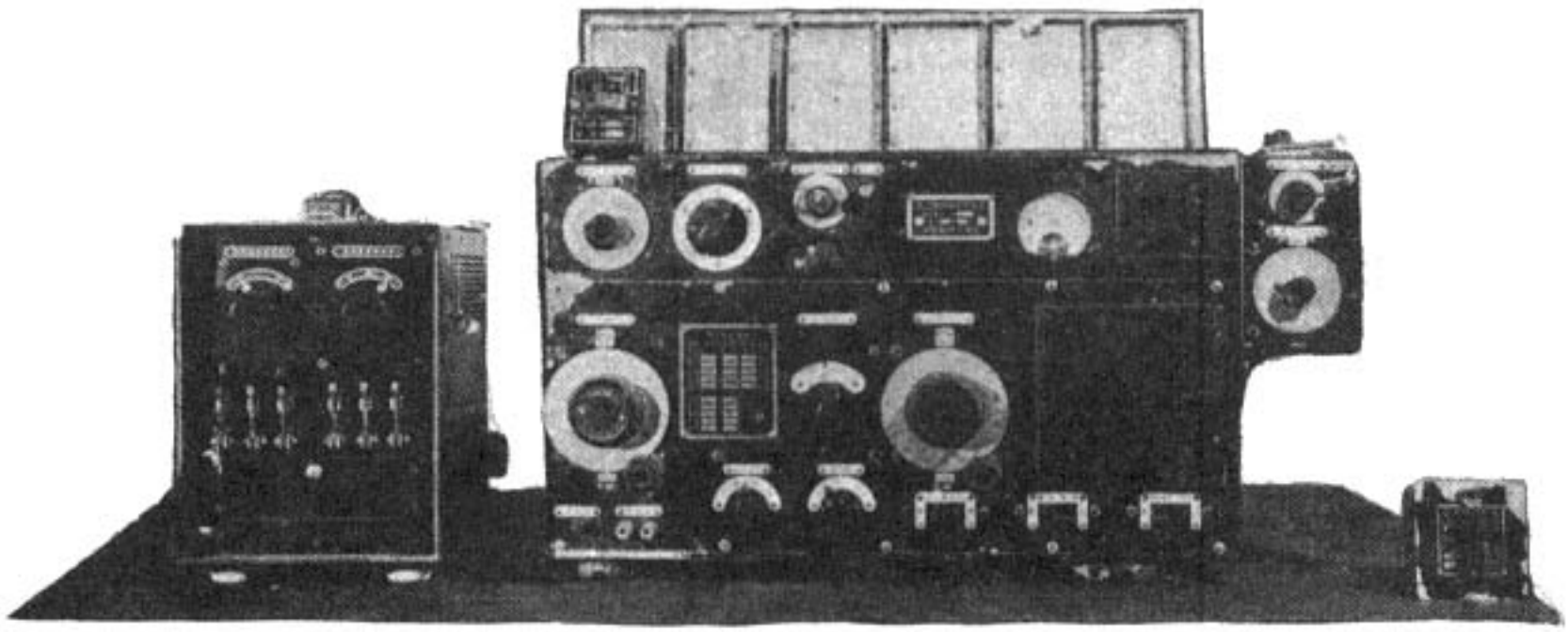


Figure 350. Model 92 Revision 3. 7 Tube, combination TRF and superheterodyne, all-wave receiver. 200 2000 KC. Shown with AC power supply. Delivers 75 and 200 volts DC.

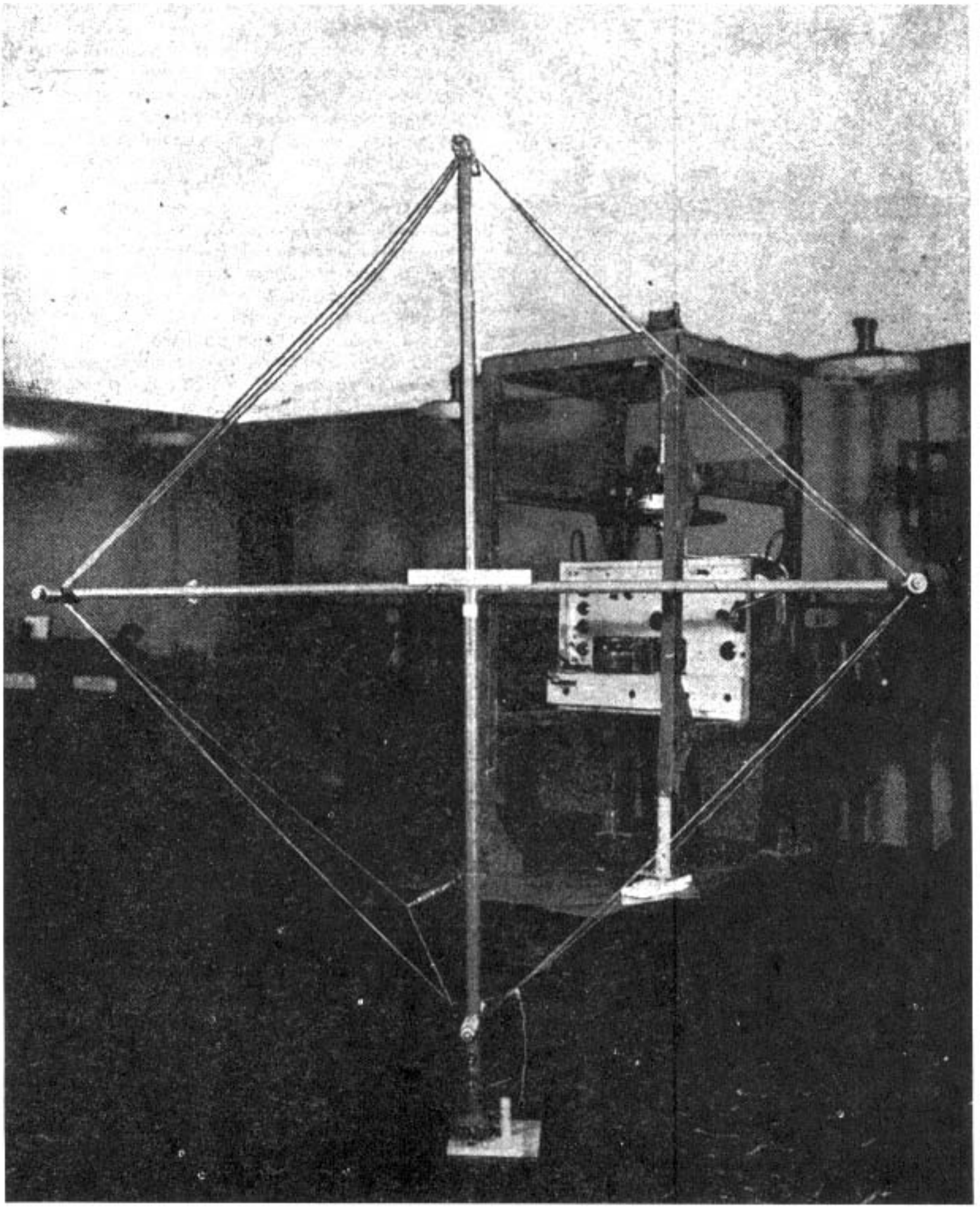


Figure 351. Model 94 Type 1. Direction finding and intercept receiver. 100–2000 KC. Loop shown dismounted from frame.

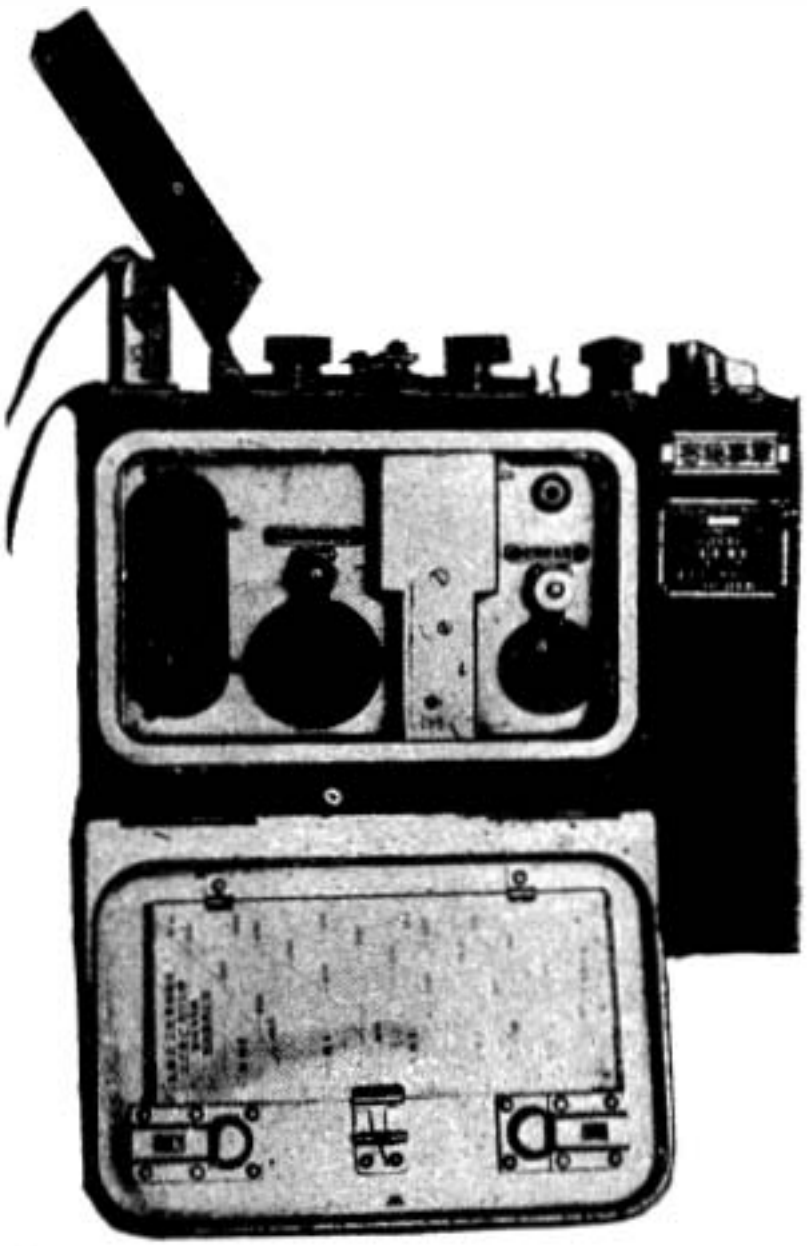


Figure 352. Model 94 Type 3–A. Receiver only. Pack type.

b. **Airborne.** (1) Japanese airborne transmitters and receivers, sturdily and compactly constructed, are of excellent workmanship and material. More attention appears to have been given to compactness of design than to ease of maintenance. In many instances, the equipment is so constructed that it is difficult, or even impossible, to service. To some extent, sets are designed to fit a particular type of aircraft, rather than standardized for general use. It has been noted that some tubes (valves) are equipped with leather handles to facilitate removal. Japanese equipment uses a large amount of aluminum, so that even bulky pieces are unusually light in weight. Although no precautions have been taken against corrosion and fungus control, reports indicate that equipment later than 1940 is far superior to that of earlier design. Electrically and mechanically, new radio equipment appears to approach Allied standards.

(2) It has been noted that not all Japanese planes have radio equipment. While radio direction finders are standard equipment on medium and heavy bombers, there have been no reports indicating that they are normally fitted to fighters.

(3) Radio equipment that was made in America, either in whole or in part, has been found on several Japanese (0) Zero fighters (Zekes). Most parts are of Japanese manufacture, but components of German and English manufacture have been noted. Exact imitations of American and German designs also have been reported. There is no evidence of quantity production; indeed, all equipment noted is hand-made and of good construction. Good quality crystals are used in the majority of radios to control the frequencies of transmitters and receivers.

(4) Technical characteristics and photographs of airborne equipment are shown in figures 355 to 363.

Classification	Transmitter output (watts)	Form	Model	Type No.	Date of original model	Function	Type transmission	Range (miles)
	100	Portable	TE-MU	3		Used on some islands in local radio net.	Unknown CW, phone, or both.	15-20
	50 or 250	Fixed station	TE-MU	2	1942	Ground to air	CW, phone	50
	275	Semiportable. Fixed station.	94	1	1934	Hq-Army Div	CW, MCW, phone,	
	300	Semi-fixed station	Not known.	Not known.		Marine ground unit.	CW only	
	500	Fixed station	95	4	1935, modified 1941.	High power, behind to behind.	Phone	Long distance
[redacted]		do	92	3	1935, modified 1941.	[redacted]	CW	do
[redacted]		do	96	Not known	1935	[redacted]	Unknown if CW, phone, or both.	do
	1,000	do	94	1	1934	Army Div Hq	CW phone	150
	2,000	do	97	1	1927	Comm. GHQ		300
	1-2	Man pack	94	5	1934	Limited range. Comm. between Inf. units.	CW phone	5-CW, 1-3-phone
	4.5-CW. 3 phone.	Portable	Not known.	Not known.		Portable field set	do	
	10	Pack	94	do	1934	Field equipment in div.	CW only	
Transmitter-receiver.	15	3-Man pack	94	SP-3A-36	1934	Comm. in Inf. Cav. and F. A. from brigade down to Inf.	do	Approximate 25.
	20		97	2	1927	Field, ground, and air.		Field-25 G/A190.
	80-CW. 200 phone.	3-Man pack	94	3-B	1934	Command. set in Inf. div.	do	
		2-3 man pack	94	3-A-36D	1934		Receives CW, MCW, phone.	
			96	3	1939		CW, MCW, phone	
	0.5	Man pack	94	6	1934	Walkie-talkie type. In Inf.	CW, MCW, phone	1-2
	1	2-3 man pack	TM	2	Revis. 1942		CW only	1-2
[redacted]vers	1-2	Walkie-talkie	97	3	1937	Walkie-talkie, also air Gnd.	CW, p[redacted]	2-3
		do	Not known	98		Infantry squads, platoons.	do	1
	2		do	Not known			CW only	
	2.5	Portable	do	do		Infantry ground; portable.		Several
		Fixed sta	93	do	1933	Comm. bet. Corps and Div.		
Receivers		Direction finder and intercept receiver.	94	1	1934	Direction finder and intercept receiver.		

RF coverage in MC	Frequency shifting capabilities	Present frequency	[redacted]	Tuning—MO or crystal (number of crystals)	Selectivity receiver	Sensitivity receiver	Receiving circuit
1.5–15.0 (plug-in-coils)		Unknown (At least 1).	Wire	MO or crystal. (Number of crystals unknown.)			
3.26–10.4; 12.2–14.0 (4 bands, tapped coils and switches.)	Good. Continuous coverage.		Wire-link coupling from PA to ant. coupler. Coupling adjusted from transmitter panel.	MO			
0.14–15.0 shift bands by plug-in coils. No. of bands and coils unknown.	Good	Unknown	Wire-2ant. ckts. in transmitter—Series resonant for high freq., Parallel resonant for low freq.	Crystal. (Number of crystals unknown.)			
3.0–10.0.							
3.7–18.2			Wire				
0.05–0.6			Wire-Uses loading coils in antenna system.				
3.7–8.0 (plug-in coils)		Unknown (at least 1).	Wire	MO or crystal (number of crystals unknown).			
0.02–0.5							
0.1–(?). *Transmitter:* 0.779–3.061 (3 bands) tapped coil and switch. *Receiver:* 0.779–7.0 (4 bands) tapped coil and switch.	Continuous coverage on MO.	10	Wire—Same ant. for both Xmtr. and Rec. connected by Send-receive switch. Counterpoise wires incl.	MO or XTAL (number of XTALS–10).	Fair	Poor	1 Stage RF. Regen. Det. 1 Stage AF.
0.9–5.3 (3 bands)		1		Crystal			4 Tube TRF Regn. Det.
0.4–6.0 (5 bands) plug-in coils. Both Xmtr. and receiver.	Continuous coverage on band used.	Unknown (at least 1).	Wire	MO or Crystal (number of crystals unknown.			
XMTR. 0.4–5.7 Rec.—0.35–6.0 (5 plug-in coils).	Continuous coverage for band used on MO.	1	....do....	Crystal or MO (number of XTALS, 1).	Fair	Very sensitive	6 Tube Superhet. Regen. 2d Det.
0.33–0.60.							
Rec.: 0.14–15.0 (7 plug-in coils) XMTR: 0.95–6.675.	Continuous coverage on band used.	Adjustable presets on dials.	Wire "L" type. Total length 29.7 yds. Counterpoise wires 27' long.	Crystal or MO (Number of XTALS 1).			5 Tube Superhet.
0.4–5.75 (5 plug-in coils)	Continuous coverage for band used.		Wire-rubber covered lead in 6 feet long. Gnd. wire same length.	....do....	Good		4 tubes, 1 stage RF., Regen Det. 2 stages AF.
Rec. 1.5–6.7 (3 plug-in trays of coils).	....do....	3		MO—Crystal (Number of Crystals 3).			....do....
34. 2–49. 3 (3 bands)			Rod, 5 feet	MO			Super-regen. Det and one stage AF.
4.0–12.0	Continously variable.		Wire with reel—to vary length, and tune ant. ckt.	....do....	Poor-except when on verge of Osc.	Extremely poor	Regen. Det. one stage AF.
25. 5–31 (tapped coil and switch).	Continuous coverage.		Dipole—each half 23 inches long. Elements tuned to cone.	....do....	Poor	Poor	Super-regen. Det. and One stage AF.
2.5–4.5	Continuous coverage on MO	1	Either long or short antenna. Ant. tune system.	Crystal or MO. (No. of XTALS–1).			3 Tube. Regen. Det
0.1–2.0; 4.0–5.0	5 crystals	1	Rod 6 feet long	Crystal			
4.5–11.0			Wire				
2.5–20.0 (Use total of 7 plug-in coils at one time.)	Continuously var. for coils used.	None	....do....		Fair	Fair	7 Tube comb. TRF and Superhet. No AVC.
0.1–2.0 (In 5 bands) switches and taps on coils.	Continuously variable for range of coils used.	None	Square loop—ea. side, 4-foot long. 5 turns, unshielded rotation—400° to stops.		Very selective	Poor	6 tube TRF., 3 stages RF., Regen. Det., 2 stages AF.

Class of station	Transmitter output (watts)	Transmitter circuit	Frequency stability	Meters used	Power source	Remarks
	100	MOPA. Tubes used—UV222A, UX814, and UV812.	Good		220 volts, 3 phase, 50-60 cycle AC. Half wave rect. Uses 3 X968 tubes.	Medium power. Short wave portable station. Used primarily in local radio nets on island.
	50 or 250	3 stages—Osc., Buffer, PA. No freq. multiplication. Keyed in buffer and PA.	Fair	Osc. indicator. Osc. plate current. Buffer plate current. PA plate current. Ant. ammeter.	Rectified AC; low power 1,000 v; high power—2,000 v.	Used with rectifier unit. Carried in 2 cases, slung on poles. Fixed station operation. Buffer and PA tubes, screen grid type. No neutralization used. Capable of low or high power operation by switching arrangement.
	275	MOPA-Hartley Osc. MO-UY811B. PA-two UV812 in parallel screen grid voltage keyed for CW. Grid modulation for MCW and phone.	do	Ant. ammeter. PA-plate current. PA-grid current. Osc. plate current. Fil. voltmeter.	Motor generator: 2,000 volts DC; 1,000 volts DC; 400 volts DC; 100 volts DC; 12 volts DC.	Semiportable. Fixed station operation. Weight with Mot. gen. approx. 500 pounds. 2 cases and Mot. Gen. Each case carried by 2 men. Has neon osc. indicator. Various voltages go through power distribution panel.
	300					
	800	Grid modulated tubes-UV211, UV865, UV-814, UV860, UV861.	Good		220 volts, 3 phase 50-60 cycle AC, output voltages 3,000 volts—2,000 volts—500 volts—300 volts. Fil. 16V rect. tubes used 9-H 830, 6-X968.	Transmitter modification No. 1: High-power, short wave fixed station. Used island to island over long distances. Has emergency power supply gas-driven generator. All filaments on DC. Tubes replicas of American types. Uses speech amplifier and modulator—4 tubes in all; 1-56, 1-66, 2-2A3. Legend on name plate for mod. unit "Modulator for type 95 Short Wave No. 4 transmitter modification No. 1".
	1,000	MOPA. Final tube SN 146.	do		220 volts, 2 phase, 50-60 cycle AC output voltages 2100 volts-1000 volts and 16 volts. 6 Rect tubes. Type H-836.	Transmitter modification No. 1: high power, long wave, long distance. Fixed stations. Used island to island. All filaments on DC. Final tube Japanese type; all others replicas of American tubes.
	1,000	MOPA. Tubes used—202, 865, 814, 812. Final—SN146.	do		220 volts, 3 phase, 50-60 cycle AC. Output voltages 3,000 volts-2,000 volts-500 volts-300 volts and 16 volts. Uses 9-H830 and 6-X968 rect. tubes.	High power, short wave, fixed station. Used over long distances. Not known if used on phone or CW or both.
	1,000					Transmitter.
	2,000					
	1-2	XTAL or MO control (Hartley ckt.) Osc. connected to antenna.	XTAL - Fair MO-Poor.	Ant. current 0-200 Ma.	Transmitter: Hand generator in separate case. Fil.-6 volts. Plate—150 volts. (Model F) receiver: batteries. In case with receiver. Fil.—1.05 volts. Plate-90 volts.	Stationary use. One twin triode tube. Triodes in parallel for CW operation. For phone, one triode becomes mod. Two man pack and operation. Throat mike used. Model 32 transmitter; Model 32 receiver.
	4.5—CW. 3 phone.					Transmitter-receiver.
	10	Hartley Oscillator		Ant. Ammeter, Plate current.	Hand generator: 7 volts filament, 500 volts plate.	Pack transmitter-receiver.
Transmitter-receiver.	15	1 Tube Hartley oscillator.	Poor	Plate voltmeter. Ant. ammeter.	Transmitter, hand generator receiver; batteries.	Pack animal or 3 man pack. Carried in 2 wooden cases. Transmitter keyed in high volt. Neg. ckt. Transmitter-receiver type.
	20					
	80—CW. 200 phone.	1 Tube Hartley oscillator.	Fair		Rec.—Batteries; Xmtr.—Gasoline; driven motor generator; 12V-Fil. 1,300V-plate.	Receiver can be used for intercept. Transport by 2 man pack or car; No. 55 D transmitter; No. 27 receiver.
			do		Batteries: 1.5V-Filament; 22.5V-Plate; 1.5V-Bias.	Receiver only. Dials marked with luminous paint and have clamps for locking. Straps provided for carrying on back. Not a "Walkie-Talkie."
		2 Beam Type Tubes. Osc.-Plate Mod.	do			
	0.5	Oscillator and Mod.		Antenna Ammeter	Batteries-separate case. Fil. 6V; plate 135V.	Transceiver. One coil with 3 taps and switch, 2 to 3 men to pack and operate. No. 23 Model H.
	1	2 tubes in parallel. Hartley osc.	Poor. Freq. shift when keyed.	Fil. voltmeter Ant. ammeter.	Rectified AC. DC voltages—150 and 180 V.	Transceiver. Portable 2 or 3 man pack, cycle, or car. Revision 1. Transmitter output also reported as 2½ Watts, and R. F. coverage as 4.5-11 M. C.
Transceivers	1-2	Master Osc. (Hartley) and modulator.	Poor	[redacted]	Hand generator: Fil.—6 volts, Plate—135 volts.	Transceiver—Uses one twin triode, UX 19, for all functions. Dipole elements of ant. fasten to each end of case. Case intended to be strapped to back; Generator to chest.
		3 tube Hartley oscillator.	do	Plate current Ant. ammeter.	Batteries: 1.5V filament; 135V plate	One man pack. Transmitter carried on chest, and batteries on back, by means of straps. Model A.
	2					Transceiver.
	2.5					Do.
					Rectified AC	Used in conjunction with transmitter Model 94 Type 2B. Fixed station Receiver. Total of 25 plug-in coils used.
Receivers			Freq. calibration not good.	No visual bearing indicator used.	Batteries—1.5V filament; 4.5V bias; 135V Plate.	Receiver only. 4 wooden chests. Weighs 350 pounds complete. Numerous controls. Slow and difficult to get a "fix." Set installed under shelter over which loop is mounted.

Figures 353–354. Japanese radio equipment—ground.

Figure 355. Model 96 (1936) Type 3. Transmitter-receiver. From Type I medium bomber (Betty). Top of unit: receiver. Bottom of unit: transmitter.

Figure 356. Radio Homing and D/F loop antenna used with some types of Japanese airborne equipment.

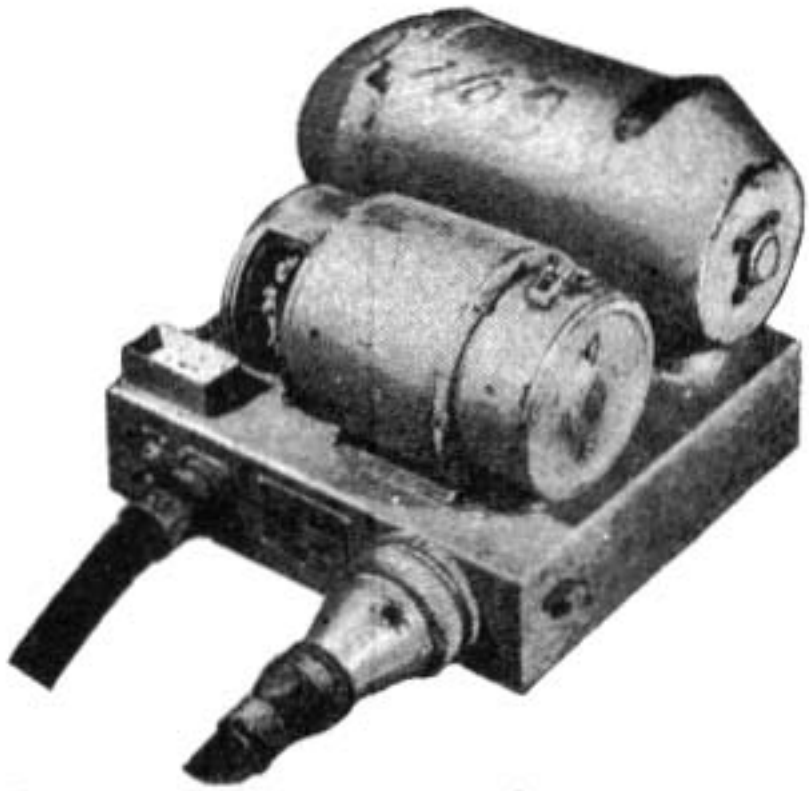


Figure 357. Dynamotor power supply for transmitter of model 96 Type 3 airborne radio set. Used in Type 1 medium bomber (Betty).

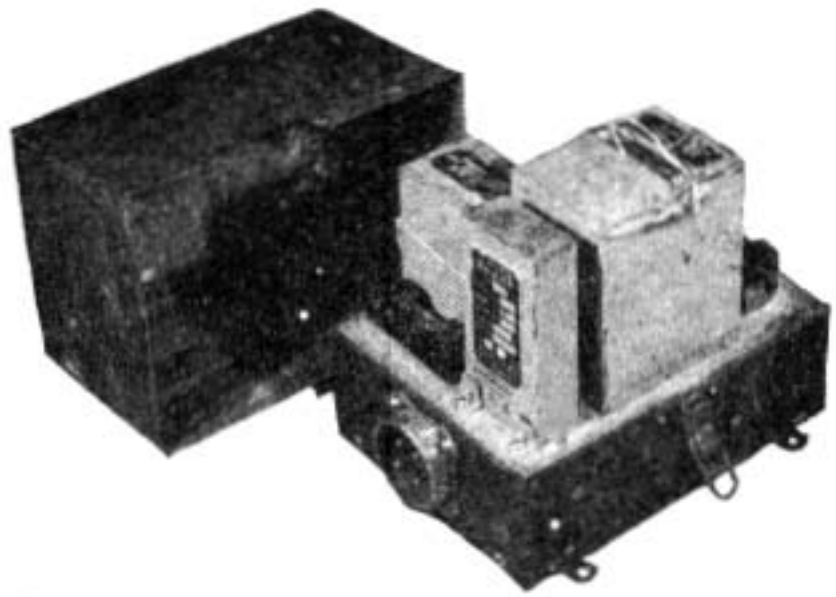


Figure 358. Vibrator power supply for receiver of model 96 Type 3 airborne radio set. Used in Type 1 medium bomber (Betty).

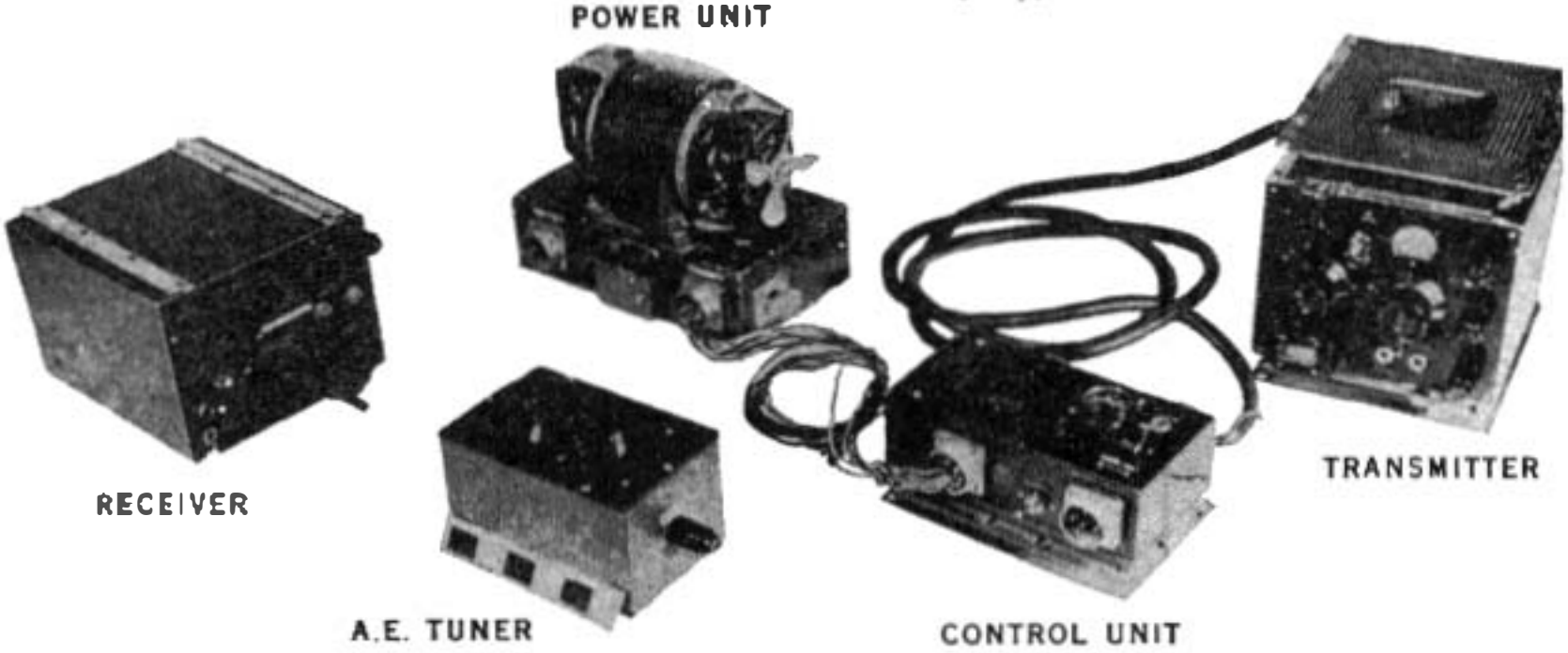


Figure 359. Model 99 (1939) Type 3. Transmitter-receiver. Used in single-seater fighter (Oscar). Transmitter: 2500-5000 KC. Receiver: 1500-6700 KC. Transmitter and receiver crystal controlled. Photo shows complete complements of equipment.

JAPANESE RADIO EQUIPMENT—AIRBORNE

Classification	Transmitter output (watts)	Model	Type No.	Date of original model	Function	Type trans.	Range miles	A P [illegible] in MC
	10	95	4	1933	V. H. F.			44.0-50.4
	10	96	1	1934	Used in plane type (Zeke).	CW, phone	20	Exact coverage unknown.
	10-CW, 5-phone.	96	1	1936	Communicate between naval fighters.	do		3.5-5.5
	10	97	Not known	1937	Bomber, RCN	do		5.0-7.0
	10-CW, 5-phone.	98	9	1939	Used in (Oscar)	CW, MCW, phone.		XMTR — unknown, Rec. — 1.5-6.7 (3 bands) Plug-in tray of coils.
	10-CW, 5-phone.	98	2	[illegible]	Used in single seat fighter. Type of MK II (Oscar).	do	CW-300, phone 100.	XMTR: 2.5-5.0 Fixed coils—Receiver 1.5-6.7 (Two sets of plug-in coils).
	12	Not known.	4		Used in Jap type 98 2EB (Lily)—Air to air and Air to gnd. VHF.	Phone only	Purposely limited. Used for short range work only.	Xmtr and receiver. 44.0-50.0.
	20	99	4	1939	Bomber command	CW only		0.45-15.5
	20	NA	5			CW, MCW		Xmtr—5.0-6.95, Rec. 0.3-2.5, 1.5-15.0.
	20	Not known.	3		Fighter command.	CW, phone	20	2.0-6.0
Transmitter-receiver.	20	95	3	1936	Air to air, and to ground. In (Betty) medium Bomber.	CW, MCW, phone.	200 miles from 10,000 feet on CW.	0.22-0.5, 5.0-10.0
	25	98	4	1938	Air to ground on medium bombers.	do	5-60	29.5-62.5
	25-30	95	HI No. 2	1936	Air to air and air to ground.	do		Xmtr—1.5-7.5 (3 bands). Rec. 1.45-7.3 (6 bands). Receiver uses plug-in coil assemblies.
	25-CW 9-phone.	96	1	1936	Air to air and air to ground in Mitsubishi bomber.	CW phone	300	XMTR — 7.5-10.5, Rec.—7.5-10.5.
	30	96	2	1936	Naval air	do	9	4.0-6.0
	50	96	1	1936	do	Phone only	30	Xmtr—4.2-5.0; Rec.—4.2-5.0.
	50	97	3	1937	General—Air-Naval Air-Gnd.	CW phone		0.3-0.5; 5.0-10.0
	150	96	2	1936	Air and Ground in RCN bombers	do	450	Xmtr — 0.3-0.5; 5.0-10.0; Rec.—5.0-10.0.
	150	94	Not known.	1934	Naval air and bombers.	do	150	0.1-0.5; 5.0-10.0
	300	94	1	1934	Naval air	do		Xmtr—5.0-10.0; Rec—5.0-10.0.
	Not known.	Not known.	Not known.		In dive bomber	CW, only		7.535 and 0.456 (see remarks.)
	do	96	3	1936	Used in type 97 single seat fighter (Nate).	Phone only		Exact coverage unknown. Had 2 XTALS (or 4.819 and 4.836 MC.
	do	EI	Not known.				1,200	Xmtr—2.5-15.0; Rec—2.5-15.0.
		do	1		D/F naval			1.75-7.5.
		do	2		D/F and homing			0.14-0.41; 0.55-1.6; 2.5-7.7.
Receivers		PY	3N		do	Aural and visual		0.155-1.0 (3 bands)
		RC	4		do	do		0.17-0.46; 0.45-1.2
		ADF	6		do	do		0.18-2.8 (3 bands)

Classification	Transmitter output (watts)	Model	Type No.	Date of original model	Frequency shifting capabilities	Present frequency	Antenna system	Type of MO or XTAL (Number of crystals)	Selectivity of receiver
	10	96	4	1938		Unknown		XTAL (number of XTALS unknown).	
	10	96	1	1936	One preset freq. cannot be changed in flight.	1	Mast behind pilot's cockpit. (See remarks).	Crystal (number of crystals—1).	
	10-CW, 8-phone.	96	1	1936	Preset—Not changeable in flight.	Number unknown.	30-foot mast	Crystal (number of crystals unknown).	
	10	97	Not known	1937					
	10-CW, 8-phone.	99	9	1939	One preset freq. cannot be changed in flight.	1—Both XMTR and receiver.	Wire—Variometer used to tune Ant. to [illegible] frequency.	XMTR—crystal receiver—crystal controlled. [illegible] crystal for each).	Fair
	10-CW, 8-phone.	99	8	1939		1	Has Ant. tuning unit so set may operate on any length Ant. Probably mast used. Could use trail wire also.	Crystal (number of crystals—2).	Good
	12	Not known	4		Instantaneous shift to any of many preset frequencies.	Many preset frequencies.	Variable—vertical on some planes, horizontal on others.	Crystal (number of crystals Xmtr—3 Rec.—3).	Fair
	20	99	4	1939		Number unknown.		Crystal (number of crystals unknown).	
	20	NA	3			do	Fixed inverted "L", 22.8 ft. long.	do	
	20	Not known.	3		Preset—Not changeable in flight.	1			
Transmitter-receiver.	20	96	3	1936			Fixed rod and trailing wire.	Crystal (number of crystals—3).	
	25	96	4	1939	Preset—Not changeable in flight.			MO or XTAL (number of crystals unknown).	
	25-30	96	HI No. 2	1936	Preset Freq. by plug-in XTALS.		Ant. lead coils for vertical "T" and inverted "L" Ant. Coils—1.5-7.5 MC. Trail wire Ant. may also be used.	MO or XTAL (MO operation by removing XTALS) (number of XTALS unknown).	Good
	25-CW 9-phone.	96	1	1936	Plug-in crystals enable change to 2 frequencies quickly.	2 preset freq., both Xmtr. and Receiver.	Trail or double wire.	Crystal (number of crystals—2).	
	30	96	2	1936					
	30	96	1	1936					
	50	97	3	1937	Preset	Number unknown		Crystal (number of crystals unknown).	
	150	96	2	1936					
	150	94	Not known.	1934	Separate XTAL for each frequency used.	1		Crystal (number of crystals unknown).	
	300	94	1	1934					
	Not known.	Not known.	Not known.		4 plug-in crystals.	2		Crystal (number of crystals—4).	
	do	98	3	1939	Plug-in.	1		Crystal (number of crystals—1).	
	do	E1	Not known			Unknown		Crystal (number of crystals unknown).	
Receivers		do	1						
		do	2						
		PY	3N					MO only	
		RC	4						
		ADF	6						

Sensitivity of receiver	Receiving circuit	Transmitter circuit	Frequency stability	Meters used	Power source	Remarks
----------	7 tube superhet. IF-1500KC.	3 tube.....	----------	----------	----------	Very good construction.
----------	Operates on 1 preset frequency XTAL controlled.	Operates on 1 preset frequency XTAL controlled.	----------	----------	Two motor generator. For Xmtr and receiver. Use 12-volt plane batteries for power.	Provides 2 way communication from plane—Same Antenna used on transmission and reception; connections made by "Send-receive" switch. Side-tone provided—Components cramped and inaccessible for servicing.
----------	5 tube superhet. IF-500KC.	----------	----------	----------	----------	Appeared on planes early in 1942.
----------	5 tube superhet.....	4 tubes.....	----------	----------	----------	Transmitter and Receiver on 1 frame. Reported that phone output can be scrambled.
Fair.....	5 tube superhet. RF, convertor, IF, Det. and AF. HF osc. XTAL controlled. Tubes used—1-US-6S7A 4—KC804A.	Hartley osc. Osc.-807, plate mod. by 807. No speech Amp.	Poor.....	----------	----------	Set can be remotely controlled on CW, MCW, or phone. Receiver tuned manually. 1 set captured used ceramic insulation thruout. Another used bakelite and is believed to be of later manufacture. Easier to machine.
Good.....	4 tube superhet. 6F7A triode-pent. RF, Convertor, IF, Det. and AF. Local Osc. either MO or XTAL controlled.	Hartley osc., UY-807A, choke Mod. by a UY807A.	Xmtr—Poor. Receiver fair.	----------	Motor generator Hi voltage—600V. Tube Filaments supplied from separate 6V winding on motor generator.	Main components of complete set are transmitter, receiver, power unit, control unit, and antenna tuning unit. Antenna disconnected from receiver by keying relay. Can "Listen through" while sending.
Fair.....	XTAL control—4 tube superhet. Uses 6F7. HF Osc. Frequency is fixed by XTAL, and IF is variable by tuning cond.	XTAL control only. 3 tubes used, type 807.	Good	Volt- milliammeter which can be switched into various circuits for metering.	Dynamotor: Supplies Hi and Lo voltage for xmtr and receiver—HiV-600V LoV-13V.	Manufactured in December 1942. Entire set shows great improvement over older equipment. Simple to operate and maintain. Design especially of Receiver very modern. High grade bakelite and ceramic insulating material used throughout. On receiver, a chart shows dial setting of variable IF and proper XTAL to use to receive on certain frequency. Termed "Flying Mark 4".
----------	5 tube double superhet. 2—IF Frequency.					
----------	4 tube.....	----------	----------	----------	Dynamotor. Supplies Hi voltage for Xmtr and receiver—700v. Low voltage from planes battery—24 V.	Positive load to PA stage keyed for CW. PA grid modulated for MCW. Plane engine has ignition shielding.
----------	Crystal controlled superhet.					
----------	6 tube.....	----------	----------	----------	Dynamotor.....	Not D/F type. Used in med. bomber. (Betty).
----------	6 tube superhet. IF-2400 KC.	MOPA.....	----------	----------	----------	Transmitter and Receiver mounted separately.
Good.....	5 tube superhet. RF-77, Mixer-6A7, IF-78, Det. and BFO-6F7, AF Output 41. IF Freq.—460KC.	4 tube MOPA. Osc. UZ47G RF Amp.-UY340B AF Amp.-UY76 Mod.—UZ-47D Supressor Grid mod.	Good.....	----------	Dynamotor. Provision also made for use of generator.	Sidetone provided for monitoring on CW—800 cycle modulation on MCW. No remote control.
Poor.....	Superhet. IF—638KC.	MOPA. XTAL controlled.	Fair.....	Ant. meter provided with separate shunts on back. Same meter can be used on other Transmitters.	Xmtr—1000V—DC dynamotor from 100V DC source. Receiver -250V from 12VDC source. Vibrapac can power receiver if dynamotor fails.	Transmitter and receiver clamped together on rack. Neon tuning indicator in transmitter antenna circuit. Provision for sidetone. No shock mounting used. Susceptible to damage by humidity and extremes of temperature. Many parts of German manufacture. Model 12.
----------	2 tube.....	----------	----------	----------	----------	Aviation 3.
----------	5 tube superhet.....	MOPA: 1-UX 47G; 3-UV516D; 1-UV 66B.				
----------	.....do.....	MOPA 4 tubes.....	----------	----------	----------	No intercommunication system provided for plane crew.
----------	6 tube.....	----------	----------	----------	Dynamotor.....	Transmitter and Receiver mounted together on brass frame. Design sound, but not advanced. Components well made but inaccessible for servicing.
----------	----------	----------	----------	----------	----------	Can be set up for operations as shown in "RF coverage." Alternate set of 2 crystals provided for operation on 7.435 and 16.580 MC.
----------	Pretuned. Cannot be adjusted in flight.	----------	----------	----------	See remarks.....	Other parts consist of combined generator and supply voltage regulator, smoothing choke assembly, remote control box, antenna selector box, and separate low frequency receiver. Parts very inaccessible for servicing. Workmanship good altho quality of parts poor. Aviation Radio No. 2.
----------	7 Stages. 2 RF, Mixer 2 IF, Det.-AVC.—BFO and Push-pull AF, Has IF XTAL Filter.	MOPA Tri-tet osc. and RF Amp.	----------	----------	----------	Very modern, good construction.
----------	5 tube TRF Has 2 RF Amp. BFO and neon peak limiter.					
----------	12 tube superhet.....	----------	----------	----------	----------	Installed in fighters and large aircraft.
----------	5 tube superhet.....	----------	----------	----------	----------	Installed in RCN or light bomber.

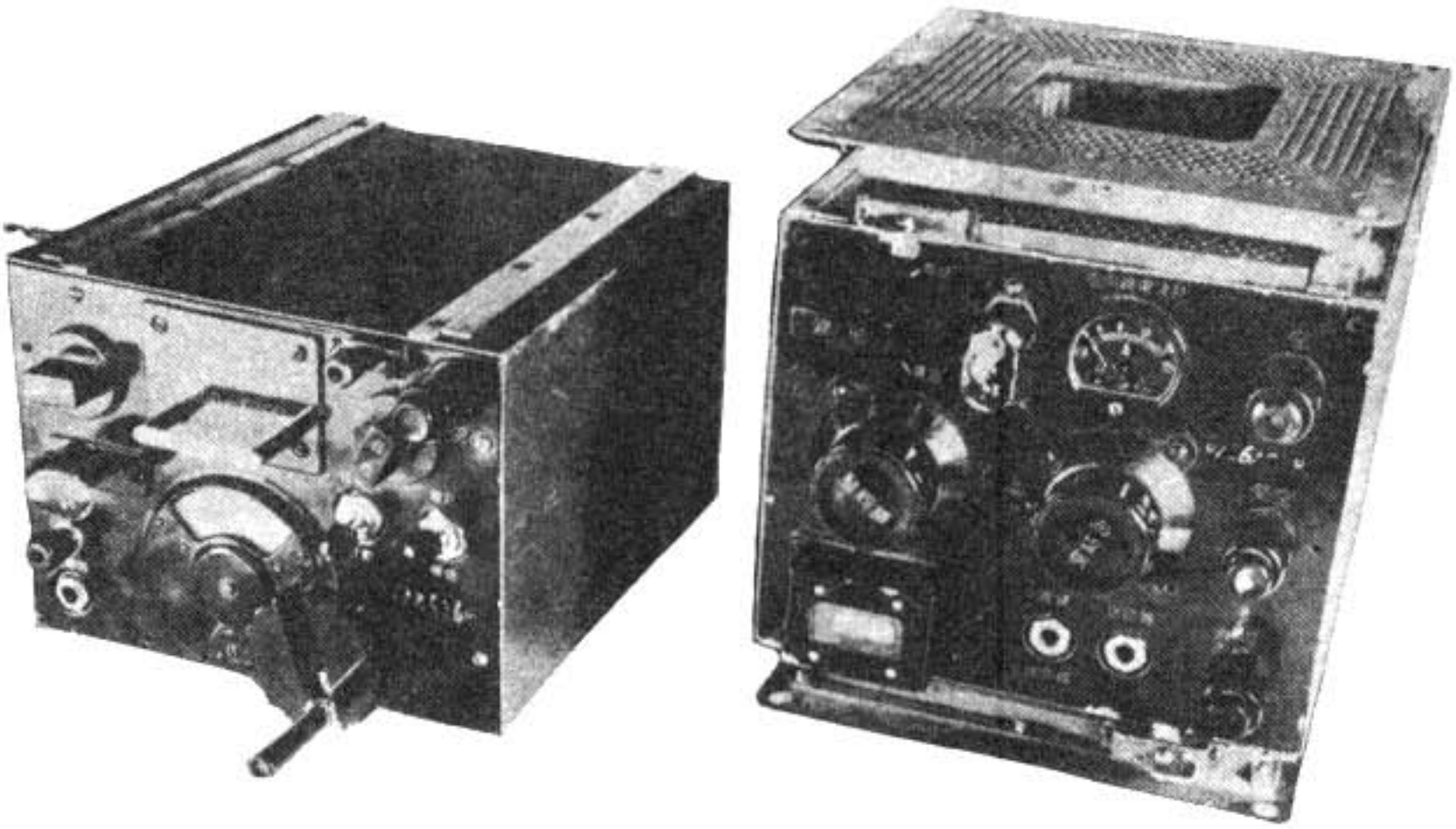


Figure 360. Model 99 (1939) Type 3. Transmitter-receiver. Close up of transmitter and receiver. Receiver at left, transmitter at right.

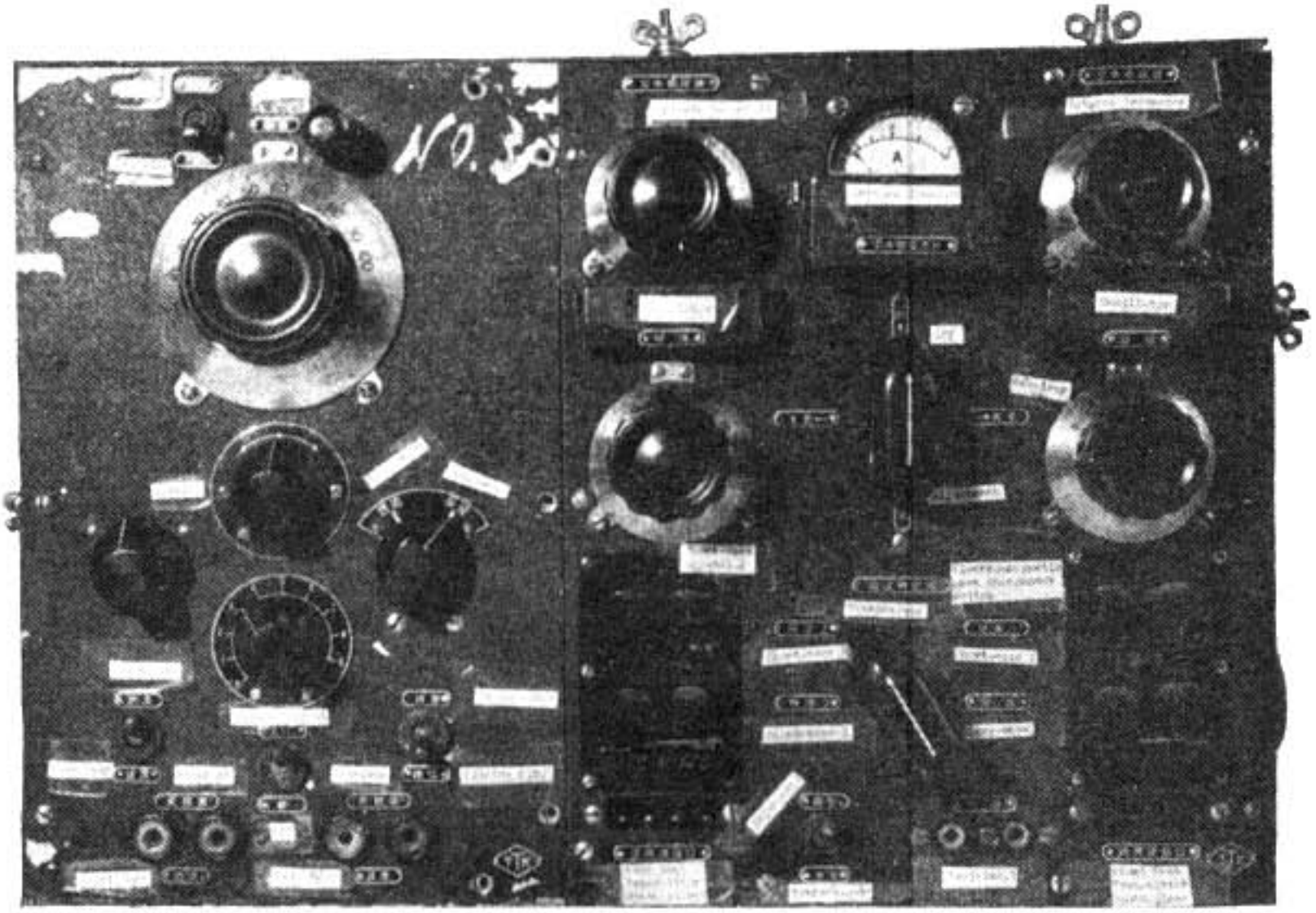


Figure 361. Model 96 (1936) Type 1. Transmitter-receiver model 13. From Mitsubishi bomber. Transmitter: 7000–10600 KC. Receiver: 7500–10600 KC.

Figure 364. Model 92 field telephone.

3. TELEPHONES. a. Model 92 (1932) telephone (fig. 364). This telephone is of conventional design and normally is used on a ground return circuit, although it may be used also on a metallic circuit. It is equipped with a buzzer and key arrangement for sending code. The complete unit is encased in a metal-reinforced, wooden box, approximately 12 inches long, 5 inches wide, and 7 inches high. Directly beneath the aluminum cover is a transmitter, handset receiver, extra single carphone, and the buzzer key. Permanent lead-in wires are fitted to the telephone to which the field wire is attached. Current is supplied by a hand-cranked generator which generates ringing current rated at 55 volts A. C. It is not advisable, therefore, to use this set with U. S. Army generators which deliver up to 90 volts A. C. It will, however, receive and transmit clearly over U. S. Army circuits, being equipped with two 1½ volt dry cell batteries which furnish 3 volts when connected in series. These batteries normally are connected in parallel and are stored on a metal rack inside the cabinet. Compared with Allied standards, the general mechanical construction of the set is inferior. It has been found that the hand-switch on the handset receiver causes frequent cut-outs as well as noise during operation. The set is contained in a heavy leather carrying case and may be carried easily by one man. A new carrying case, composed of layers of rubberized canvas, also has been observed. This material will withstand tropical climate much better than leather. The complete set weighs approximately 12 pounds.

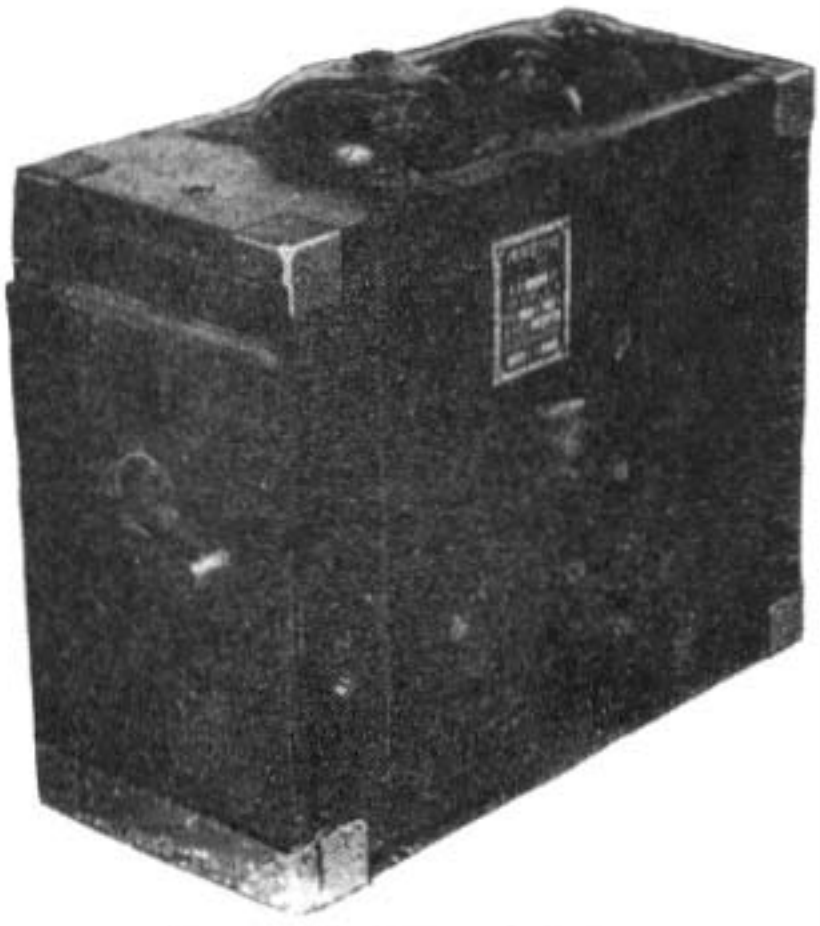


Figure 365. Model 2 trench telephone.

b. Model 2 (1942) trench telephone (fig. 365). This telephone normally is used with a ground-return circuit, although it may be employed with a metallic circuit. The unit is contained in a wooden cabinet, with metal-reinforced corners. The handset; batteries; and generator, bell, condenser, and induction coil are housed in three compartments. The set may be operated on local or common battery circuits, while magneto signaling facilities also are included. The generator hand crank folds up and fits within the generator armature shaft. A fiber driving gear on the generator eliminates noise to some extent during cranking.

c. Sound-powered telephone (fig. 366). The microphone of the sound-powered telephone, deriving its energy directly from the sound waves, is a reversion to the original prineiple of the telephone in that the receiver unit is used also as a microphone. The instrument consists of a handset, with a single dual-purpose operating unit and an additional unit

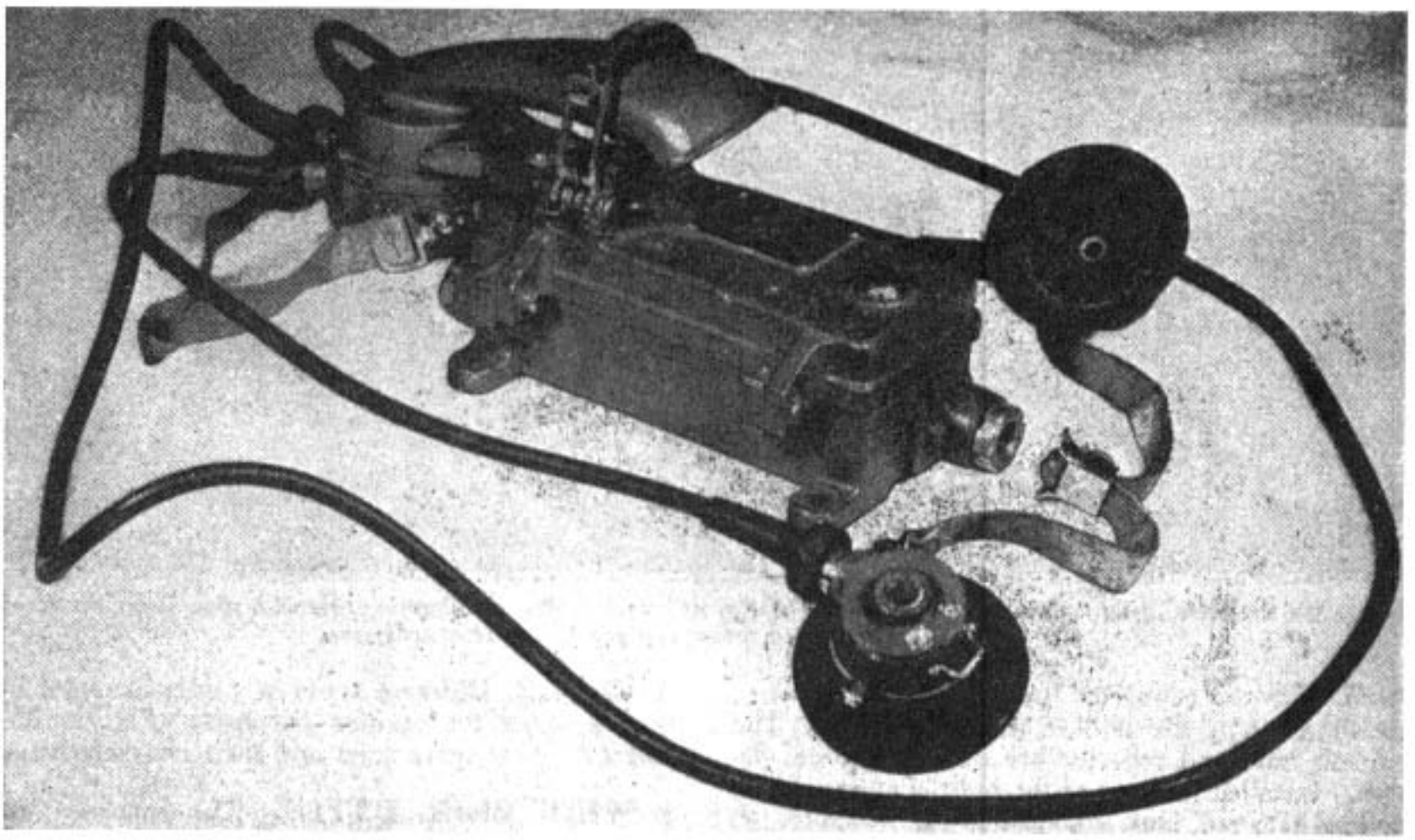


Figure 366. Complete assembly of sound-powered telephone.

as an extra receiver. It is used to provide intercommunication within vehicles, or over short lines when circumstances require rapid and simple setting-up and disconnection.

d. Lip microphone. This carbon type microphone is attached to a leather and elastic strap. Total weight is approximately 3½ ounces. Other than the fact that it is used with head receivers, there is nothing to indicate for what purpose it was intended. However, since the output of this microphone is low, it is possible that it may be used in connection with radio equipment in armored vehicles.

4. SWITCHBOARDS. The Japanese have field switchboards, but in place of these they frequently connect field telephones together to form a party line system. At higher headquarters and large airfields commercial switchboards and pole lines of open wire construction have been used.

5. TELEGRAPH SETS. Figure 367 illustrates the Model 95 set which can be used in conjunction with Model 92 telephone. The set has a built in key arrangement. It probably is used by lower units for administrative traffic.

6. SIGNAL LAMPS. a. Portable signal lamp. This lamp, provided with universal adjustment, is mounted on a tripod and powered by a hand generator. At the front, a hinged cover, equipped with a shutter adjustable to 6°, controls the intensity of light. A reflector and 6-volt lamp, rated approximately 32 candlepower, are contained inside the housing. Usually 3 different-colored filters—green, amber, and red—are provided with each lamp. A metal-reinforced wooden cabinet, 10¾ inches long, 5⅜ inches high, and 8⅜ inches wide, is provided for the equipment with the exception of the generator.

b. Hand signal lamp. This small pocket lamp measures 3½ inches long. While resembling a cylindrical flashlight, it contains no batteries; in-

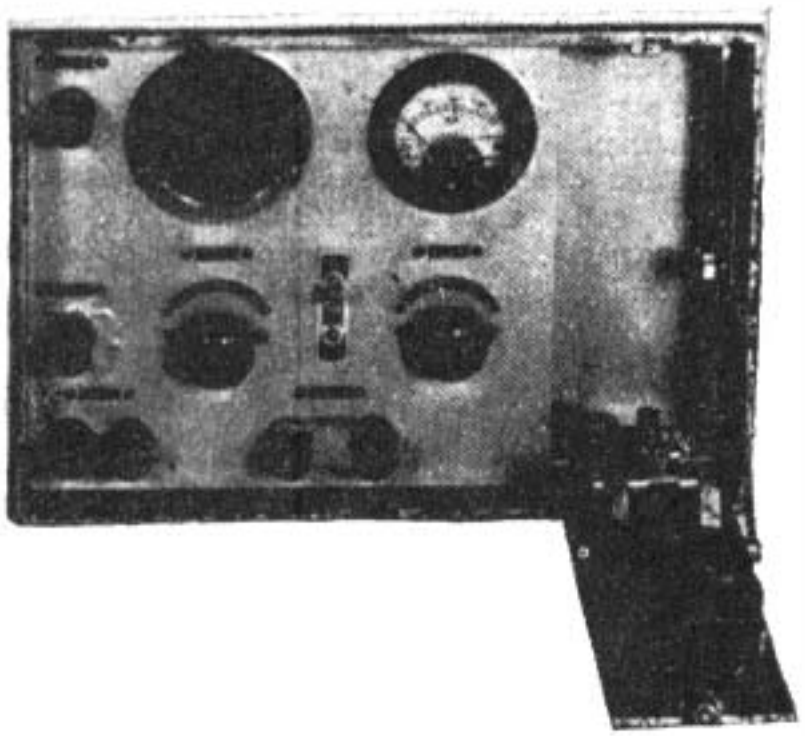


Figure 367. Model 95 telegraph set with sounder and buzzer.

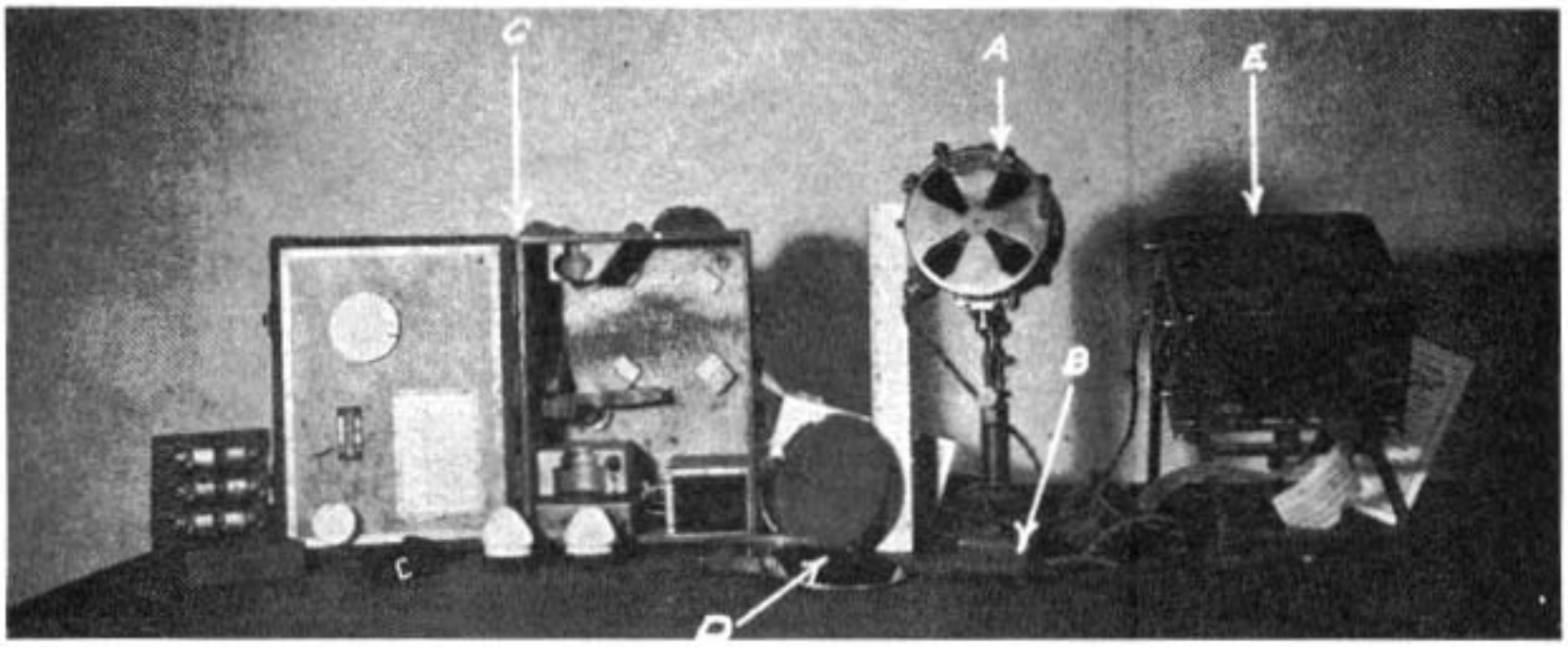


Figure 368. Portable signal lamp. (a) Signal lamp, (b) Key with lock device, (c) Carrying case with spare lamp, eyepieces, filters, etc., (d) Filters; red, amber and green, (e) Hand generator.

stead, a cord, connected to an external battery, passes through the hollow wooden handle. The 3.5-volt bulb and reflector are of conventional design. Installed in front of the bulb is a glass filter, divided into red, blue, amber, and clear sectors. A cover, in front of the filter, can be revolved so that its opening will disclose a lighted segment of the desired color. Signaling is accomplished by a combination push button and slide switch on the side of the case. This lamp should be useful at short range, but the degree of security would be limited by the fact that its beam is not highly directional.

7. FIELD WIRE. The three principal types of field wire in general use are as follows:

a. Assault wire. Assault wire is very small in diameter. It consists of a single conductor and is composed of 8 strands (1 copper and 7 steel) with an outer covering of yellow-colored braid. This wire is for ground-return circuits and is used between regiments and forward units.

b. Seven-strand wire. This single conductor, 7-strand wire (3 copper and 4 steel) is larger in diameter than assault wire. The wire is rubber insulated, and tests have shown that the insulation resistance can remain high throughout a 14-day immersion period. It has an outer covering of yellow colored braid. Tensile strength of the wire is high, but its abrasion resistance is low, and its electrical characteristics are not as good as indicated by its construction. This wire is for ground-return circuits and is used between regimental and battalion headquarters.

c. Heavy wire. Heavy wire, consisting of two rubber-insulated, solid conductors (one black, the other red), is used for metallic circuits, probably between division and higher headquarters as well as at the larger airfields. It has an outer covering of green-colored braid.

8. CABLE. Different types of cables are used by the Japanese for various purposes. Figures 369 and 370 show types used and their characteristics.

9. WIRE REEL UNITS. The Japanese use various types of hand wire reel units, most of which appear to be designed primarily for handling single conductor wire.

a. Hand wire reel unit. The reel is carried on the shoulders, or to one side of the body, by means of a broomstick handle and it will hold approximately 1,600 feet of the larger diameter, yellow-braided, field wire. No crank is provided for convenient recovery of the wire. Perforations on the head and splines of the drum tend to damage the insulation if the wire is stored on the reel for any length of time. This unit, which is light in weight and not very rugged, can readily be dismantled without the use of tools. (See fig. 371.)

b. Head wire reel. The unit (see fig. 372) is solidly made of pressed metal, with leather straps for carrying on the chest or back. This reel evidently is designed for use by troops in forward areas and normally is carried on the back to allow free use of the hands. (See fig. 372.) When recovering wire, for which purpose a handle is provided, the reel normally is carried on the chest. The reel may be folded up when not in use.

10. AIRPLANE PANELS. Cloth air-ground panels are usually 1½ to 3 feet wide and 6½ to 13 feet long. Some shorter panels, and some triangular panels 3 to 6½ feet on each side, have been used. In most cases panels are white, but other colors, contrasting to the terrain, also may be used. When regular panels are not available, rags, maps, or pieces of paper may be substituted. On occasion, Japanese soldiers have been observed to lie on the ground to form panel signals.

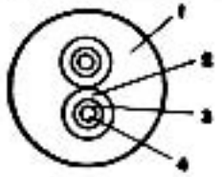
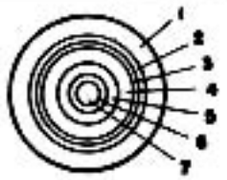
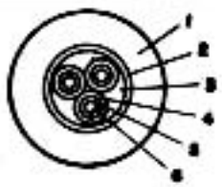
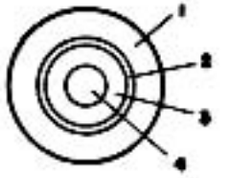
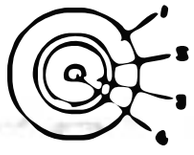
Outside Diameter (inch)	Cross section of cable	1	2	3	4	5	6	7	8	9	Remarks
7/16		Rubber insulation.	Rubber insulation.	Cotton string wrapping	No. 14 Stranded wire.						This was taken from the power cord of a test lamp. It corresponds to ordinary rubber covered lamp cord.
7/16		Woven steel wire sheath (lead).	Impregnated cloth.	Impregnated paper.	Lead sheath	Cotton cloth wrapping.	Rubber insulation.	Copper wire core.			The conductor of this cable consists of 19 strands of No. 20 copper wire. Probably used as buried underground cable.
7/16		Lead sheath	Cotton cloth	Jute or hemp cord filler.	Silk cloth	Rubber insulation.	Solid copper wire.				Each of the three conductors is composed of No. 17 solid copper wire.
7/16		Lead sheath	Cotton cloth	Rubber insulation.	Stranded copper wire.						This was taken from a Japanese radar transmitter and was used to carry power to the tube filaments. The single conductor core consists of 30 strands of No. 20 copper wire.
3/8		Lead sheath	Cotton cloth	Rubber insulation.	Solid copper conductor						This was used to carry 600 volts to a radar transmitter. The solid copper conductor is size No. 14.
9/32		Black cotton cloth.	Woven steel wire sheath.	Rubber insulation.	Air holes in rubber.	Solid copper conductor, size No. 23.					The cloth covered coaxial line is used to carry video and pulse signals between the various units of a radar. The estimated impedance of the line is 100 OHMS. The capacitance of the cable has been decreased by extruding three holes in the otherwise solid rubber dielectric. These holes are in a symmetrical position around the center conductor.

Figure 369. Various types of Japanese cables.

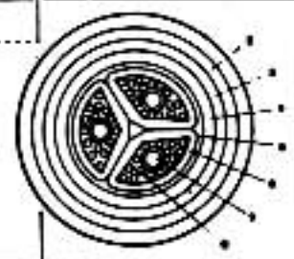
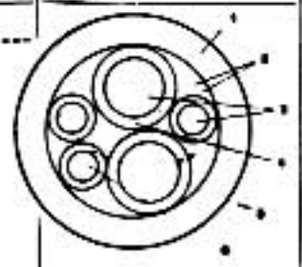
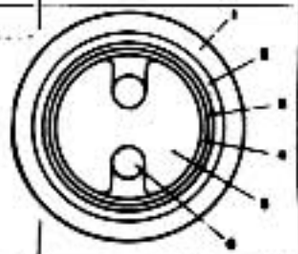
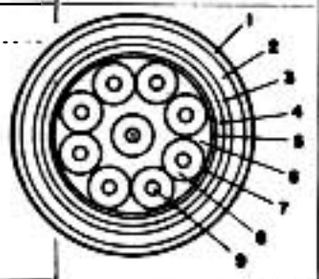
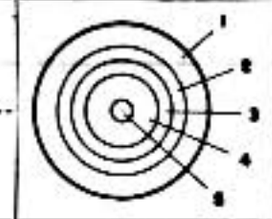
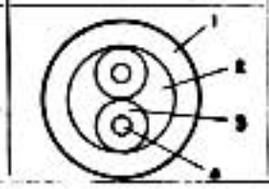
Outside Diameter (inch)	Cross section of cable	1	2	3	4	5	6	7	8	9	Remarks
1¼		Tar coated hemp.	Spiral wound steel band sheath.	Impregnated fiber	Lead sheath	Impregnated paper.	Impregnated paper.	No. 10 solid copper wire.	15 conductors of No. 17 solid copper wire.		This cable is probably used as underground power cable.
1 1/16		White rubber insulation.	Cotton string filler.	5/64" diam. stranded from No. 31 tinned copper wire.	Rubber insulation.	Rubber insulation for H. V.	No. 9 stranded wire from No. 30 tinned copper wire.				This cable is probably used to carry power from a power supply unit to a communications transmitter. The large wires are for the filament power and the small are for B plus and bias voltages.
2 3/16		Lead sheath	Brown paper	Copper braid	Brown paper	Polystyrene spacers every inch.	Copper No. 9 wire (solid).				The shielded balanced wire line is used to carry r-f power to the antenna of a Japanese Radio Navigation Aid. The characteristic impedance of the line is approximately 115 OHMS.
2 3/16		Woven steel wire sheath (white).	Impregnated cloth.	Impregnated paper	Lead sheath	Cotton cloth	Jute or hemp cord filler.	Silk cloth winding.	Rubber insulation.	Solid copper conductor.	This is a nine conductor cable. Probably multi-conductor remote control cable. All the conductors are size No. 17.
3/4		Lead sheath	Cotton cloth	Black rubber insulation.	White rubber insulation.	Stranded copper					This high voltage cable was used on a radar transmitter to carry plate voltage at a potential of 6 KV. The stranded core, which is size No. 11, is made up of seven strands of No. 20 copper wire.
3/16		Rubber insulation.	Cotton string filler.	Rubber insulation.	No. 18 stranded copper wire.						This is probably ordinary power cable.

Figure 370. Various types of Japanese cables.

Figure 371. Hand wire reel unit with broomstick handle.

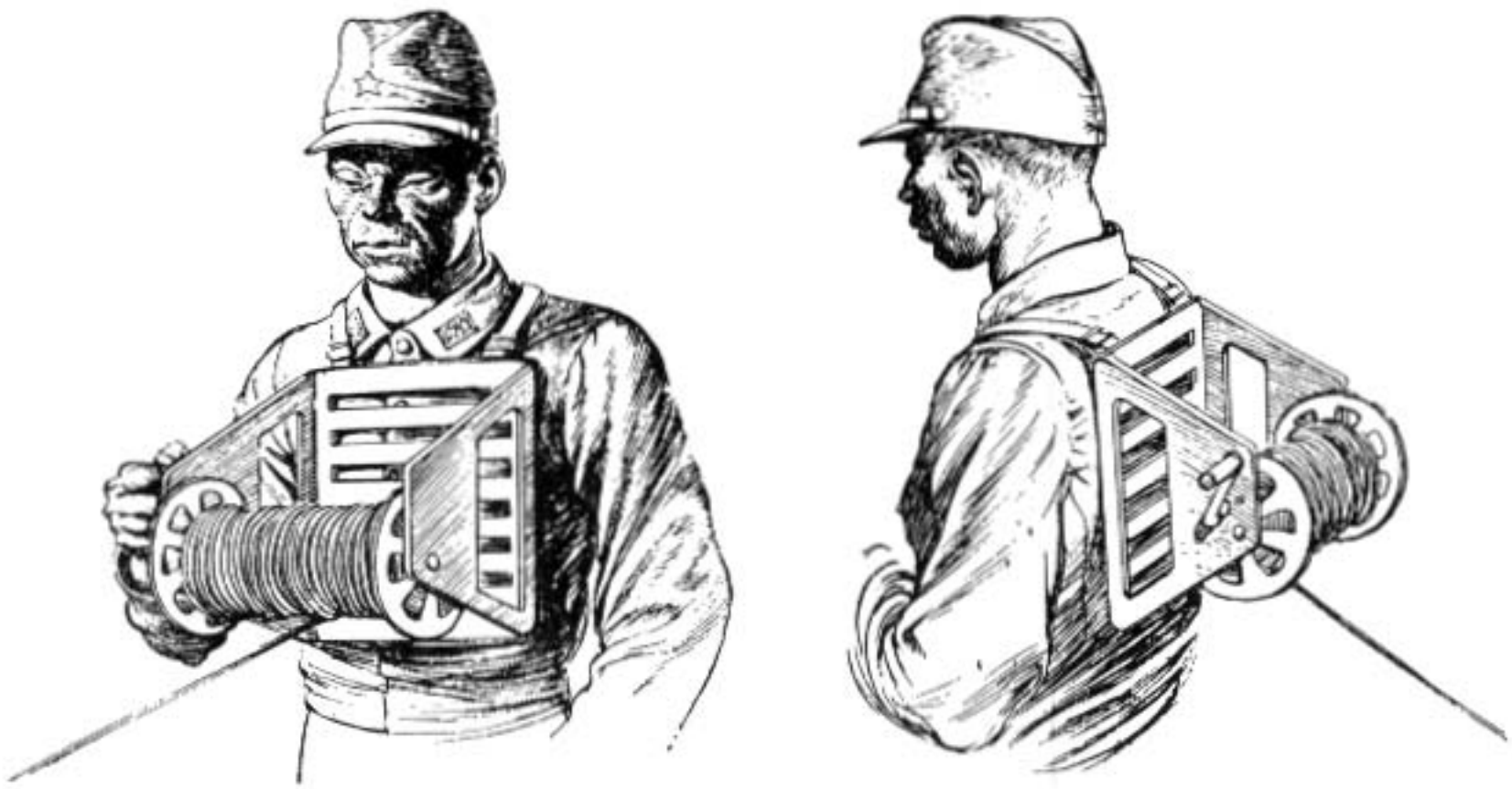


Figure 372. Head wire reel—used by field artillery. At left: Recovering wire. At right: Reeling out wire.

11. SIGNAL FLAGS. Two small hand flags, one red and the other white, are used for semaphore. For signaling Morse Code a large red and white flag, on a bamboo shaft about 5 feet long, is utilized.

12. MILITARY DOGS. Trained dogs, used to some extent for carrying messages, are cared for and trained by the division signal unit.

13. PIGEONS. Pigeons, also, are used for carrying messages.

14. HAND GENERATORS. a. Model "F". This simple and compact hand-driven generator, which weighs only 16 pounds, delivers 24 watts. It serves as a source of filament voltage (3 volts) and of plate voltage (125 volts). The mechanical transmission between driving handle and armature consists of 4 geared wheels, 2 of which are fiber, the others steel. According to the name plate, the normal rate of turning is 70 revolutions per minute, giving an armature speed of 5,200 revolutions per minute. Harness is provided for carrying the generator and for fastening it to a support. It is possible for a man to work the generator when the straps are slipped over his shoulders, with the base resting against his chest.

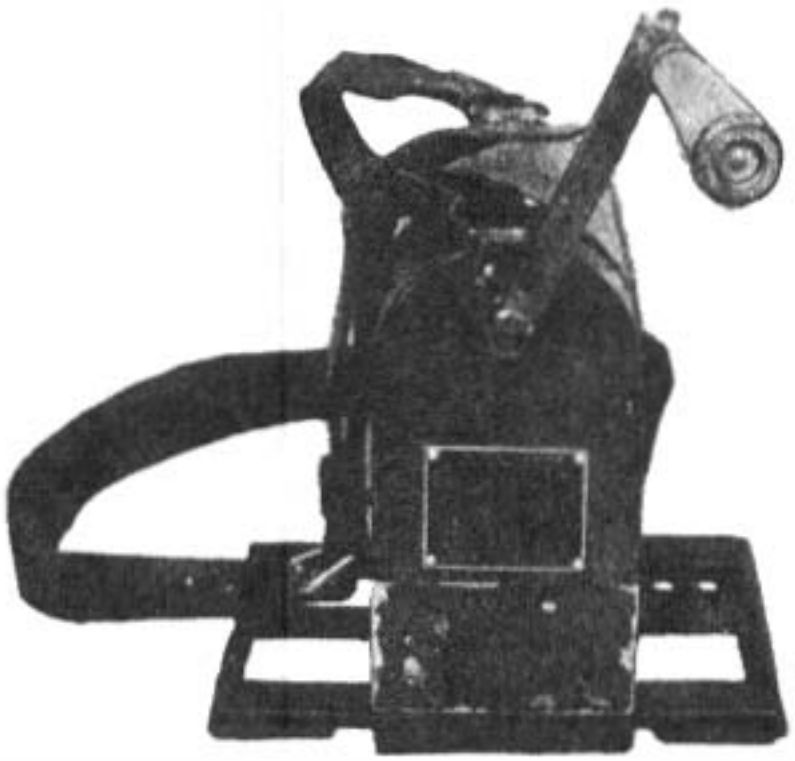


Figure 373. Model "F" hand generator right side view showing crank handle in place.

15. BATTERY CHARGER. Two charging circuits are provided. One uses a Tungar, half-wave rectifier, delivering 14 volts at 6 amperes. The other circuit uses a type 83, mercury-vapor, full-wave rectifier, delivering 130 to 160 volts at 0.1 ampere. Component parts are mounted on an angle-iron framework which fits into a metal carrying case. The case is provided with ventilating apertures, 3 weatherproof receptacles, a door at the rear, and a leather carrying handle. The charger is capable of charging one 12-volt storage battery and one storage "B" battery at an average efficiency of 30 percent. This efficiency compares favorably with that of half-wave Tungar chargers of American manufacture. The switching arrangement controlling the active turns in the transformer primaries allows operation of the charger from three different line voltages.

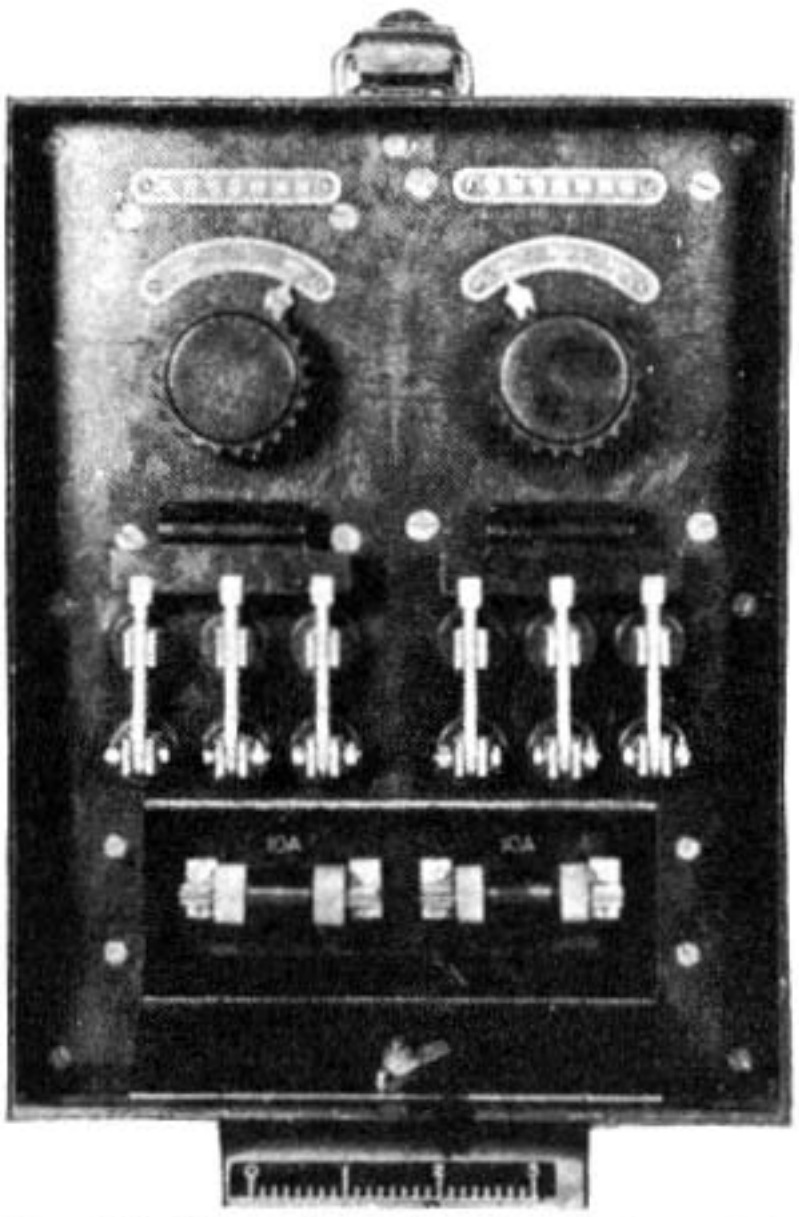


Figure 374. Battery charger, front view, showing controls.

16. POWER UNITS—DUAL VOLTAGE DC(1300V/12V). This is a completely self-contained, rope-starting, power unit, consisting of a single cylinder of 1.977-inch bore x 2.0-inch stroke. The air-cooled gasoline engine is coupled directly to a straight-shunt, 2-pole-field, dual-voltage 1300-V/12V generator, inclosed in an aluminum housing. Engine and generator are ruggedly constructed and supported, indicating long-life operation. This unit can be used to furnish plate voltage to U. S. Army SCR 177.

17. PYROTECHNIC SIGNALS. The Japanese make much use of pyrotechnic signals. Projection is achieved by means of Models 10 and 89 Grenade Dischargers, both of which are common infantry weapons.

Listed below are some of the pyrotechnic signals which can be used in grenade dischargers. They frequently have been referred to by the Japanese as dragons. The nature of the signal may be ascertained by two methods: (a) by color bands painted on the body. (b) by designs embossed on the cover (for use in the dark).

Signal	*Color bands on body*
Black smoke, parachute	One wide black band.
White star, parachute	One wide white band.
White star	One narrow white band.
White star, double	Two narrow white bands.
White star, triple	Three narrow white bands.
Orange smoke, parachute	One wide yellow band.
Green star, parachute	One wide green band.
Green star, single	One narrow green band.
Green star, double	Two narrow green bands.
Red star, parachute	One wide red band.
Red star, triple	Three narrow red bands.

Signal pistol, 35-mm (1.38-inch) parachute and cluster "stars" in red, white, or green colors, with a burning time of from 4 to 15 seconds, are reported to exist. The cartridge closely resembles a shotgun shell. Model 97 (1937) signal pistol: One and three barrel models of this newer type signal pistol have been reported. The pistol is well made of a good grade of steel with an excellent finish; its overall length is 9 13/16 inches, and its weight is 1 pound 13 ounces.

Section V

ENGINEER EQUIPMENT

1. GENERAL. a. Japanese engineers are well-equipped and are armed as infantry. They have shown outstanding ability in both the construction and demolition of bridges. On the other hand, airfields and roads so far encountered have not been up to Allied standards in speed of construction or serviceability. This may be attributable to the fact that the Japanese have depended more on manual labor than on heavy equipment, which they have not taken into forward areas in any quantity.

b. The construction of field fortifications has been very highly developed, and even at remote points Japanese engineers have been successful in constructing first class defense positions from material immediately available. (For detailed descriptions of various kinds of Japanese defensive constructions, see part 2, secs. III and IV, chapter 7).

c. Engineers are also well-equipped with a wide variety of explosive charges and other material for assault and demolition tasks.

d. The shipping engineers (Senpaku Kohei) are specially trained and equipped to operate a large

e. Moneys.

Yen (¥) = 100 sen = 1,000 rin = { 0.49846 U. S. dollars (at par). / 0.23196 U. S. dollars (average rate of exchange, November 1941).

3. METHOD OF NUMBERING MODELS.

a. Before 1926 the model number of weapons and equipment was indicated by the year of the reign in which the model was adopted. Since 1926 the model has been numbered from what is assumed to be the date of the founding of the Japanese Empire. The last two digits of this number are used up to the year 1940. Models adopted in 1940 are simply designated as "0" (Zero). Models adopted in 1941 are designated "1" and so on.

b. A comparative table indicating the western year, the Japanese year, and the model number corresponding thereto follows:

Western year	Japanese year	Model No.	Western year	Japanese year	Model No.
1930	2590	90	1938	2598	98
1931	2591	91	1939	2599	99
1932	2592	92	1940	2600	0
1933	2593	93	1941	2601	1
1934	2594	94	1942	2602	2
1935	2595	95	1943	2603	3
1936	2596	96	1944	2604	4
1937	2597	97			

c. This method of marking equipment is in general use in both the Army and the Navy for numbering types of equipment, including airplanes, tanks, pieces of ordnance, etc.