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⑥ A SHORT SURVEY OF JAPANESE RADAR,
VOLUME II.

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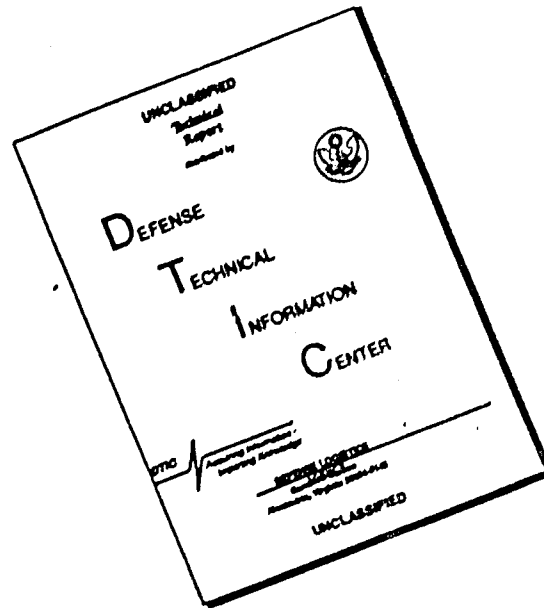
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A SHORT SURVEY OF JAPANESE RADAR

Volume II

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IV - JAPANESE ARMY RADARS--EQUIPMENT MANUFACTURED AND PLANNED

^{JAPANESE}
1. General. In this section of the Survey are given brief reviews of each of the ~~army~~ radar sets of any importance. ~~(Similar data are given, in Section V on Japanese Navy sets.)~~ Many were still in the developmental, or even planning, stage. These are included with the thought that they may on that account be of even greater interest since they tend to point out the extent of the art and thinking in Japanese electronic circles. The data have all been supplied by Japanese war research or manufacturing agencies. In some cases slightly conflicting information will be noted. These have been left as reported since the discrepancies did not appear of sufficient importance to warrant expending the time to resolve them.

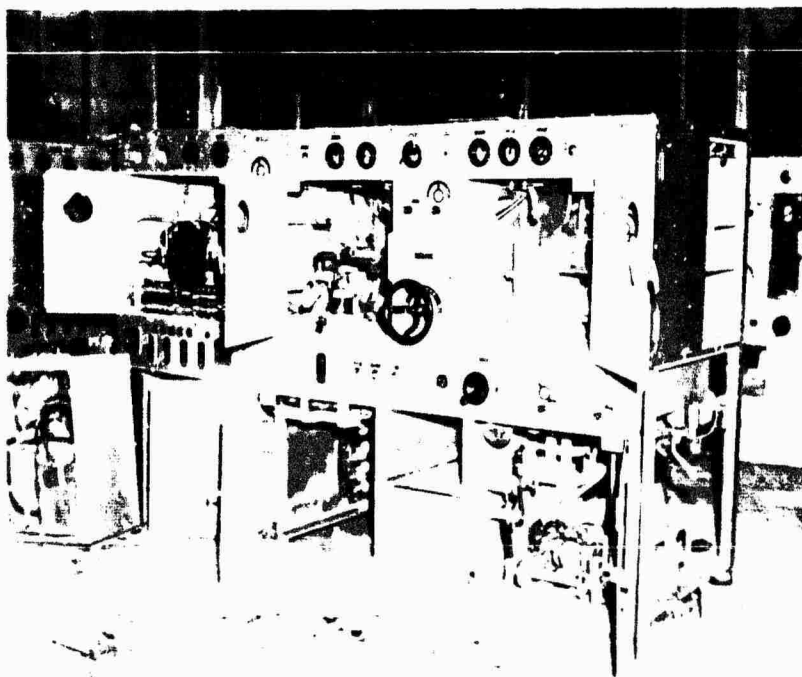
The block diagrams of army sets were drawn up to comply with the directive of General Headquarters, U.S. Army Forces in the Far East, to disclose all of their radar equipments, research work, and proposed developments. Most of these diagrams were drawn in pencil on rough paper. Reproduction is therefore not perfect but it is believed adequate for ordinary study purposes. Numerous oddities of spelling and notation have been left untouched (except where difficulty in meaning was present).

With each block diagram have been inserted one or more pages summarizing the technical characteristics of each equipment. Wherever possible close up pictures are shown which assist in describing its construction or operation. Only new pictures taken on the home islands of Japan (mostly in the Tokyo area) are included, on the assumption that pictures taken of earlier captured Japanese sets will, in the main, be familiar to the reader. In some cases suitable pictures or studies could not be made because the Japanese had partly destroyed the units; other times, and much more often, our own occupying forces had either gone "souvenir hunting" or engaged in the fun of smashing delicate instruments, and defaced certain sets almost beyond recognition. An example of this is shown in the accompanying photos in some of the buildings at the main Army Radar School near Tachikawa. A small number of sets were installed at such remote points that photographing would have been quite difficult. Some of these will yet be visited by subsequent radar investigators who will undoubtedly make their pictures available in later reports.

2. Type A vs Type B Systems. The Japanese Army used both Type A (Doppler) and Type B (pulsed) radar systems. A network of A-nets girdled the shores of the home islands as seen in the maps of Section VIII. The navy had plans for A-type sets also but did not employ them. The A-sets depend on the Doppler effect or wave interference patterns set up when a moving reflector, e.g. an airplane, crosses the transmission path between a transmitter and a receiver. This section of the Survey will concern itself exclusively with Type B sets.



The U. S. Army
stripped this
Japanese radar
equipment --
for souvenirs
or for unaccounted
reasons. (Japanese
Radar School at
Kodaira.)



3. "The Japanese Army Radar Book". The information and block diagrams for the army radar sets were supplied principally by members of the Tama Radar Research Institute. Certain data, however, are from manufacturers and other sources.

It may be observed that Tachi- and similar designations are Tama Laboratory numbers and frequently do not appear on the name plates of the equipment. They are used here because they are convenient, are recognized by the laboratories, the manufacturers and the operators, and because they give information on the use to which the set will be put. Thus:

Tachi is used for ground equipment.
Tase is used for shipborne equipment.
Taki is used for airborne equipment.

A "Radio Detector" is a search radar.

A "Radio Locator" is an accurate positioning radar. Searchlight control, gunlaying and GCI radars fall in this class.

A "Radio Leader" is a set used to furnish accurate information on the position of a friendly fighter. With a locator it makes up a GCI station.

A "Wave Counter Measuring Apparatus" is an RCM search receiver. A "Disturber" is a jammer.

PRESENT STATUS OF JAPANESE ARMY RADAR EQUIPMENT

15 August 1945 Survey

NAME	CLASSIFICATION	CODE NAME	OBJECTIVE	CAPABILITIES	WEIGHT	STATUS OF PROGRESS AS OF 15 AUGUST 1945	MANUFACTURED BY	NUMBER PRODUCED	
WARNING RADAR	GROUND	(400) Trans-A (1000) altair (4000)	-----	"Doppler" Warning System	Antiaircraft Warning - Range 20-300 km	100 kg-2 tons	Research and Test Completed In Use	Tokyo Shitaura Communications and several other companies	
		B (Permanent)	Techi Mk 6	Permanently built at important bases. Detects and computes the position of approaching aircraft.	f = 68, 72, 80 MC/S. Maximum power output 50 KW. Antiaircraft warning range 300 km. Range accuracy ± 7 km. Azimuth accuracy ± 5°	10 tons	Research and Test Completed. Most of preparation to send specialist out to the bases to make further research. Research was being made to improve accuracy of range and azimuth.	Sumitomo Communications	350
		B (Field)	Techi Mk 7	Mounted on vehicles to facilitate its use in detecting and computing the position of approaching aircraft.	f = 100 MC/S. 50 KW. Range 300 km. Range accuracy ± 5 km. Azimuth accuracy ± 5°	10 tons (includes vehicles)	Research and test completed. In use.	Iwasaki Communications	60
		B (Portable)	Techi Mk 18	Equipment transportable by trucks. Detects and computes the position of approaching aircraft.	f = 94, 96, 102, 106 MC/S. 50 KW. Range 300 km. Range accuracy ± 5 km. Azimuth accuracy ± 5°	4 tons	Research and test completed. In use.	Tokyo Shitaura and Iwasaki Communications	400
		Altitude Calculator	Techi Mk 35	Accurately locates the position of the aircraft and computes the altitude.	f = 82 MC/S. 50 KW. Range 100 km. Range accuracy ± 1 km. Azimuth accuracy ± 10° Elevation accuracy ± 500 M	4 tons	Research completed, test completed and 3 sets in actual use. (Matsudo, Kureyadani, Goshima).	Sumitomo Communications	3
		Altitude Calculator with Receiver Attachment	Techi Mk 20	Attached to the receiver of the permanent warning radar. Computes the altitude of aircraft at long range.	f = 68, 72, 76, 80 MC/S. Range 100 km. Range accuracy ± 1 km. Azimuth accuracy ± 10° Elevation accuracy ± 500 M	2 tons	Research and test completed. Five sets in use (Shimoi, Shimoda, Shitaura).	Asahi Electric	12
	SHIP	B (Ship)	Techi Mk 1	Used on ships. Detects and computes the position of approaching aircraft.	f = 110 MC/S. 50 KW. Range 300 km. Range accuracy ± 5 km. Azimuth accuracy ± 7°	4 tons	Research completed. Results unsatisfactory in actual use. Plans being formulated to transfer its use on land.	Tokyo Shitaura Communications	30
		Transport Sub	Techi Mk 10	Used on transport ships for aircraft protection.	f = 150 MC/S. 10 KW. Range 50 km. Range accuracy ± 3 km non-directional.	100 kg (actual not included)	Research completed. Suspended activity production. Test incomplete due to inadequacy of electrical equipment on sub.	Tokyo Shitaura Communications	1
		Anti-sub	Techi Mk 2	Used on ships to detect and compute the position of ships and subs.	Wavelength = 15.7 CM. 1 KW. Range against ships 30 km. Range against subs 15 km. Range accuracy ± 100 M. Azimuth accuracy ± 10°	2 tons	Research completed. Results were unsatisfactory in actual use. Modified and utilized good results as anti-air warning radar.	Tokyo Shitaura Communications and Nippon Wireless	80
		A/C	Anti-airship	Model II	Used on large type aircraft to detect and compute positions of ships and subs. Smaller type but same capabilities as Model II.	f = 150 MC/S. 10 KW. Range against ships 100 km. Range against subs 20 km. Range accuracy ± 20 M. Azimuth accuracy ± 5°	Model II 110 kg. Model IV 60 kg.	Research and test completed. In use.	Nippon Wireless
Anti-sub	Model IV					Research completed. Test model being made.	Tokyo Shitaura Communications		
LOCATING RADAR	GROUND	Model 1	Techi Mk 1	Set up at important bases. Flashes firing data for anti-aircraft guns.	f = 200 MC/S. 10 KW. Operating range 20 km. Range accuracy ± 100 M. Azimuth accuracy ± 10° Elevation accuracy ± 2-3°	3 tons	Research completed. Produced 30 and production was suspended. Plans were being made for Model IV modification with transmitter and accumulator to increase range and stability.	Sumitomo Communications	3
		Model 2	Techi Mk 2	Same as above.	f = 200 MC/S. 10 KW. Range 20 km. Range accuracy ± 100 M. Azimuth accuracy ± 10° Elevation accuracy ± 10°	2.5 tons	Research completed. Produced 30 and production suspended. More than one-half completed. Same in use.	Tokyo Shitaura Communications	40
		Model 3	Techi Mk 3	Improvement over Model 1 and 2 with increased power output and higher degree of stability.	f = 12 MC/S. 50 KW. Range 40 km. Range accuracy ± 100 M. Azimuth accuracy ± 10° Elevation accuracy ± 10°	4 tons	Research completed. Emergency production suspended. In use. Similar to improvement was made which facilitates the adjustment of the azimuth compass.	Sumitomo Communications	150
		Model 4	Techi Mk 4	Improvement over Model 1 and 2 with simplified construction.	f = 100 MC/S. 10 KW. Range 40 km. Range accuracy ± 100 M. Azimuth accuracy ± 10° Elevation accuracy ± 10°	2.5 tons	Research completed. Emergency production suspended. Same in use. Transmitter and receiver modified to simplify assembly.	Tokyo Shitaura Communications	50
		Model 4 Modification	Techi Mk 31	Improvement made over Models 1, 2 and 4. Will be the standard model for locating radar.	f = 200 MC/S. 10 KW. Range 40 km. Range accuracy ± 100 M. Azimuth accuracy ± 10° Elevation accuracy ± 10°	2.5 tons	Research completed. In emergency production now. Research is being made in improving the antenna.	Tokyo Shitaura Communications	70
		Warburg	Techi Mk 34	Collected the standard German model Warburg B for the purpose of reducing the wavelength and improving the azimuth accuracy.	Wavelength = 50 CM. 10 KW. Range 40 km. Range accuracy ± 40 M. Azimuth accuracy ± 10° Elevation accuracy ± 10°	1.5 tons	Research completed. Under preparation for production. Research has been made to improve the stability and capabilities.	Nippon Wireless	1
		A/C	Anti-aircraft (Anti-airship)	Model II	Principally used during the night on fighter aircraft to approach ships and aircraft.	Wavelength = 90 CM. 2 KW. Range 3 km against aircraft. Range 1 km against ships. Range accuracy ± 200 M. Azimuth accuracy ± 10°	120 kg.	Research completed. Under actual test. Under emergency production.	Sumitomo Communications
			Model III	Improvement made on the indicator of Model II.		Finished	Research in the indicated completed. Under preparation for actual test.		
	OFFENSIVE FIGHTER AC DETECTING		Ground Section	Techi Mk 13	Set up at fighter bases. Used together with aircraft relay equipment (Techi 15) to compute the position of the friendly aircraft.	Transmitter f = 144 MC/S. Receiver f = 175 MC/S. 100W. Range 150 km. Range accuracy ± 100 M. Azimuth accuracy ± 10°	1.5 tons	Research and test completed. Technical instruction are given to units using equipment.	Tokyo Shitaura Communications
		Aircraft Section - Model I.	Techi Mk 15	Equipment on friendly fighter aircraft. Automatically relays electronic impulses from ground.	Receiver f = 144 MC/S. Transmitter f = 175 MC/S. 100 W. Non-directional.	25 kg.	Same as above.	Tokyo Shitaura Communications	50
Ground Section		Techi Mk 28	Deployed around fighter bases and computes the position of friendly aircraft by central converging system.	f = 120 MC/S. Range 30 km. Range accuracy ± 1 km. Azimuth accuracy ± 10°. Signal relay f = 40-65 MC/S. ± 5°.	500 tons	Research completed. Under actual test. Under preparation to use equipment and data for completion of test.	Iwasaki and Fuji Communications	1	
Aircraft Section.		Techi Mk 30	Transmitter equipment on friendly aircraft used in conjunction with Tech 28.	Transmitter f = 140 MC/S. 10W. 20 A. Modulation f = 50-60 MC/S. 11 MC/S step. Non-directional.	25 kg.	Same as above.	Sumitomo Communications	50	
Indicator		Techi Mk 36	Indicates the bearing and range of the future position of friendly and enemy aircraft from late scattered from weather and leading radar.	Accuracy of bearing ± 10°. Range ± 10 km. Azimuth accuracy ± 10°.	40 kg.	Test of Model I was completed. Preliminary tests were made to test the indicator and the relay.	Tokyo Shitaura Communications	2	
Transmitter			Transmits the position of friendly and enemy aircraft on the screen.	Accuracy of bearing ± 10°. Range ± 10 km. Azimuth accuracy ± 10°.	40 kg.	Test of Model I was completed. Preliminary tests were made to test the indicator and the relay.	Tokyo Shitaura Communications	2	
Receiver			Receives the position of friendly and enemy aircraft on the screen.	Accuracy of bearing ± 10°. Range ± 10 km. Azimuth accuracy ± 10°.	40 kg.	Test of Model I was completed. Preliminary tests were made to test the indicator and the relay.	Tokyo Shitaura Communications	2	
DEFENSIVE FIGHTER AC DETECTING	Ground Section	Techi Mk 17	Installed together with warning radar. Detects and identifies friendly or foe in conjunction with the relay equipment on the aircraft.	Transmitter f = 144 MC/S. Receiver f = 175 MC/S. 10 A. Range 150 km. Range accuracy ± 10 M. Azimuth accuracy ± 10°	1.5 tons	Research completed. Under actual test.	Tokyo Shitaura Communications	50	
	Model II		Is now used over Model I with modification made on relay.	Range 200 km. Range accuracy ± 10 M.	1.5 tons	Equal test with the Model I.	Tokyo Shitaura Communications	50	

				length and improving the azimuth accuracy.		Altitude accuracy $\pm 1/80$ Elevation accuracy $\pm 1/80$		proves the stability and capabilities.			
A/C	Anti-aircraft (Anti-airship)	Model II	Test Mx 2	Principally used during the night on fighter aircraft to approach ships and aircraft. Improvement made on the indicator of Model II.		Wavelength = 80 CM. 2 KW. Range 3 km against aircraft. Range 5 km against ships. Range accuracy ± 200 M. Azimuth accuracy ± 10		120 KG.	Research completed. Under actual test. Under emergency production.	Sumitomo Communications.	
		Model III						Unknown	Research on the indicator completed. Under preparation for actual test.		
LEADING RADAR	OFFENSIVE FIGHTER A/C DETECTING	FOR SINGLE A/C	Aircraft Section	Test Mx 13	Set up at fighter base. Used together with aircraft relay equipment (Test 15) to compute the position of the friendly aircraft.	Transmitter f = 160 MC/S. Receiver f = 175 MC/S. 100W. Range 150 KM. Range accuracy ± 500 M. Azimuth accuracy ± 10		1.5 tons	Research and test completed. Technical instruction was given to units using equipment.	Tokyo Shibaura Communications.	
			Aircraft Section - Model I.	Test Mx 15	Equipment on friendly fighter aircraft. Automatically relays electric impulses from ground.	Receiver f = 180 MC/S. Transmitter f = 175 MC/S. 100 W. Non-directive.		25 KG.	Same as above.	Tokyo Shibaura Communications.	
		FOR SEVERAL A/C	Aircraft Section	Test Mx 38	Deployed around fighter base area and computes the position of friendly aircraft by conical converging method.	f = 190 MC/S. Range 300 KM. Range accuracy ± 1 KM. Azimuth accuracy ± 0.5 . Signal relay f = 50-65 MC/S. 8 W.		500 tons	Research completed. Under actual test. Under preparation to use equip. at immediately upon completion of test.	Kokusai and Fujit Communications.	
			Aircraft Section.	Test Mx 30	Transmitter equipment on friendly aircraft used in conjunction with Test Mx 28.	Transmitter f = 190 MC/S. 5 W. 20 M. Modulation f = 30-60 KG/S. (1 KG/S step). Non-directive.		25 KG.	Same as above.	Mitsubishi Electric.	
		DEFLECTING EQUIPMENT	Computer	Test Mx 46	Computes the bearing and range of the future position of friendly and enemy aircraft from data gathered from booster and leading radars.	Accuracy of computation: Bearing ± 20 Range ± 100 sec. a cruising speed.		40 KG.	Test Model Mx 1 was lost in the incendiary raid, but carrying on tests at Fujiyama with Mx 2.	Yoroga Electric.	
			Transmitter		Transmits the above data to the aircraft.	Accuracy of transmission: Bearing ± 5 Range ± 200 M. Altitude ± 500 M.		20 KG.	Completed tests on three models. Not in actual use.	Sumitomo Communications.	
IFF	DEFLECTING EQUIPMENT	Indicator		Indicates the position of friendly and enemy aircraft on the screen.			500 KG.	Testing and manufacturing company turned. Research temporarily suspended.	Sumitomo Communications.		
		Ground Section	Model I	Test Mx 17	Installed together with leading radar. Carries out identification of friend or foe in conjunction with the relay equipment on the aircraft.	Transmitter f = 190 MC/S. Receiver f = 175 MC/S. 10 KW. Range 250 KM. Range accuracy ± 3 KM. Azimuth accuracy ± 10 .		1.5 tons	Research completed. Not in practical use.	Mitsubishi Electric.	
			Model II		Improvement over Model I with modification made on sensitivity.	Range 450 KM. Range accuracy ± 2 KM. Azimuth accuracy ± 10 .		1.6 tons	Equipment using the tone-switching principle was under test.	General Communications.	
		Aircraft Section	Model II	Test Mx 15	Installed on friendly aircraft and works together with Test Mx 17.	Transmitter f = 175 MC/S. 100W. Receiver f = 175 MC/S. Non-directive.		25 KG.	Research on test completed. Under preparation for practical use.	Mitsubishi Electric.	
			Model III		Combination of Models I and II.			25 KG.	Test model completed. Preparation made for field test.	Tokyo Shibaura Communications and Asahi Electric.	
NAVIGATION EQUIPMENT	TWO CURVED LINE NAVIGATION EQUIPMENT	Ground Section	Test Mx 39	Two curved lines used for navigation. Is computed from the phase difference of impulses transmitted from two stations.	f = 1.5 MC/S. 150 KW. Range 1000 KM. Range accuracy $\pm 1\%$.		600 tons	Partially completed. Some equipment of the system section but was destroyed by fire from incendiary bombs.	Sumitomo Communications.		
			Aircraft Section	Test Mx 35	Same as above - aircraft section.	f = 1.5 MC/S. Non-directive.		10 KG.	Started training on a training model.	Kinross Wire-ress.	
		Model 1	Test Mx 14	Installed on aircraft. Identifies the condition of terrain and during the night and from above the clouds. Used for navigation and bombing.	Wavelength = 27 CM. 2 KW. Range in medium 20 KM. (5000 M altitude). Range accuracy ± 2 CM. Azimuth accuracy ± 10 . PPI display.		170 KG.	Research completed. Carrying on preparation for test. Aircraft was to be placed for the equipment was damaged by bomb. Repairing in aircraft almost complete.	Tokyo Shibaura Communications.		
			Model 2		Improvement over Model 1. Planned to use at high altitude.			Unknown	General research completed. Making test model.	Tokyo Shibaura Communications.	
		For High Altitudes.	Test Mx 11	Installed on aircraft. Computes the distance to the ground from high altitude.	Wavelength = 80 CM. 200 W. Range 10,000-200 M. Error $\pm 10\%$.		25 KG.	Research and test completed. Some in practical use.	Tokyo Wireless and Kawasumi Machinery.		
			For Low Altitudes.	Model I	Test Mx 1	Computes distance to ground from low altitudes.	Wavelength = 40 CM. Continuous power output 4W. Frequency modulation 15 MC/S. Range 150-20 M. Error $\pm 5\%$.		25 KG.	Research and test completed. In use.	Tokyo Shibaura Communications.
RADAR	RADAR ALTIMETER	Model II		Improvement over Model I with a stabilizer.			25 KG.	Research completed. One section under way for test.	Tokyo Shibaura Communications.		
		A	Test Mx 4	Used in detecting the wavelength of radars and has the capability of absorbing.	Wavelength = 7-15 M. Gain 100 dB. Range 250 KM. Accuracy of wavelength computation $\pm 1\%$.		50 KG.	Research completed. Further research is being made to improve the capabilities.	Tokyo Communications.		
			B	Test Mx 5	Has the abilities of determining direction.	Wavelength = 4-1.5 M. Gain 120 dB. Range 100 KM. Accuracy of wavelength computation $\pm 1\%$. Accuracy of determining direction ± 5 at 200 KM.		50 KG.	Research completed. Production completed with 30 radars. Used in the field.	Tokyo Communications.	
		D	Test Mx 6	A simple detecting radar.	Wavelength = 7-0.5 M. Gain 110 dB. Range 200 M. Accuracy of wavelength computation $\pm 1\%$.		12 KG.	Research and test completed. Training the units in the field.	Tokyo Communications.		
			Ground	Test Mx 10	Wavelength = 70-3 CM. Gain 40 dB. Crystal detector. Accuracy of direction ± 10 . Range 40 KM.	50 KG.		Research and test completed. Training the units in the field.	Mitsubishi Electric.		
RADAR JAMMING	A/C	Aircraft	Test Mx 8	Has the abilities of detecting radars.	Wavelength = 7-1.5 M. Gain 120 dB. Range 100 KM. Accuracy of wavelength computation $\pm 1\%$. Accuracy of determining direction ± 5 at 200 KM.		50 KG.	Research completed. Production completed with 30 radars. Used in the field.	Tokyo Communications.		
			Test Mx 7	Same as above.	Wavelength = 7-1.5 M. Gain 120 dB. Range 100 KM. Accuracy of wavelength computation $\pm 1\%$. Accuracy of determining direction ± 5 at 200 KM.		50 KG.	Research completed. Production completed with 30 radars. Used in the field.	Tokyo Communications.		
		Ground Section	Test Mx 20	A booster or an instrument that guides others following the sensitivity lines of special radar waves.	f = 200 MC/S. Accuracy of direction ± 40 . Partly modified version of Model 4 booster.		2.5 tons	Research completed. General for a fighter. Plans are being made for test in flight. Research on the capability of performance of 100 MC/S output to 10 M.	Tokyo Shibaura Communications.		
			Aircraft Section	Test Mx 200		f = 200 MC/S. Directional control of source indicator planned.		42 KG.			
		For Ships	Test Mx 100	Detects and allows to electric waves sent from ships and ships with radar material (method of detecting ship sensitiveness).	Wavelength = 4-1.5 M. Effective distance ± 1 M. Indicator of Test Mx 4 modified and auto control section attached.		distorted	Research.	Tokyo Communications.		
			For Air-craft	Test Mx 17	Detects reflected waves from ships and a radar receiver wave. Is called detecting method.	f = 400 MC/S. Continuous output 70 W. Effective distance ± 1 M. Effective distance ± 1 M.		distorted	Research.	Mitsubishi Electric.	

TACHI - 6

RADIO DETECTOR FIXED TYPE

Corresponding Allied Designation: Chi-B (F).

Technical Characteristics:

f = 68, 72, 80 MC/S. 50 KW. Range 300 Km.

Accuracy: Range, \pm 7 Km; Azimuth, \pm 5°.

Number Built = 350. Approximate Number Installed = *MANY*

Description:

This is the set on which the main Japanese reliance was placed for early warning. These equipments were called Yochi Yo Dempa Keikaik, or "Radio Detector for the Important Place," and as seen on the radar disposition maps in Section VII dotted the southern shores of the home islands. They were also built on several islands in the chains leading southward from Japan, the installations becoming less elaborate as the distances increased to such points as Okinawa and the Philippines.

A Tachi-6 installation usually comprised one transmitter which radiated in all directions at once, or at least in a 90° sector, and from 3 to 6 receivers spaced in a roughly circular pattern about it at distances up to several hundred yards. At the major reporting station at Choshi, 75 kilometers east of Tokyo, two complete Tachi-6 units were set up; the transmitters were located on a small hill about a mile from the ocean with some 8 receiving stations oriented in all directions about them.

The fixed transmitting antennas took various forms, usually supported on a single very tall pole. Four layers of horizontally polarized antennas were always used. For a 90° sector an antenna similar to the one shown in the block diagram was used. For an all round sending station a four sided "box-kite" was built encircling the pole.

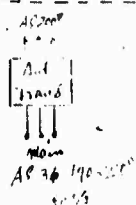
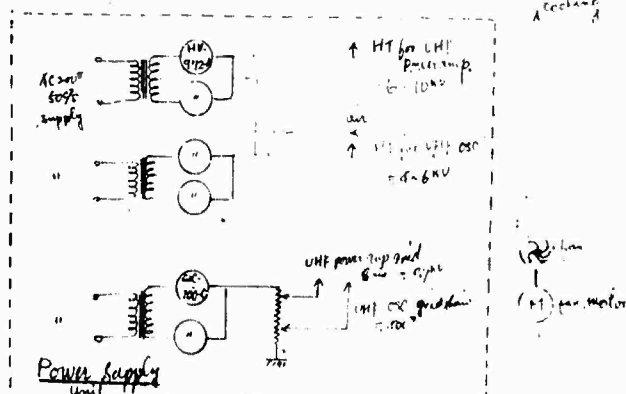
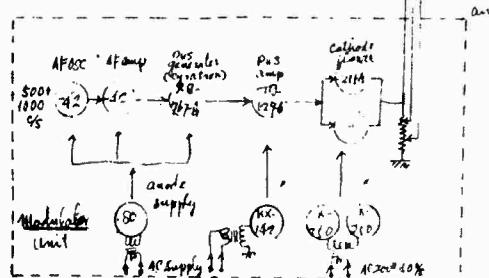
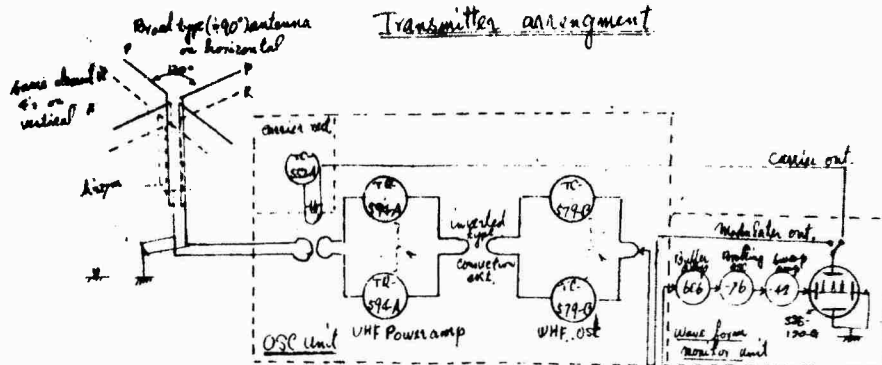
The receiving antennas which were hand rotated on a heavy central column usually extending down through the building housing the receiver equipment are of the type shown in the photograph. In operation one or more receivers are assigned a certain search sector. Thus searching a sector continues while one antenna tracks a flight. Display is on an A-scope reading 0-150 km or 0-300 km.

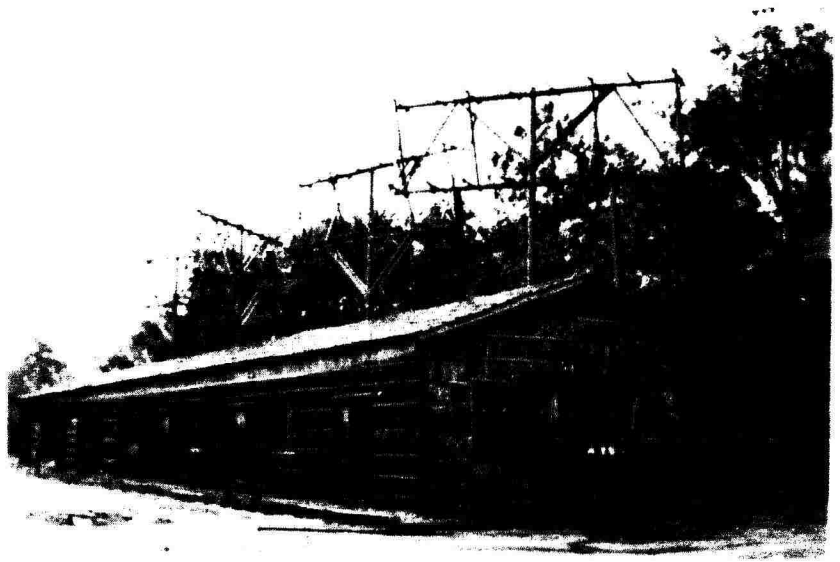
An auxiliary receiver picks up the pulse from the transmitter and uses it for sweep synchronization purposes.

Additional receivers may be located at points 20 km or more away to supply early warning information to AAA units, which "see" the aircraft by the illumination of the one transmitter unit. Such units use special elliptical charts to plot the position of a flight. One such installation was in use by a series of 8 AA and S/L headquarters receivers located in positions up to 20 km from the Tachi-6 transmitter at Ikuta west of Tokyo.

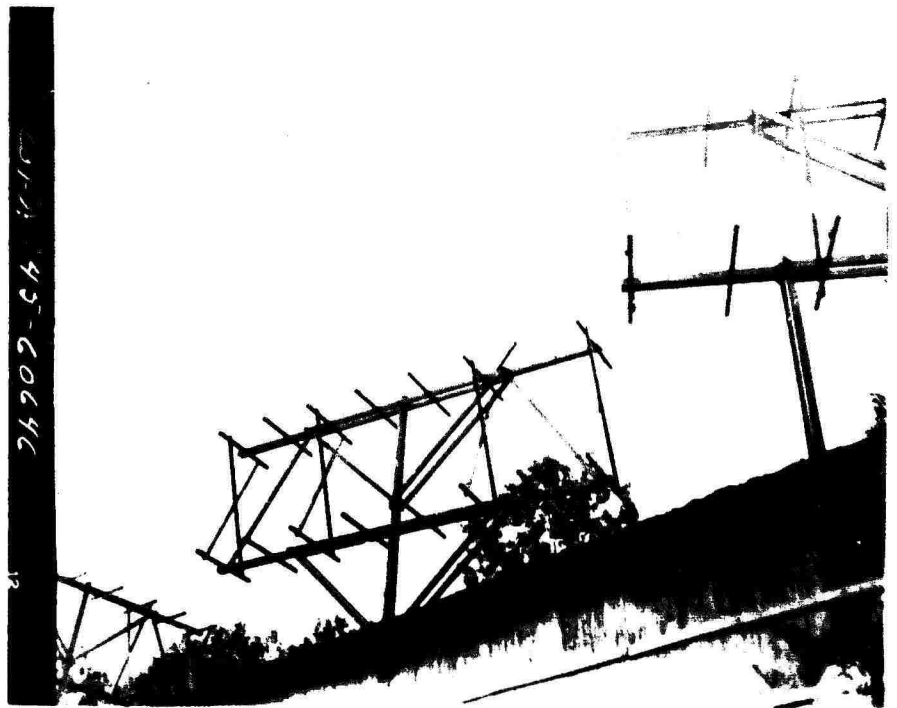
Radio detector fixed type (TACH-6)

Transmitter arrangement

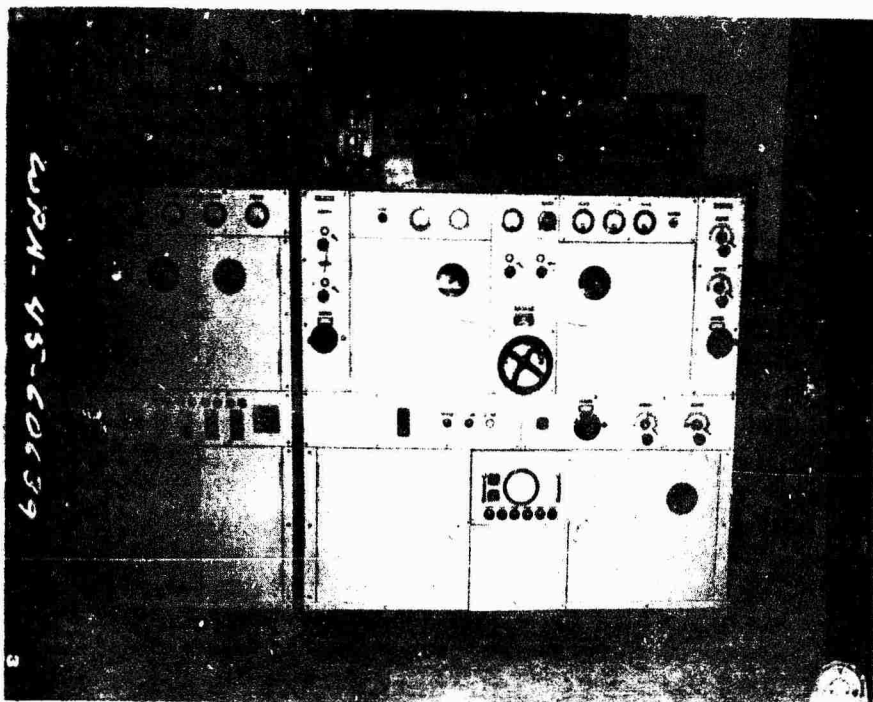




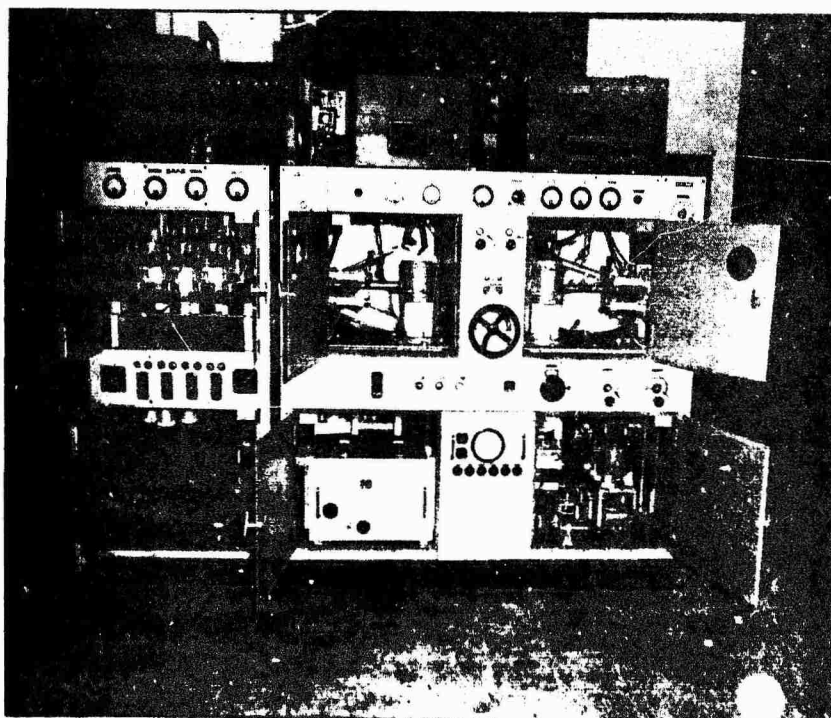
A Group of Tachi-6 Receiving Antennas at the
Army Radar School - Kodaira.



Close up of a Tachi-6 Receiving Antenna.



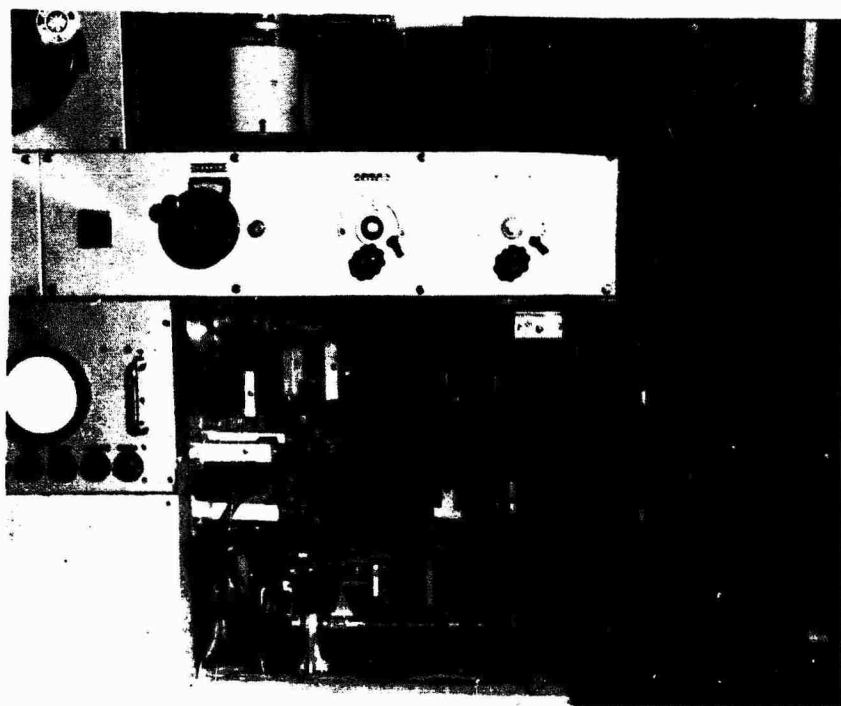
Transmitter and Power Units of Tachi-6.



Interior View of Transmitter and Power Units of Tachi-6.



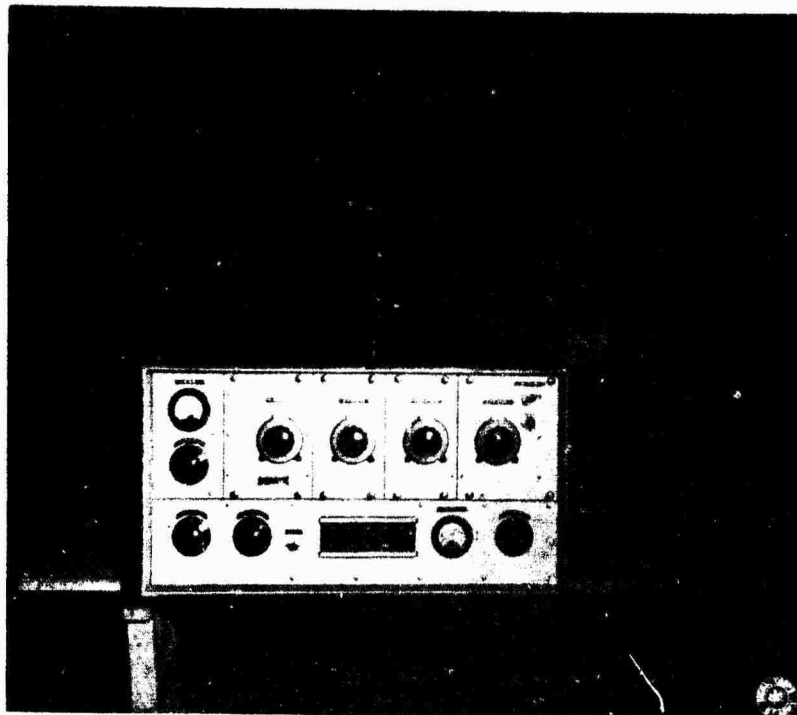
Detail of Transmitter Section - Tachi-6.



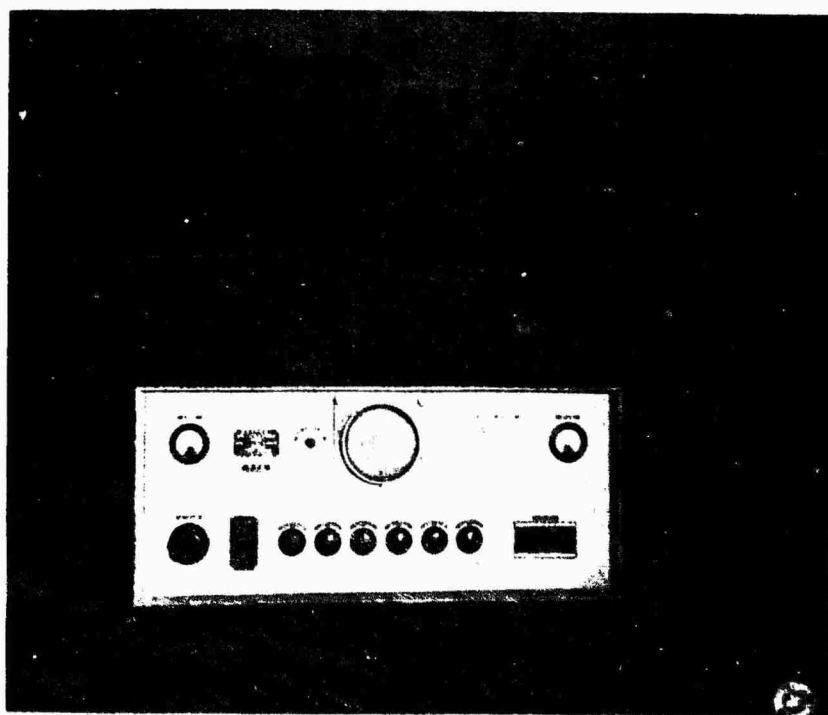
Detail of Oscillator Adjust Compartment -
Tachi-6.

Receives assignment

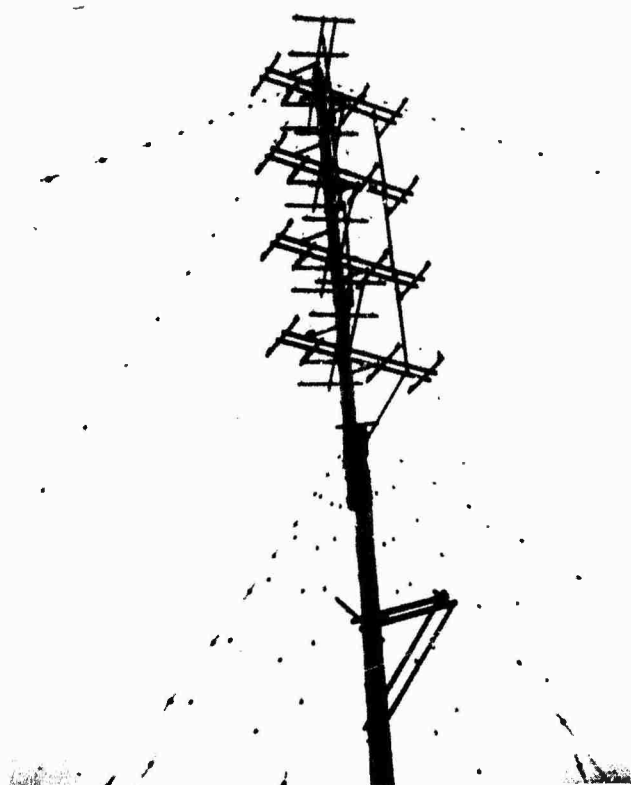




Receiver Unit for Tachi-6.

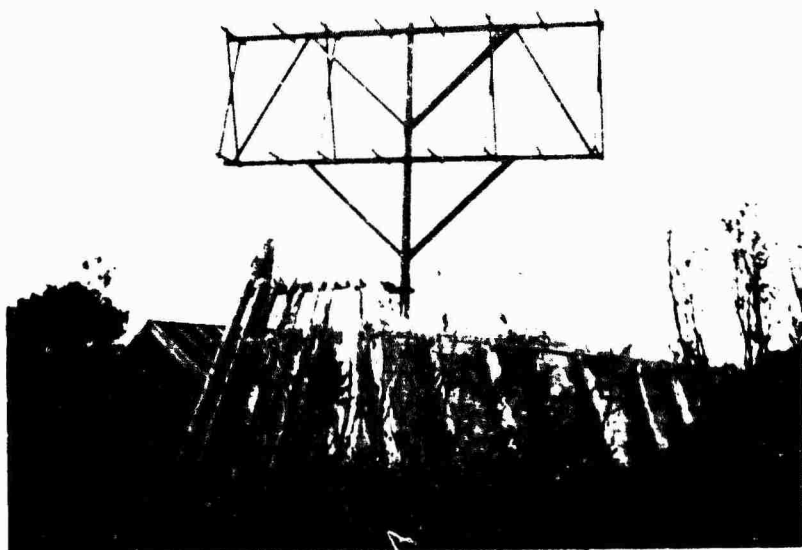


Indicator Unit for Tachi-6.



Above: Tachi-6
Transmitting
Antenna

Below: Tachi-6
Receiving
Antenna



TACHI - 7

RADIO DETECTOR FIELD USE TYPE

Corresponding Allied Designation: Chi-B (M).

Technical Characteristics:

$f = 100 \text{ MC/S.}$ 50 KW. Range 200 Km.
Accuracy: Range, $\pm 5 \text{ Km}$; Azimuth, $\pm 5^\circ$.

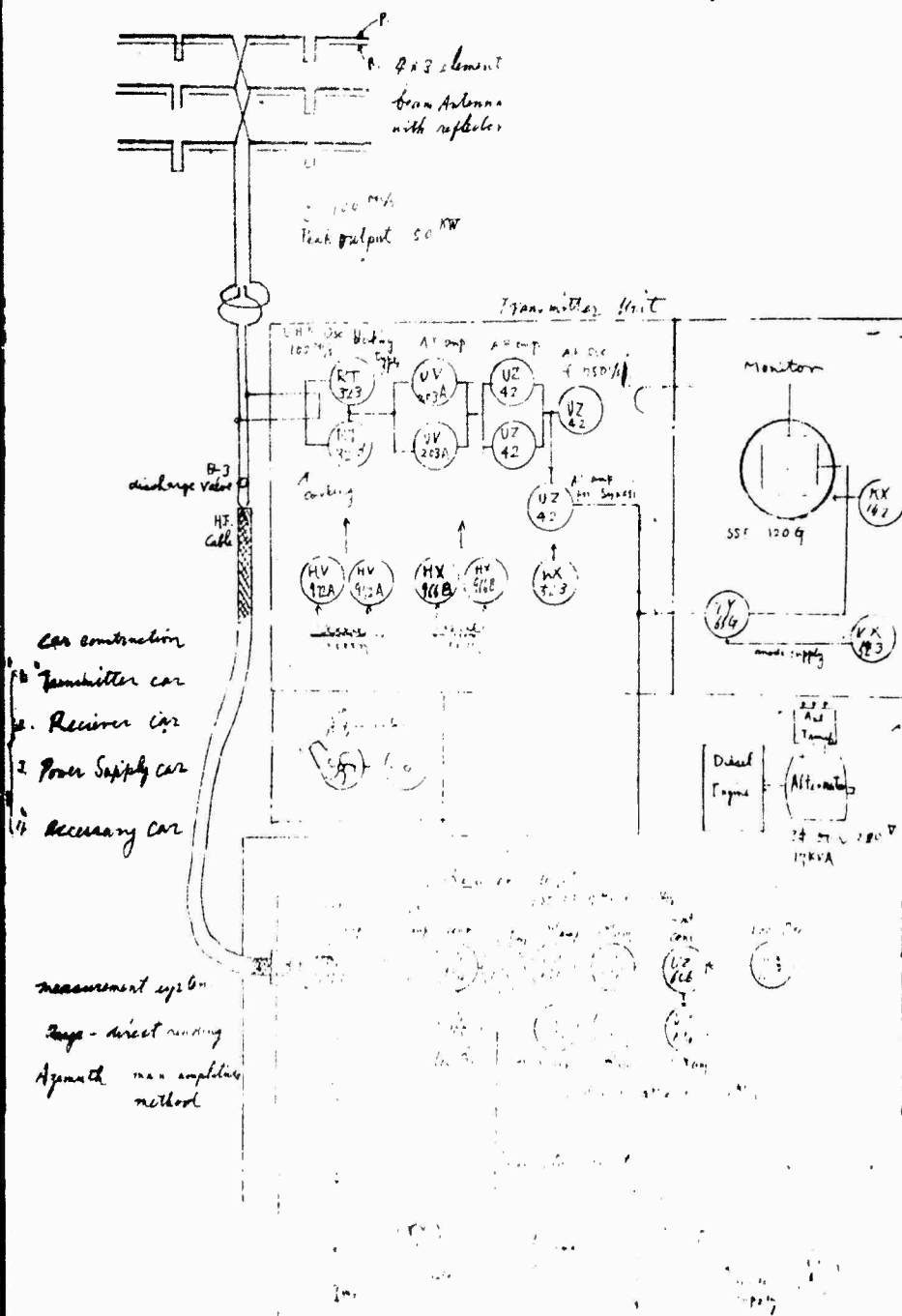
Number Built = 60. Number Installed = *NUMEROUS*

Description:

Tachi-7 was the chief mobile early warning radar. Three trucks or trailer mounts served to facilitate its moving into locations where the larger fixed Tachi-6 installations were not practicable. Tachi-7 was naturally sent further from the homeland and was found on Chichi Jima, Miyako Jima, and Okinawa. One was captured by Allied forces in the Philippines. It was also a popular standby set for Tachi-6 installations, and was thought with its different frequency to give some insurance against jamming.

A single antenna array is used for transmitting and receiving; a gas filled T-R tube tends to protect the receiver against the transmitted pulse. A type A display is used on a 120 cm tube. The claimed azimuth accuracy of $\pm 5^\circ$ is highly problematical.

Radio Detector Field Use Type (Tachi 7)



TACHI - 18

RADIO DETECTOR-CARRIER TYPE

Corresponding Allied Designation: ----

Technical Characteristics:

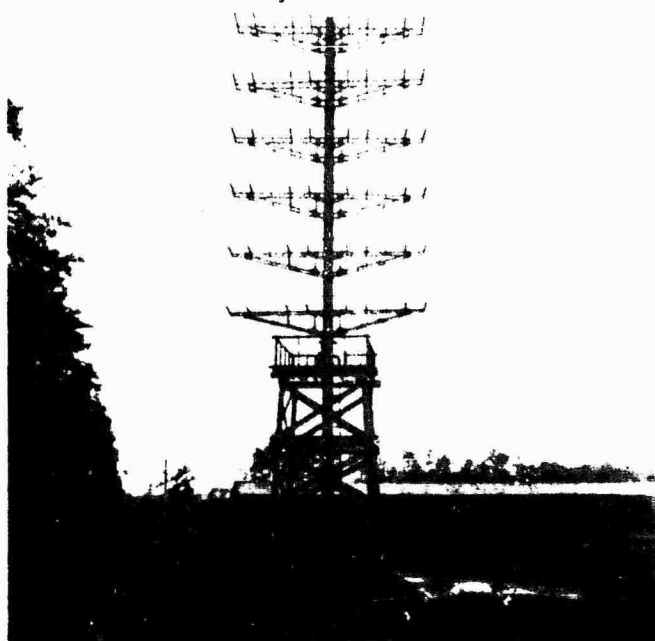
f = 94, 98, 102, 106 MC/S. 50 KW. Range 300 Km.
Accuracy: Range, ± 5 Km; Azimuth, $\pm 5^\circ$.

Number Built = 400. Number Installed = *FEW*

Description:

This is the third and lightest (4 tons) of the stock Japanese early warning sets, and in spite of the formidable proportions of the 6 x 4 element antenna was designed to be transportable in trucks. The units are not unlike those of the Tachi-7 although a different modulator plan is used. The antenna is motor driven at 2 rpm, and gives a remote azimuth indication by means of selsyns. An A-type display with a 0-300 km scale is used.

[Small mark]

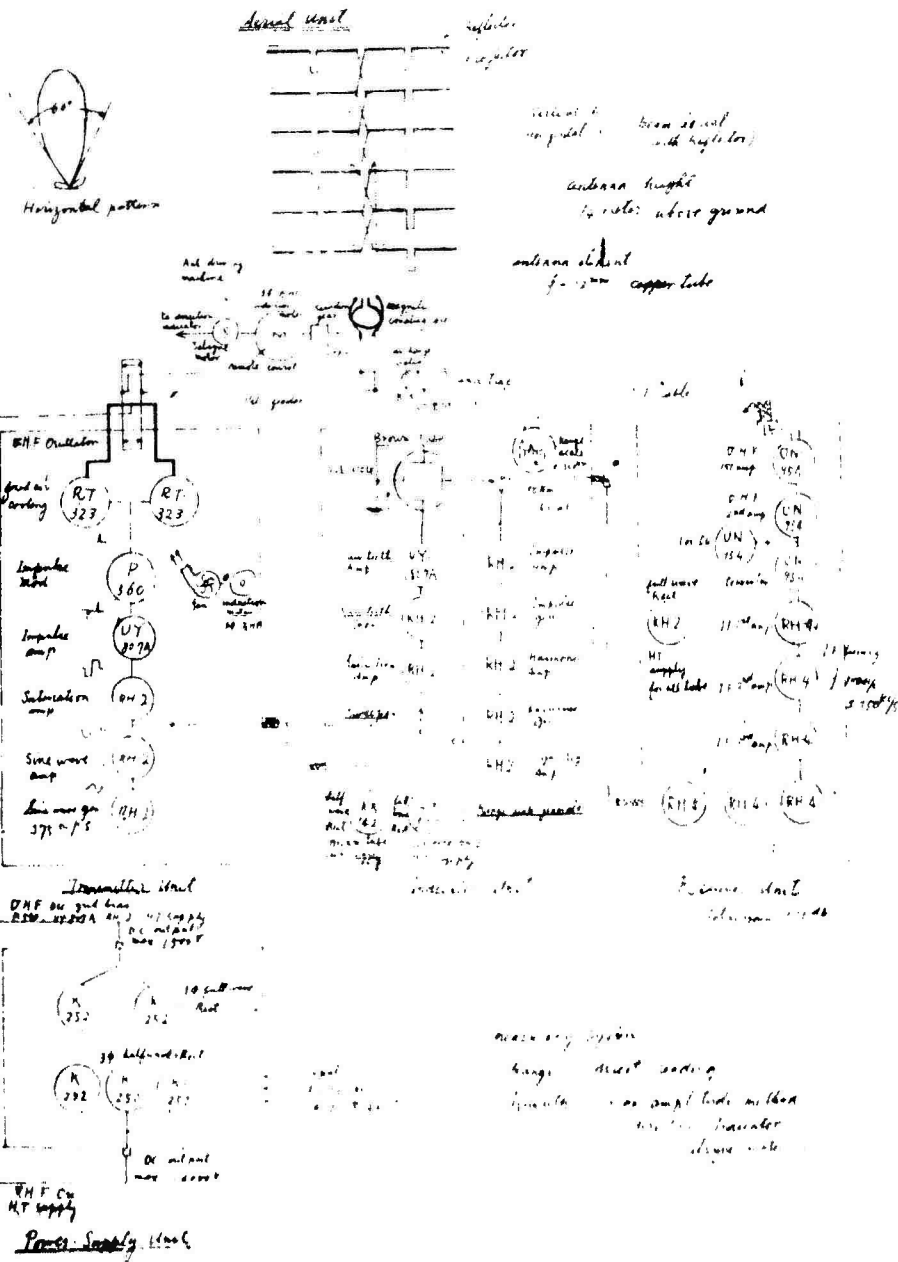


Antenna for
Tachi-18 -
Kodaira School.

Antenna for Tachi-18 - Kodaira School.

Radio Detector Carrier type (Tachi-18)

manufactured by Iwasaki & Tokyo Shibaura Communication Co Ltd



TACHI - 35

RADIO DETECTOR FOR ELEVATION MEASURING

Corresponding Allied Designation: ----

Technical Characteristics:

$f = 82 \text{ MC/S.}$ 50 KW. Range 100 Km.

Accuracy: Range, $\pm 1 \text{ km}$; Azimuth, $\pm 1^\circ$; Elevation, $\pm 500 \text{ M.}$

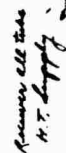
Number Built = 3. Number Installed = 3.

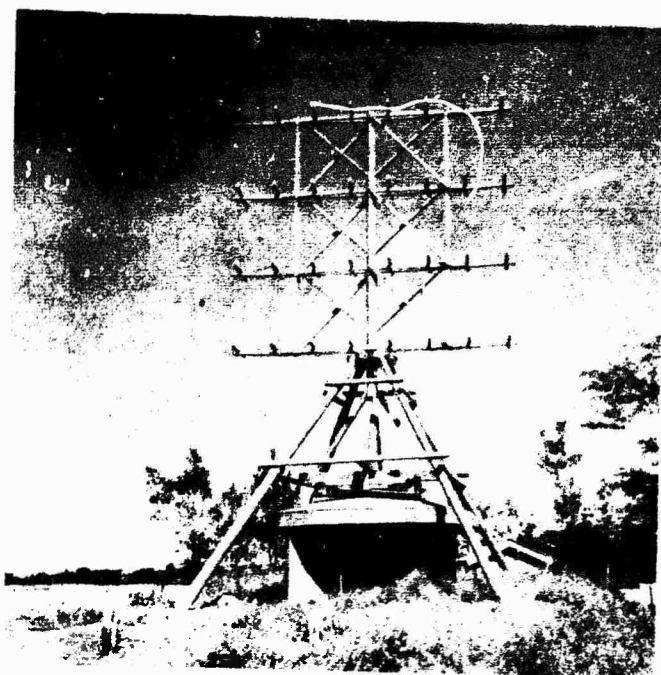
Description:

Tachi-35 was installed at 3 strategic locations in the Tokyo area for giving height data on approaching aircraft. An antenna switch arrangement on the receiving antenna permits alternate comparisons of the signal magnitudes from a pair of left and right lobes and a pair of vertical lobes. A goniometer pick up is varied in each case until the pips are the same height. Entering a calibration chart with goniometer range and elevation readings then gives the airplanes height.

Color disks are placed before the elevation and azimuth pip matching scopes (as on Tachi-3 and Tachi-20) containing 90° sectors of red and green filters. They are synchronized with the antenna switch so that when the left (or upper) lobe is operative a red pip is seen, and when the right (or lower) lobe is operative a green pip is seen. Instead of the pips being displaced along the scope base line as in customary American practice, they appear at the same point. Then when the superimposed red and green pips coincide exactly in height the result to the eye should be white. This idea is probably taken from British GL Mark II set captured early in the war.

Tool-35





Transmitting Antenna for Tachi-35.

TACHI - 20

RADIO DETECTOR FOR ELEVATION ANGLE MEASURING

Corresponding Allied Designation: ----

Technical Characteristics:

$f = 68, 72, 80 \text{ MC/S.}$ Range 100 Km.

Accuracy: Range, $\pm 1 \text{ Km}$; Azimuth, $\pm 5^\circ$; Elevation, $\pm 500 \text{ M.}$

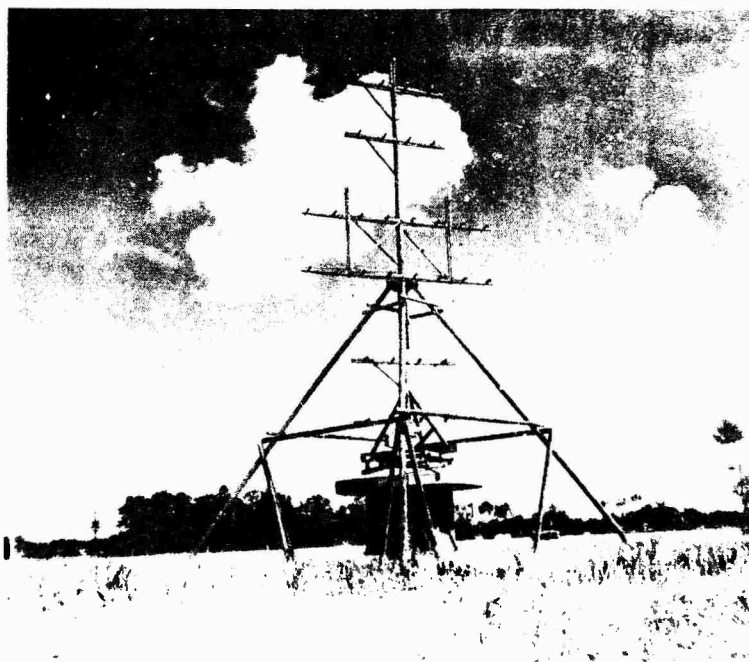
Number Built = 12.

Number Installed = *FEW*

Description:

Tachi-20 is a receiving unit added to important Tachi-6 stations to give height estimates, supplementing the normal 3 to 5 search receivers.

Azimuth is measured by comparing return echo heights from left and right antennas on a color disk scope (as in Tachi-35). Range and elevation are estimated by the combined positions of two goniometers registering range and elevation angles obtained from the diffraction patterns of pulses received by the upper and lower antennas. Color disk pip matching is used again here to locate the matched point.



Antenna for Tachi-20.

Radio Detector for Elevation angle measure (T-16-20)

[Faint handwritten notes at the bottom of the page]

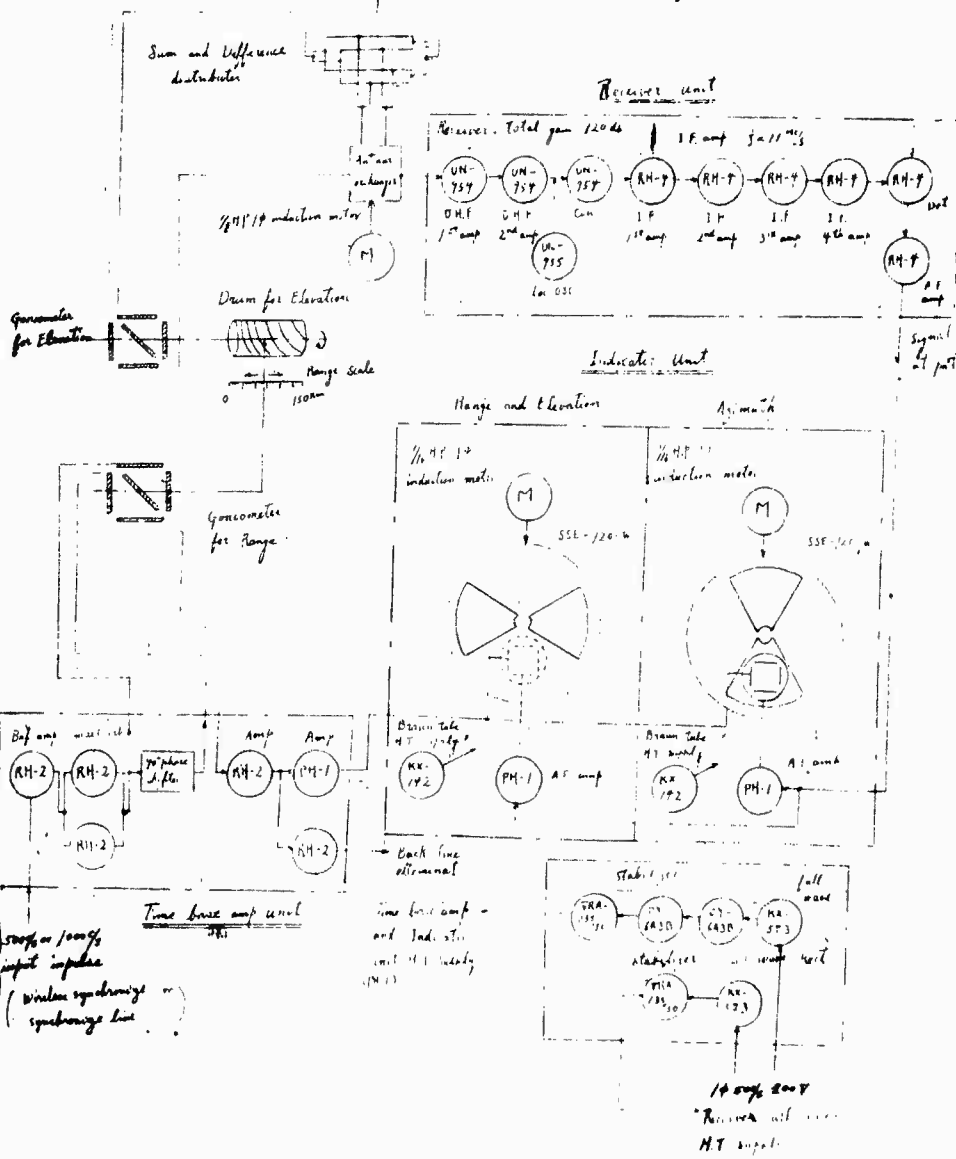
9th height 17 meters above ground

Left out for Ajimath measure

used out for transition angle measure

Right out for Ajanta museum

power unit for elevation angle measure



TASE - 1

RADIO DETECTOR MARINE USE

Corresponding Allied Designation: None.

Technical Characteristics:

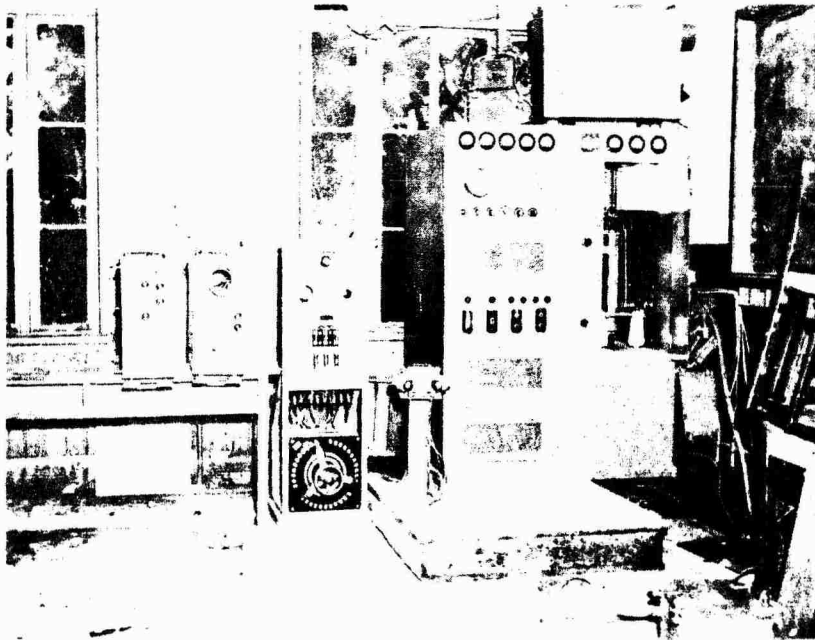
f = 110 MC/S. 50 KW. Range 300 Km.
Accuracy: Range, ± 5 Km; Azimuth, $\pm 7^\circ$.

Number Built = 30. Number Installed = Few.

Description:

This set was designed to be used on army transports for long range detection of the approach of enemy aircraft. Results were unsatisfactory, however, so plans were made to transfer it to land use.

Separate antennas are used for transmitting and receiving; control of azimuth is by the Ward Leonard System.



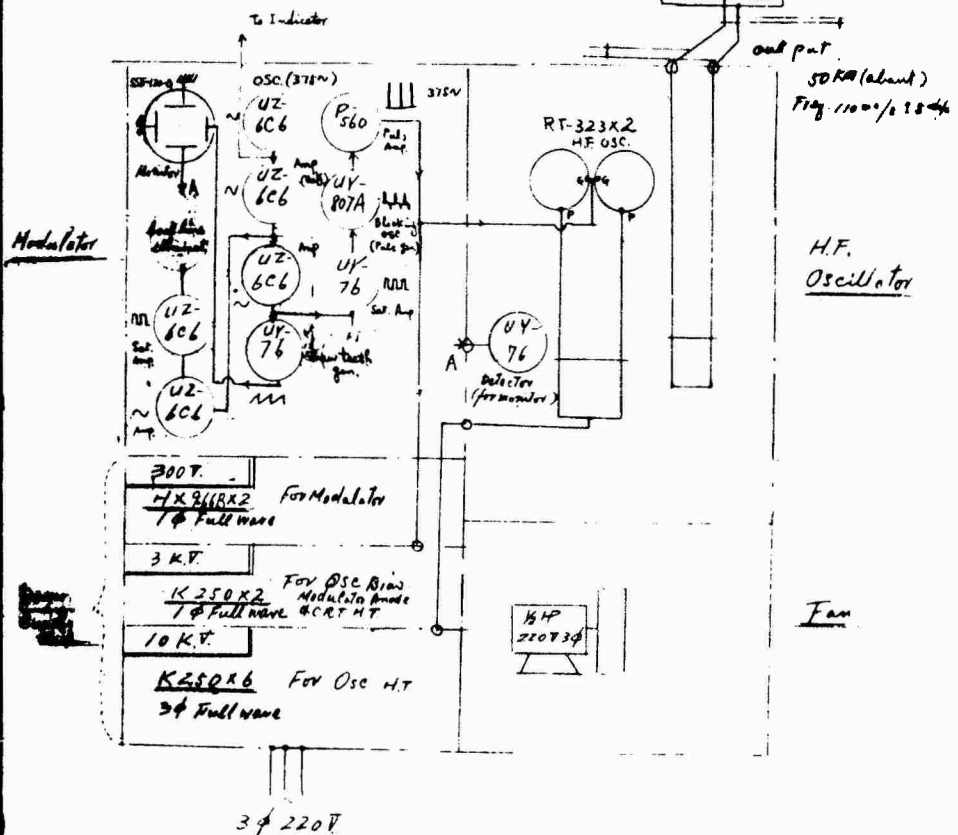
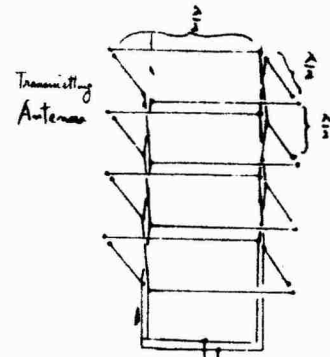
Tase-1 Transmitter, Receiver, Indicator, and
Control Equipment - Kodaira School.

Radio Detector (Marine Use) (Type-1)

Transmitter

Manufactured by Tokyo Elect. Co.

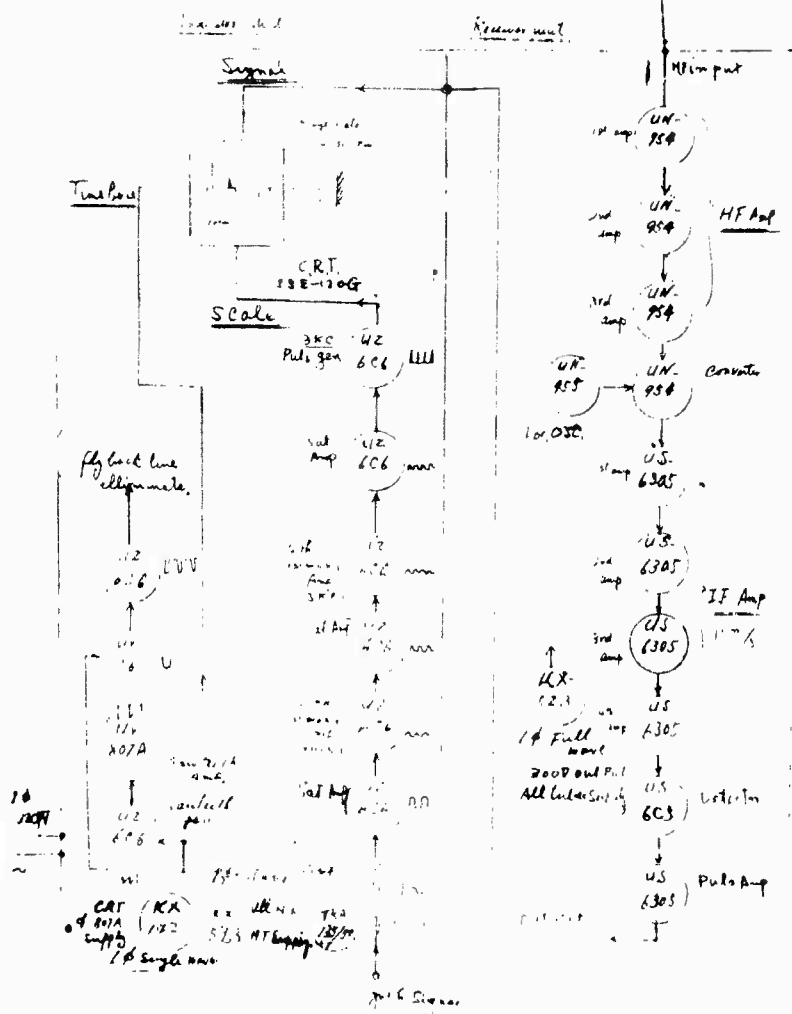
Freq. - 110 Mc/s 200%
out put - 50 kw peak
Recc. freq. 275 V



Reverse Indicator manufactured by Tokyo Ed. Co

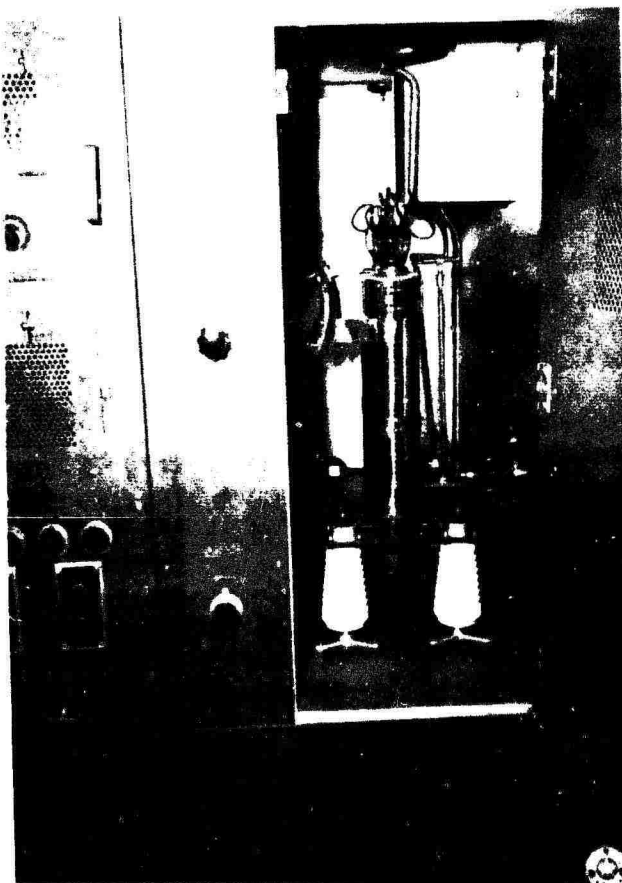
Antenna driving ~~antenna~~ as
word based system

Receiving band $110 \pm \frac{1}{2} \pm \frac{1}{5}$





Tase-1
Receiving
Antenna
for Ship-
board
Mounting.



Transmitter
Tubes and
High Frequency
Tuning Section
of Tase-1.

TASE - 10

RADIO DETECTOR FOR SUBMARINE USE

Corresponding Allied Designation: ----

Technical Characteristics:

f = 150 MC/S. 10 KM. Range 50 Km.
Accuracy: Range, + 3 km non-directive.

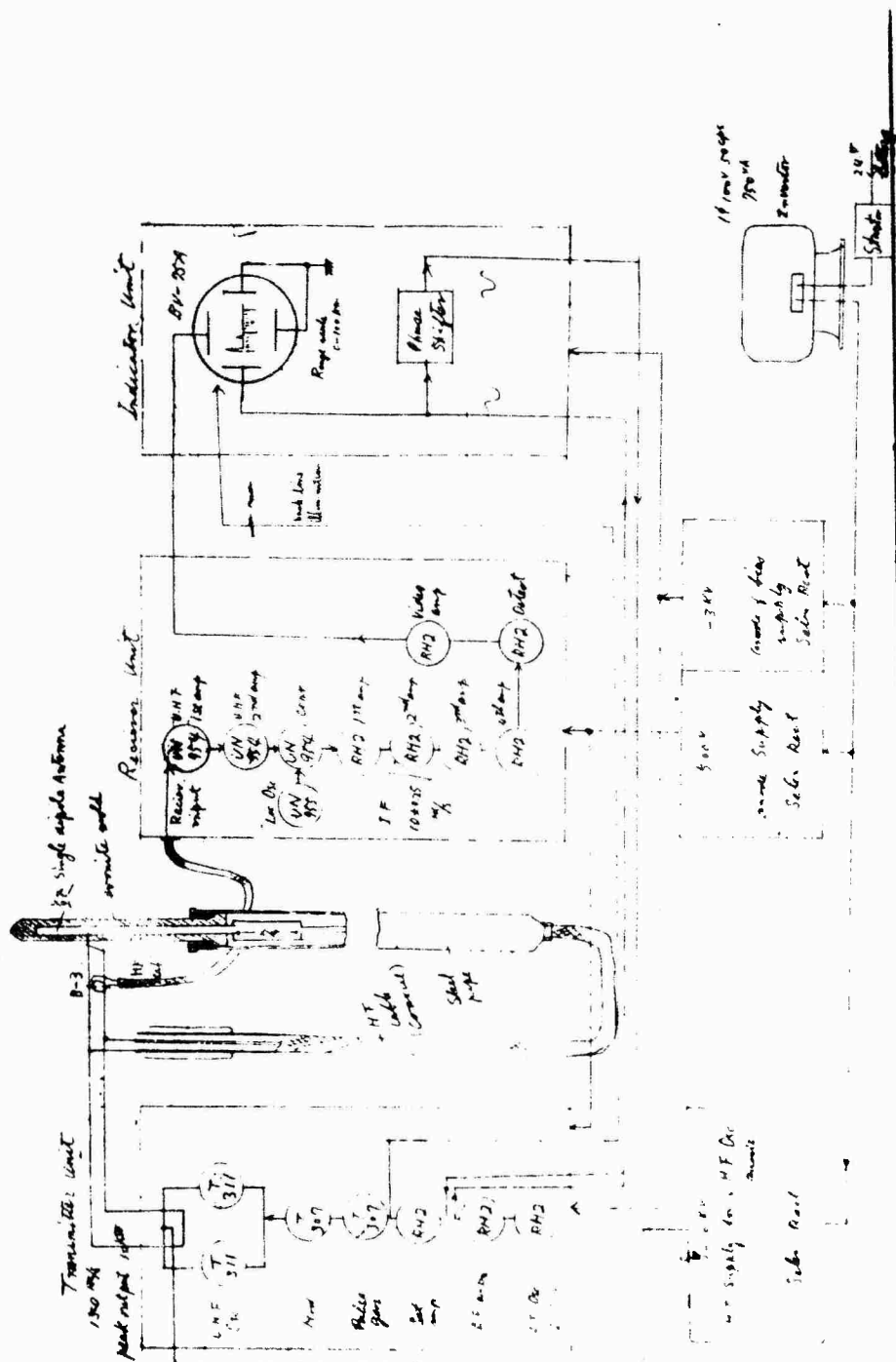
Number Built = 10. Number Installed = 1.

Description:

This set which was to provide all round warning of approaching aircraft was installed on the Japanese Army's only transport submarine of suitable size. Conflicting reports of the set's fate are given. One says that the warehouse containing the set destined for installation was bombed and destroyed. Another says the set was actually installed but due to inadequate electrical power on the submarine tests were never completed. A third says the submarine was sunk. The remaining sets were modified for land use with a 3 x 2 mattress antenna.

A single half wave vertical stub antenna is used projecting above the submarine's hull. An A-type displays shows the range of any targets but not their azimuth.

Radio Detector for Submarine Use (Type 10)



TASE - 2

RADIO DETECTOR FOR SEA SEARCH

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 15.7 cm. 1 KW. Range against: ships, 30 Km; subs, 15 Km.

Accuracy: Range, \pm 100 M; Azimuth, \pm 1°.

Number Built = 80.

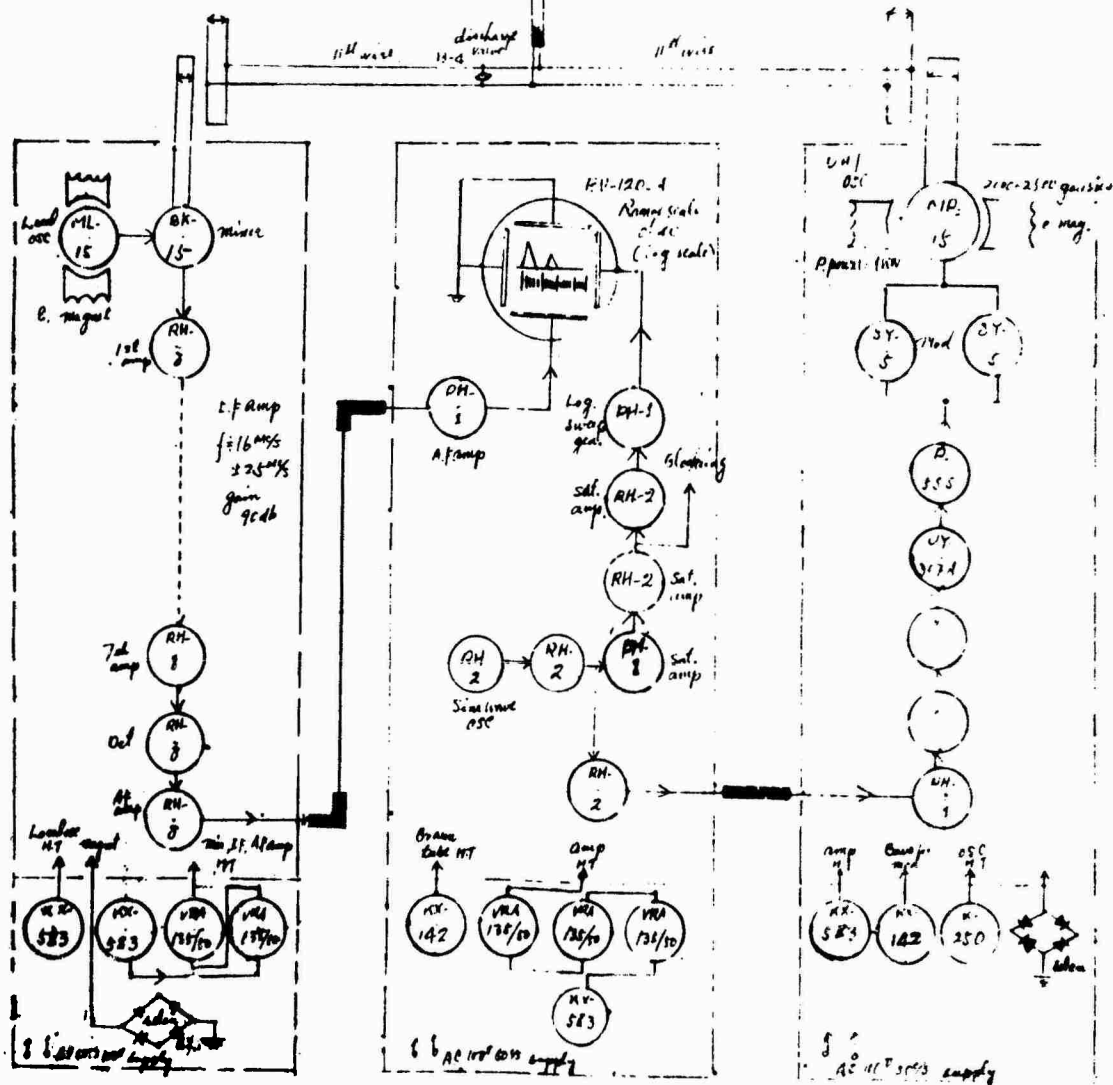
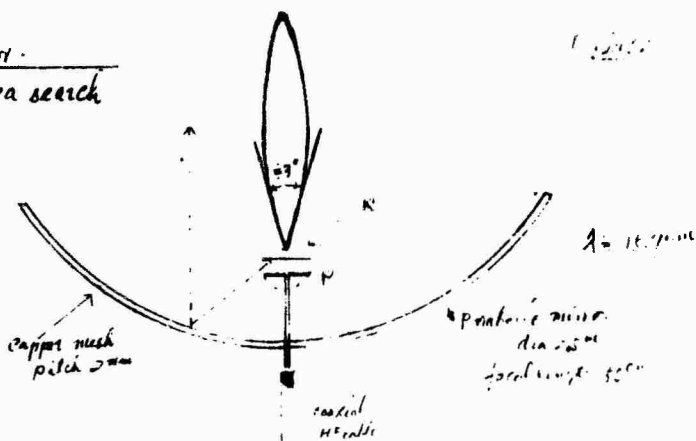
Number Installed = *FEW, UNSATISFACTORY.*

Description:

This set for army transport surface protection was designed to operate at a wavelength of 20 cm. However, at this time a 15 cm air cooled magnetron was being developed by Nihon Musen (the MP-15) and after the building of 20 sets by Tokyo Shibaura the set was changed to operate at this wavelength. A very small magnetron (also with electromagnet) was used as local oscillator with a specially designed "Barkhausen-Kurz" mixer tube (BK-15). The large paraboloid antenna with dipole horizontally polarized and rod reflector in front of it was hand swung in azimuth. The set used a hydrogen filled TR tube containing a fixed tungsten gap whose life was only about 30 operating hours.

Tase 2 proved quite unsatisfactory because the transmitting magnetron developed so little power (1 kw) that submarines could not be detected beyond 2-3 km. Nihon Musen urged the army to adopt the already successful navy 10 cm set No. 22 instead of building Tase 2, but the army could not be convinced until too late. Eventually the army switched to the No. 22 set.

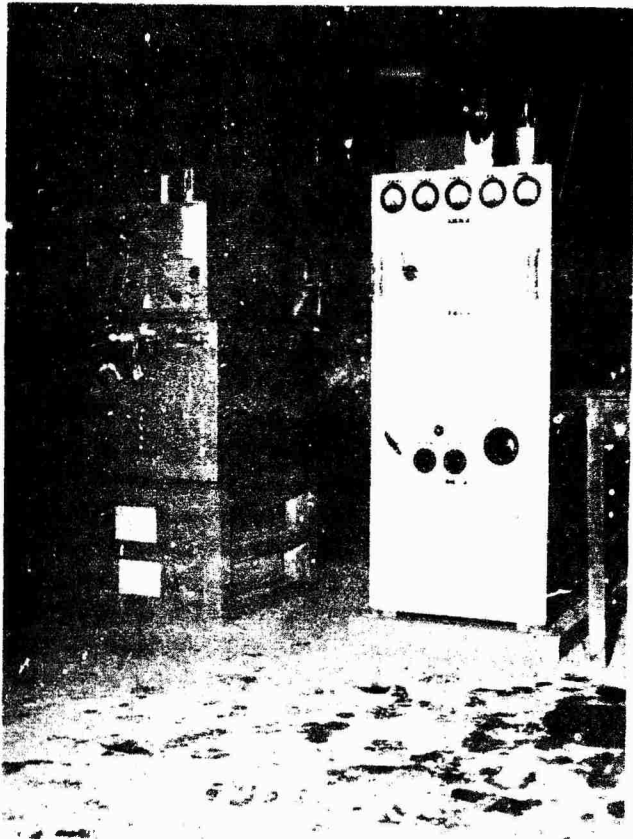
Radio detector for Sea search



Receiver unit

Indicator unit

Transmitter unit



Tase-2 Transmitter, Receiver
and Indicator, Showing Trans-
mitting and Receiving Magnetrons.

TAKI - 1 TYPE II

AIRPLANE RADIO DETECTOR FOR SEA SEARCH

Corresponding Allied Designation: Taki Mark 1.

Technical Characteristics:

f = 150 MC/S. 10 KW. Range against: ships, 100 Km; subs, 20 Km.
Accuracy: Range, + 2 Km; Azimuth, + 5°.

Number Built = 1000. Number Installed = *NUMEROUS*

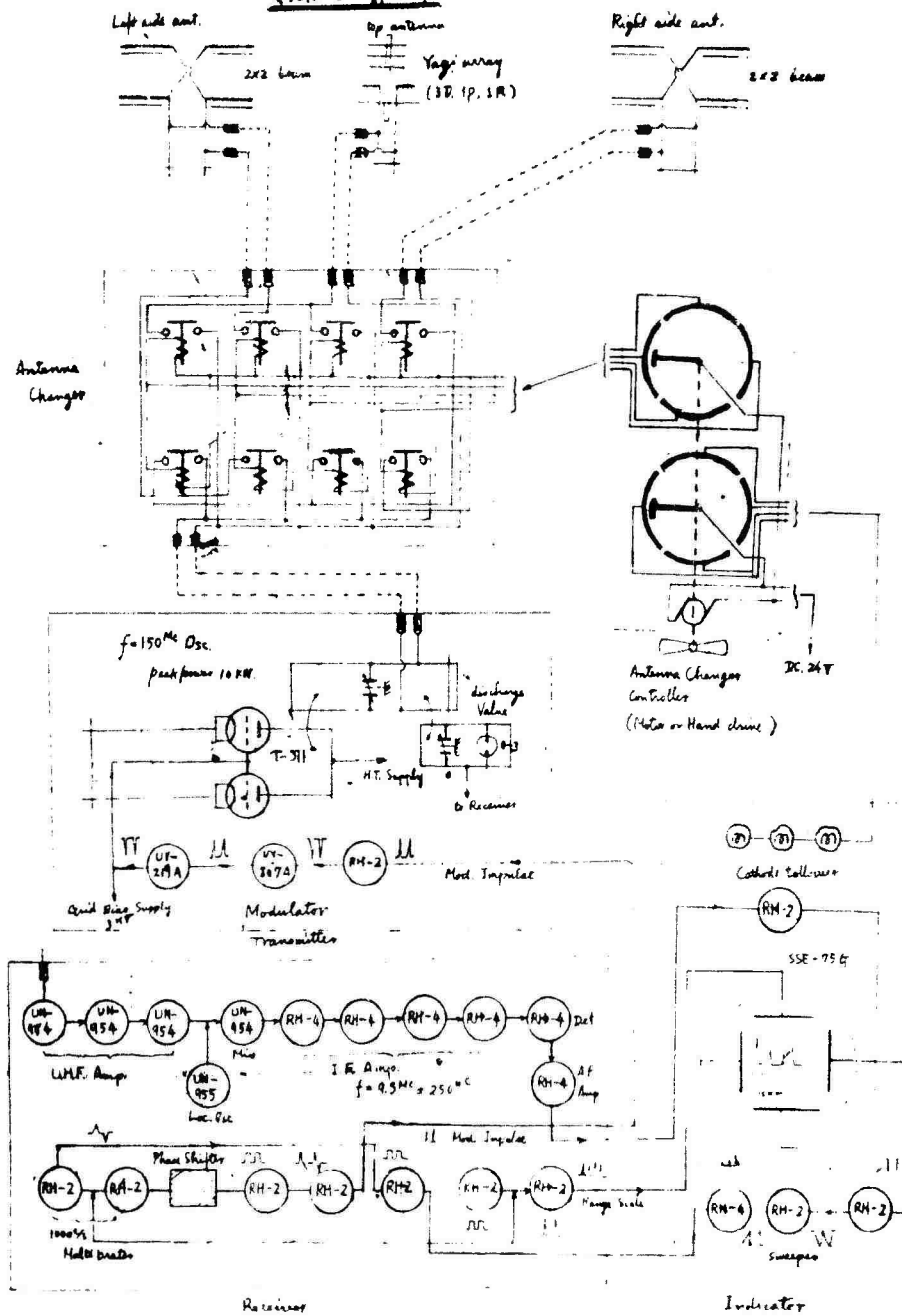
Description:

This first airborne radar set was completed in 1943 for use on heavy bombers. (Later a lighter version called Taki 1, Type II was developed with similar characteristics for smaller planes.) Notable is the fact that only 6 months elapsed between the setting of the specifications and sets coming off the assembly line at Nihon Musen.

Three antennas are used, a forward looking Yagi, and a 2 x 2 array on either side of the fuselage for sidewise searching. By means of an "antenna changer" any one can be rested upon at will. Or by means of a motor drive all three can be run through in rapid sequence. An indicator light shows at any instant the particular antenna connected. Transmitting and receiving are done on the same antenna, a TR tube (B-3) being used to protect the receiver. A simple A-type presentation giving range is used. A series of pips spaced 10 km apart with a phase shifter to zero them on the main pulse gives an accurate range on targets.

The equipment, though heavy, was reported to have given very satisfactory surface search results.

Asomplane Radio Detector for Sea-Search (Taki-1 "Type II")



TAKI - 1 TYPE IV

AIRPLANE RADIO DETECTOR FOR SEA SEARCH

Corresponding Allied Designation: ----

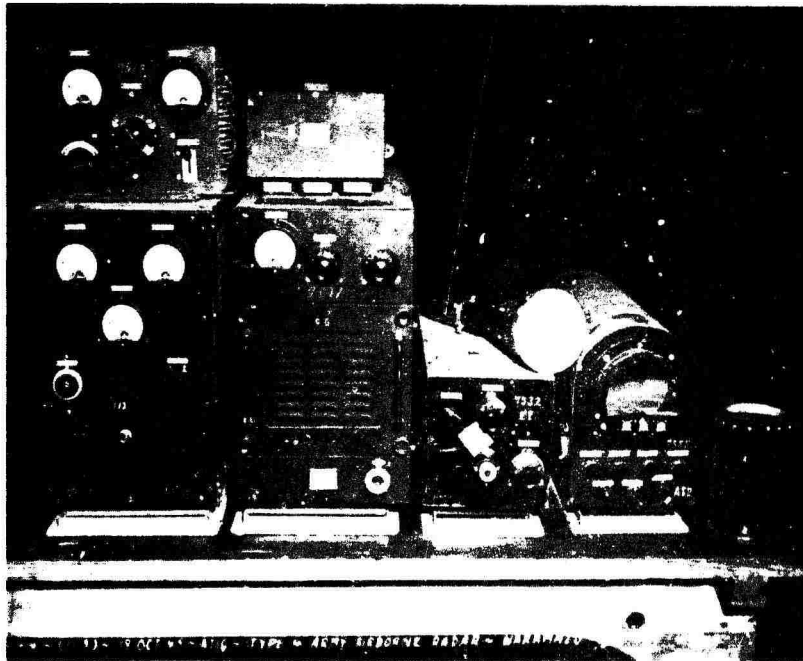
Technical Characteristics:

f = 150 MC/S. 20 KW. Range against: ships, 100 Km; subs, 20 Km.
Accuracy: Range, \pm 2 Km; Azimuth, \pm 5°.

Number Built = None; test model under construction.

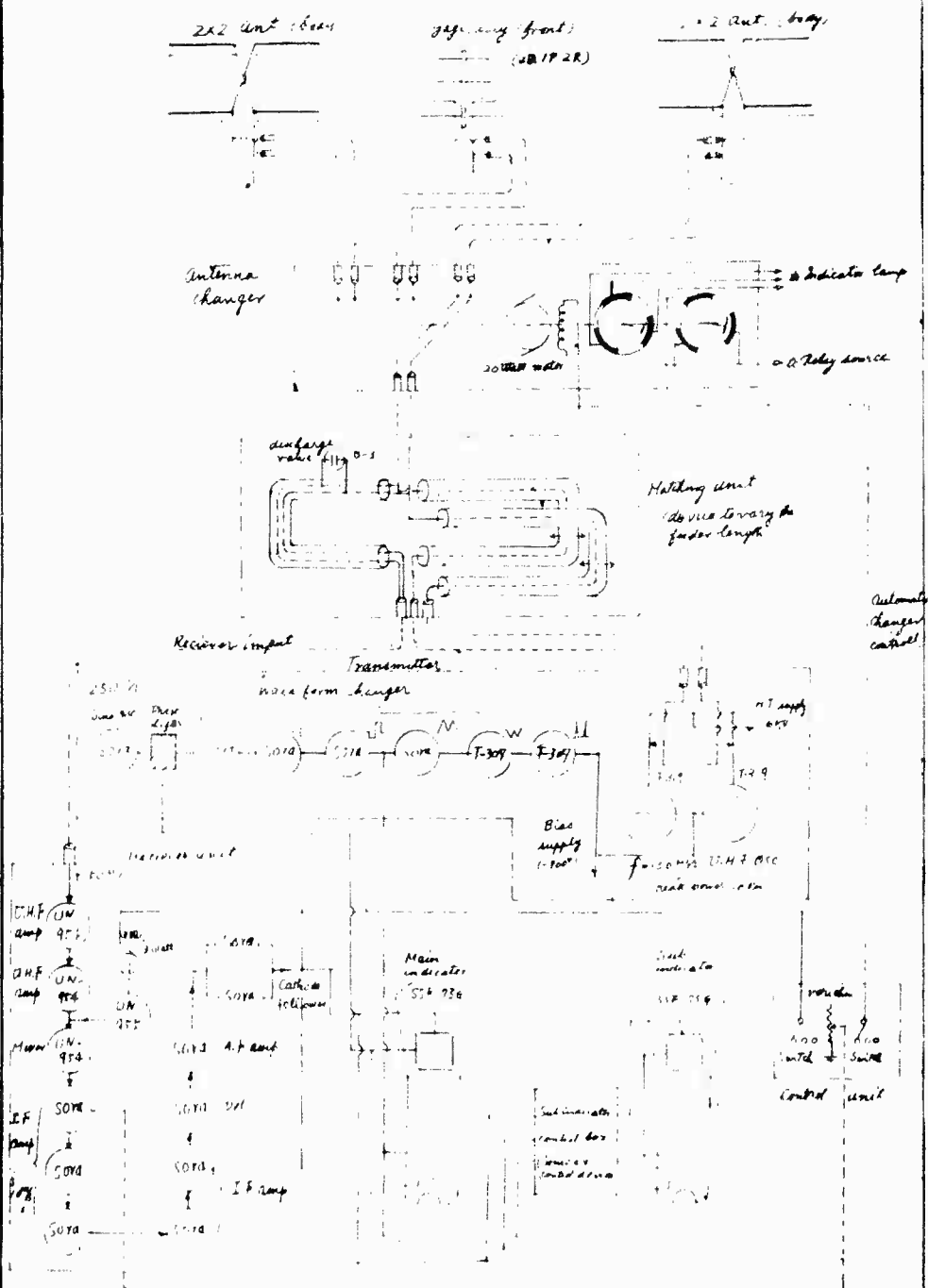
Description:

Taki 1 Type IV was designed as a lighter set to replace Taki 1 Type II (80 kg vs 150 kg). Similar operating characteristics and performance were expected. Two A-type scopes connected in parallel were provided.



Taki-1, Type 4 Airborne Search Radar.

Aeroplane radio detector for sea-search
(Type-1, Type-18)





Taki-1, Type 4 Radar, Showing Interior
of Components.

TAKI - 3

AIRBORNE SEA SEARCH RADAR

Corresponding Allied Designation: ----

Technical Characteristics:

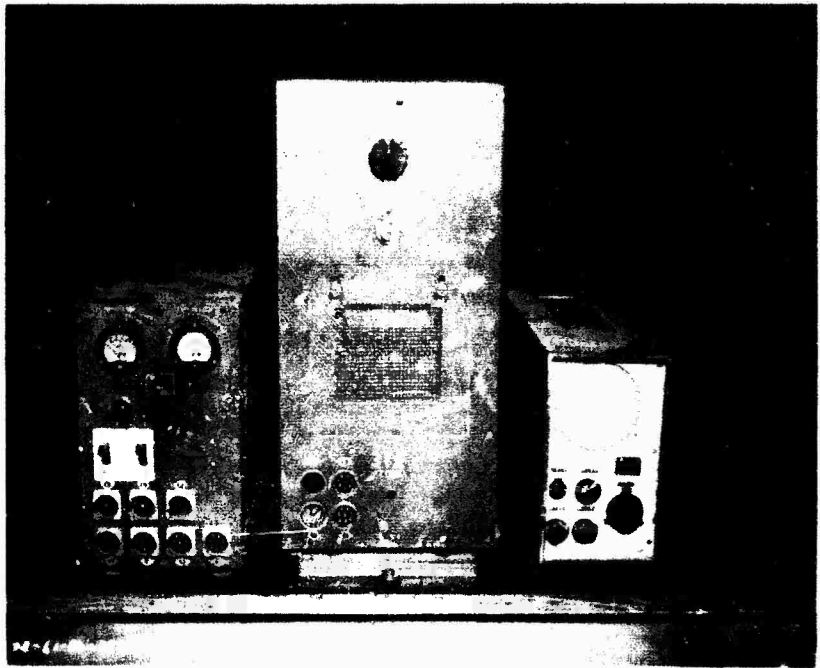
f = 375 MC/S

Number Built = 50

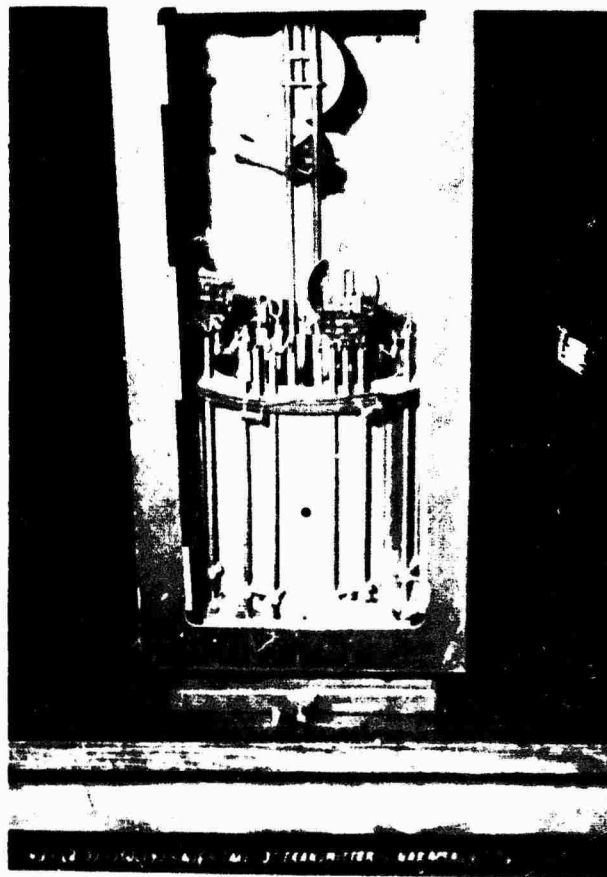
Number Installed = 0

Description:

This airborne surface search set was an experimental model using an 8 tube ring oscillator for the transmitter. A pin fastened to the lecher wire shorting bar runs in a spiral groove cut in a disk as shown in the photo; it provides an ingenious method for precision knob tuning of the transmitter from the front of the panel. The set was developed in August 1943 by the radio department of the Aeronautical Laboratory, Tokyo Imperial University. Two Vagi antennas were to be placed side by side projecting from the nose of the plane. Tama Institute rejected the set in 1944 because of its poor performance; unfortunately 50 sets had already been built.



Taki-3 Airborne Search Radar.



Transmitter of
Taki-3 Showing
8-tube Ring
Oscillator in
the Transmitter
Unit, and
Spiral Control
of Lecher Rod
Tuning.

TAKI - 24

AIRBORNE 10 CM SEARCH RADAR

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 10 cm. Power: unknown. Range: unknown.

Number Built: One under experimental construction.

Description:

Taki-24 employed almost the same circuits as Taki-14 described previously, with the exception that a 10 cm magnetron was used and the dimensions of the high frequency coaxial tuning and transmission circuits were correspondingly reduced. (In the 5 cm version, Tachi-34, the transmission lines were replaced by rectangular wave guides.) Two glow discharge "valves" are used to protect the receiver while transmitting.

Primary research was concentrated on Taki-14, with Taki-24 and -34 to be next in line up on its satisfactory completion.

(For block diagram see Taki-14)

MICROWAVE AIRBORNE SEARCH RADAR

Corresponding Allied Designation: ----

Technical Characteristics:

$f = 6000 \text{ MC/S}$ ($\lambda = 5 \text{ cm}$). 1 KW. Range 15 Km.
Accuracy Unknown.

Number Built = 1 experimental model.

Description:

This set was the Japanese army's bid to equal the performance of the APQ-13 found in American B-29s. Many of the ideas incorporated were directly inspired from studies their engineers made on captured sets.

A 5 cm magnetron was developed by the Sumitomo Company, but its output was only about 1 kw. An 80 cm paraboloid antenna reflector was fed by a waveguide, after passing through two rotary joints. The antenna rotated at 20-60 rpm and tilted from 0° to -60° .

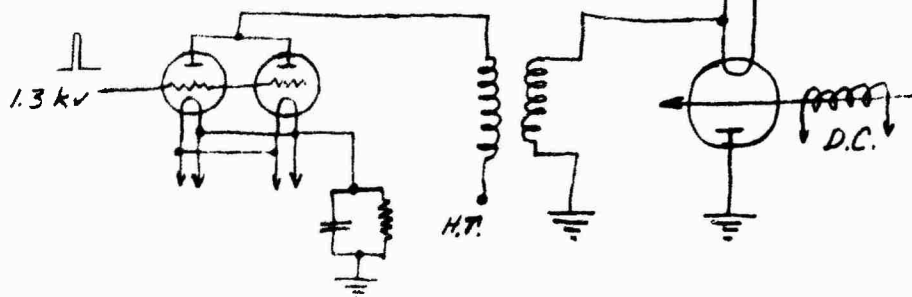
A double superheterodyne receiver was used with crystal mixer and a velocity modulated beat frequency oscillator. I.F. frequencies were 100 MC and 27 MC.

Display was on a 0 to 50 km range PPI scope with variable range circle, and on a paralleled A-type scope with corresponding bright dot range mark.

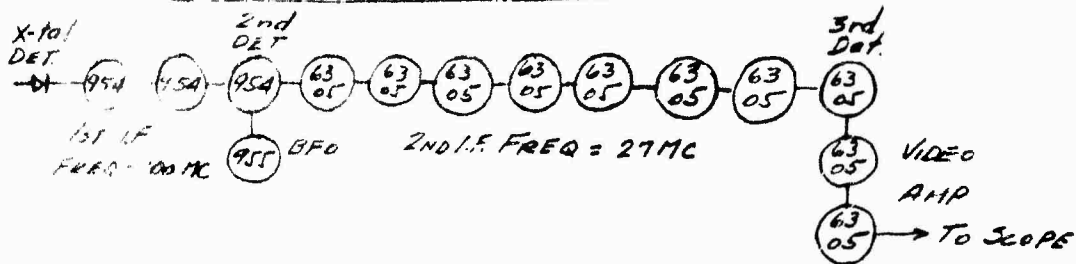
Altitude determination was by a calibrated sweep delay circuit which narrowed the ground return circle until it became just a dot. Altitude ranges were 0 to 15 km.

Research was begun in November 1944, and the one experimental set resulting was turned over to the Army for testing in July 1945. Ranges obtained from a high point land installation were very disappointing, being only 12 to 16 km.

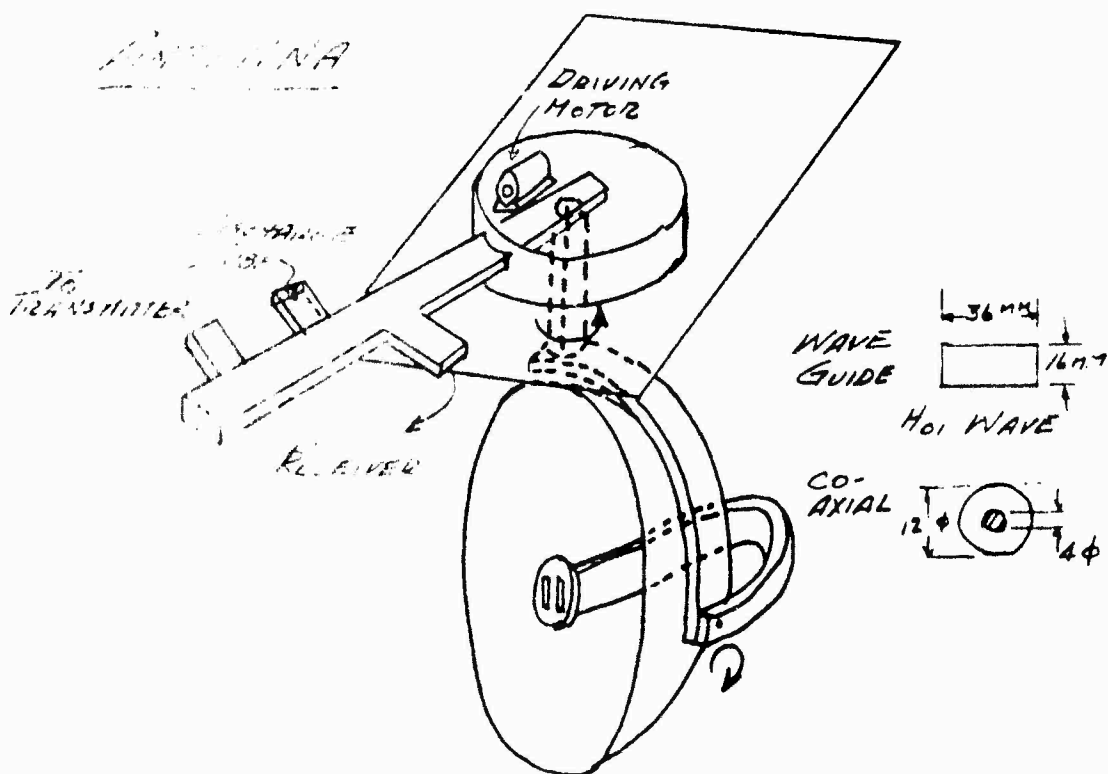
OSCILLATOR CIRCUIT - TAKI 34



RECEIVER ARRANGEMENT



ANTENNA



TACHI - 1

RADIO LOCATOR TYPE 1

Corresponding Allied Designation: Mark Ta Model 1.

Technical Characteristics:

f = 200 MC/S. 10 KW. Range 20 Km.

Accuracy: Range \pm 100 M; Azimuth \pm 1°; Elevation \pm 2-3°.

Number Built = 30.

Number Installed = several.

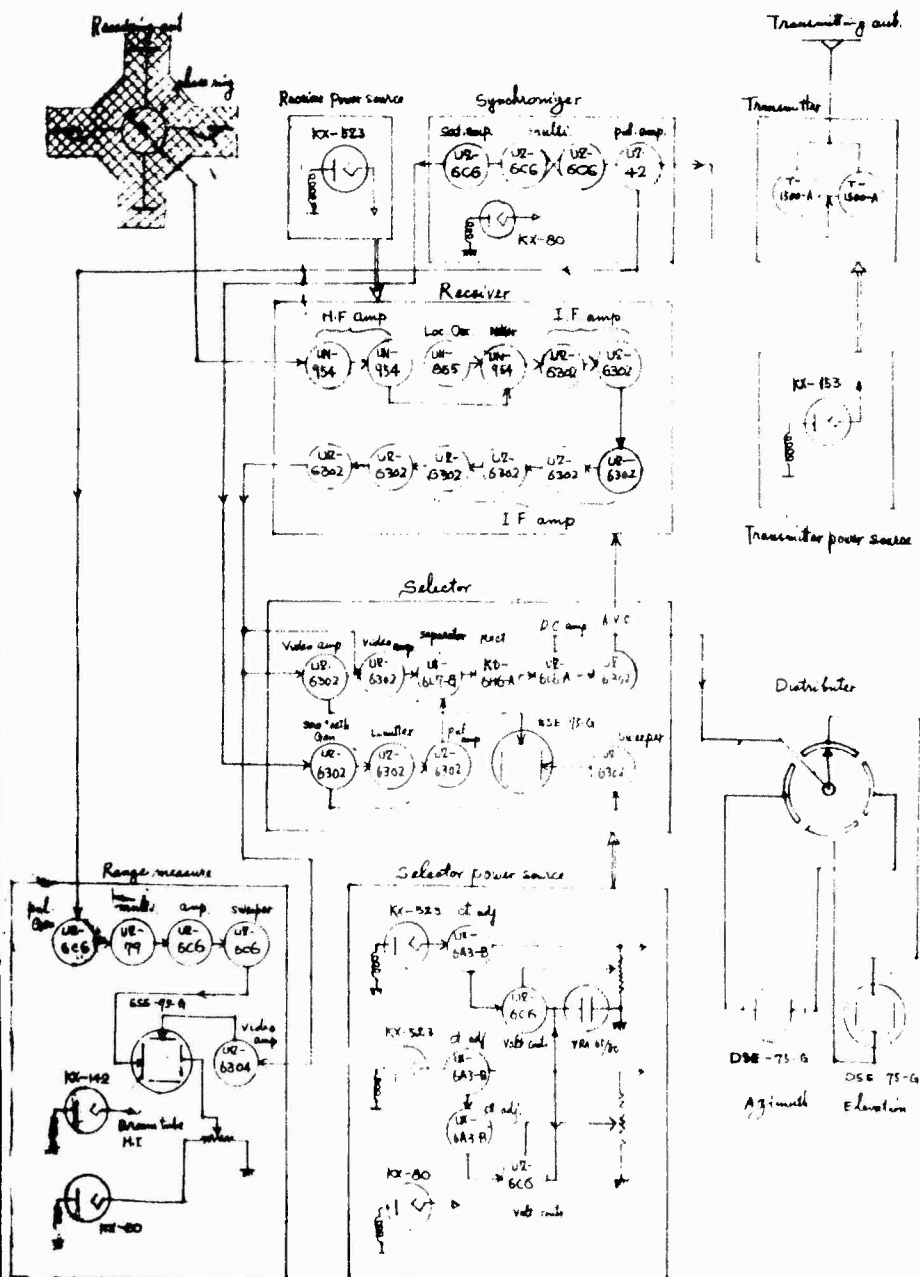
Description:

This set of the "locator" type is to provide data at important bases for antiaircraft gun firing. A simple transmitting antenna and four receiving antennas with screen reflector are used, the latter being principally relied upon to give azimuth and elevation. A 4 segment distributor synchronized with the progressive phasing of the 4 receiving antennas, switches the received signal echoes to the corresponding deflecting plates in the azimuth and elevation cathode ray tubes. Pip heights on either side of the scope base lines are matched by eye.

In practise the power output was only half (5 kw) of the designed value, and relatively poor range results were obtained. Expected ranges of 20 km on single aircraft turned out to be only half that great.

Radio Locator "type-1" (Tech-1)

Manufactured by Sumitomo



TACHI - 2

RADIO LOCATOR TYPE 2

Corresponding Allied Designation: Mark Ta 2.

Technical Characteristics:

f = 200 MC/S. 10 KW. Range 20 Km.
Accuracy: Range, + 100 M; Azimuth, + 1°; Elevation, + 1°.

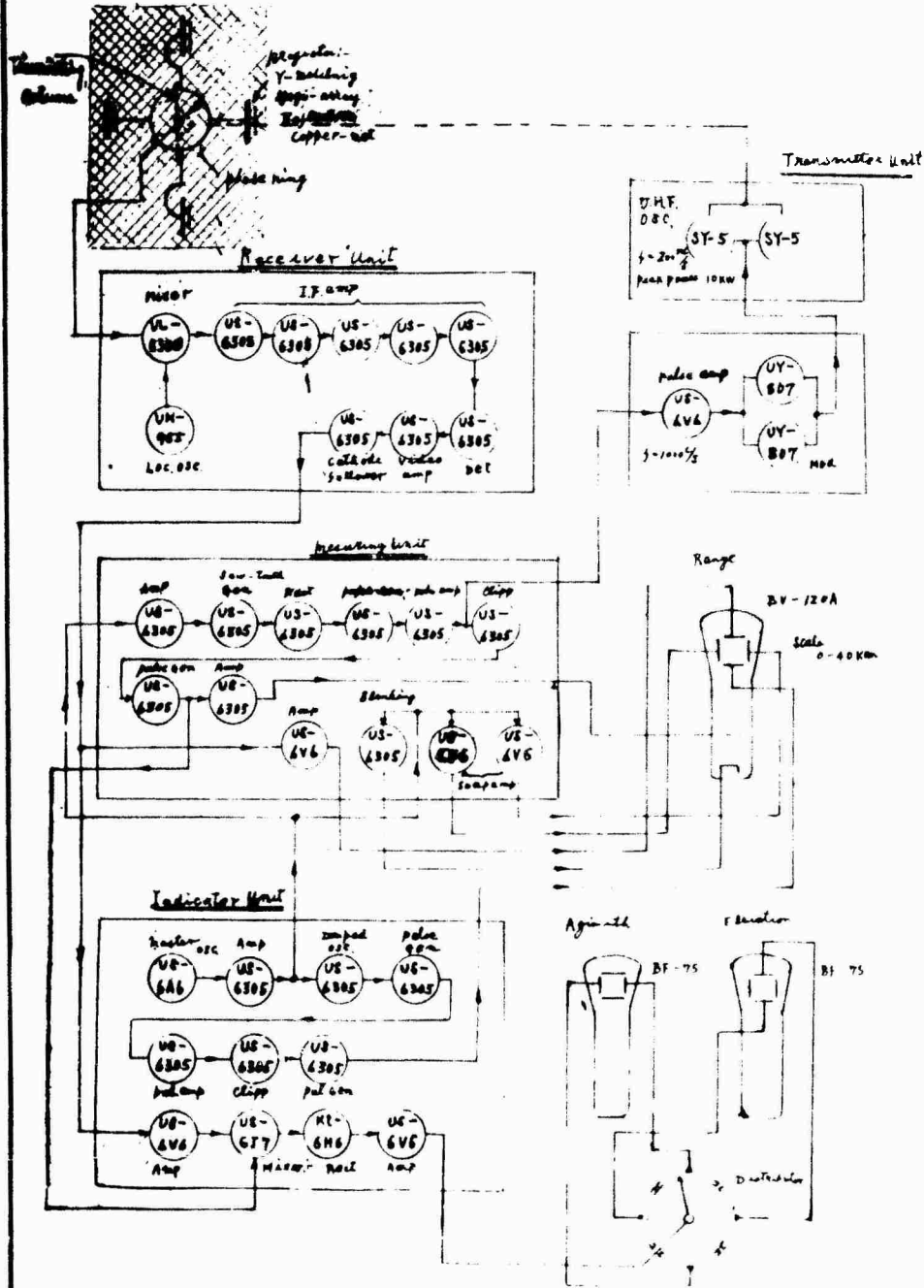
Number Built = 35. Number Installed = *SEVERAL*

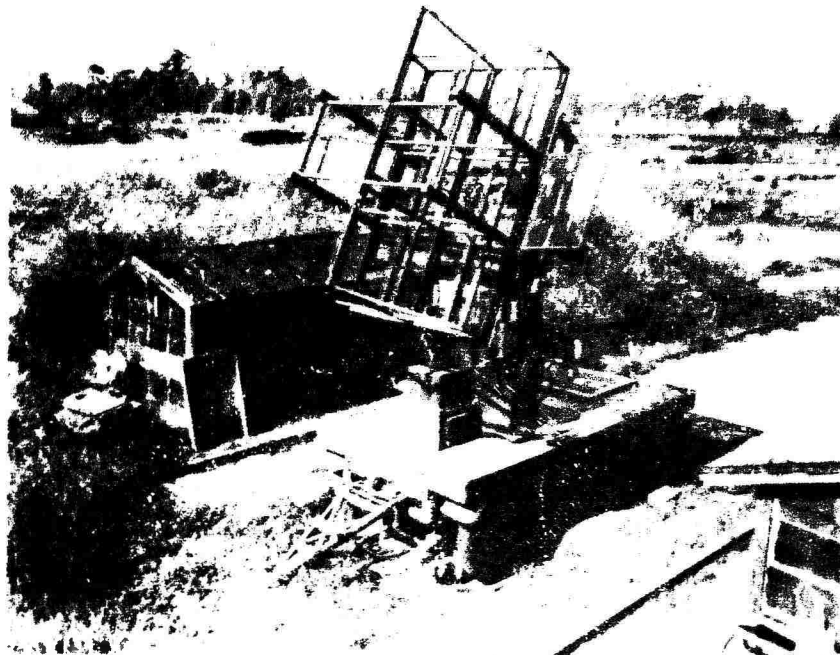
Description:

This gun laying equipment is a mobile unit the transmitting and receiving antennas, while separately operating, are mounted on the same reflector framework. The vertically polarized transmitting dipole sends out a comparatively broad beam. The four receiving antennas are interconnected by a phasing ring so that successive lobes in left and right and up and down directions are generated; these are switched through a 4 segment distributor to the corresponding deflection plates of the azimuth and elevation oscilloscope tubes.

Design ranges of 20 km were readily attained, at times reaching out to 40 km. The elevation accuracy was not as reliable as desired in certain locations. In general Tachi-2 was a satisfactory fire and searchlight control equipment. In the latter stages of the war Tachi-31's were being substituted for Tachi-2's.

Radio Locator type 2 (Tachi-2)

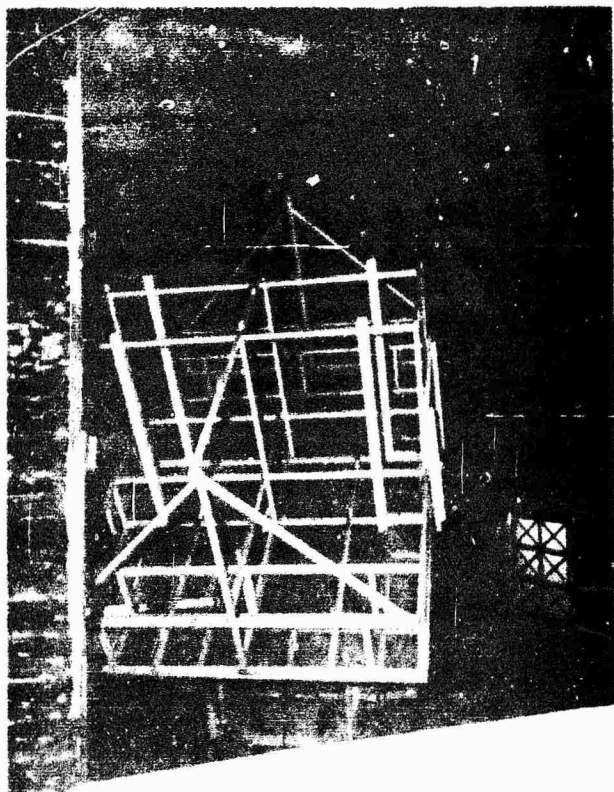




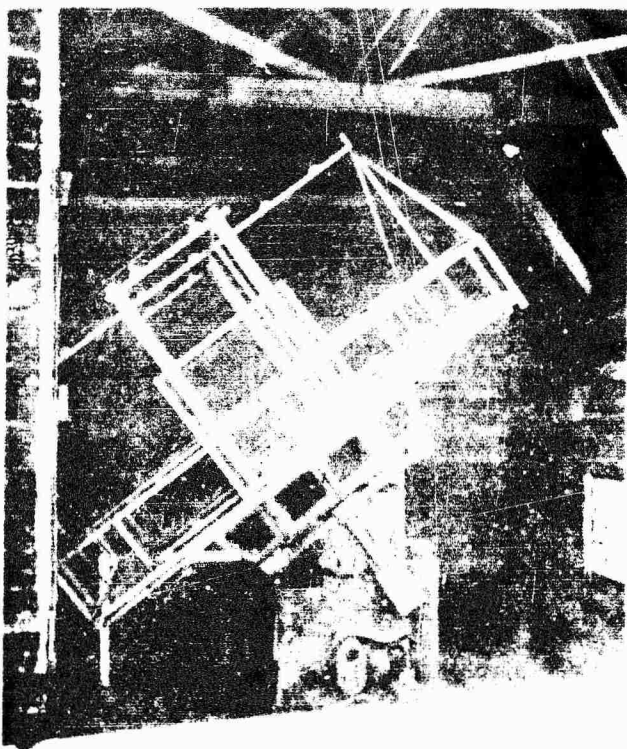
Tachi-2 is sometimes Trailer Mounted



For Camouflage
Purposes Tachi-2
May be located
In a Barn which
Rolls back on
Rails when the
Set is in Use



Tachi-2 is
Found with
A Variety of
Antennas, some
quite complex
As in this one
At Kawasaki
(See Aerial
Photo in
Section I)



TACHI - 3

RADIO LOCATOR TYPE 3

Corresponding Allied Designation: Mark Ta 3.

Technical Characteristics:

f = 78 MC/S. 50 KW. Range 40 Km.

Accuracy: Range, + 100 M; Azimuth, + 1°; Elevation, + 1°.

Number Built = 150.

Number Installed = *NUMEROUS*

Description:

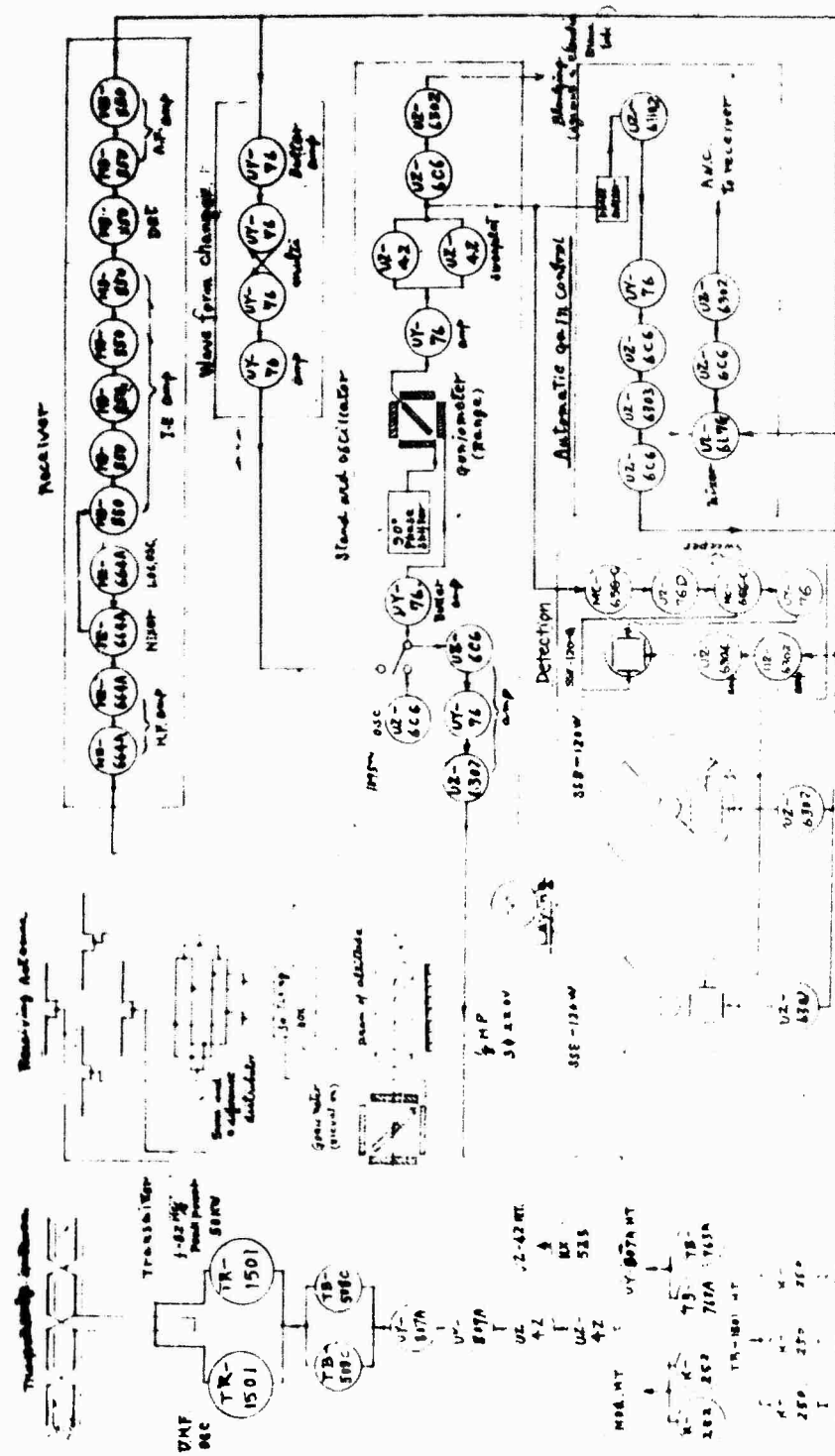
This is a larger and heavier equipment than Tachi-1 or Tachi-2 and was used, only in fixed installations, for controlling both searchlights and guns. The rotating transmitting array was located in a hut separated from the receiving antenna by 50 to 100 yards. The receiving antenna as seen in the photographs lies flat on its back. Azimuth is obtained through horizontal lobe pip matching on a color disk cathode ray tube. Elevation angle is estimated by a goniometer measurement of the phase angle between the signals received on the fore and aft antennas. The positioning is set by matching signal pips on the elevation CRT. A calibrated drum is mechanically coupled with the elevation and range goniometers and permits a direct reading of the altitude of the plane being tracked.

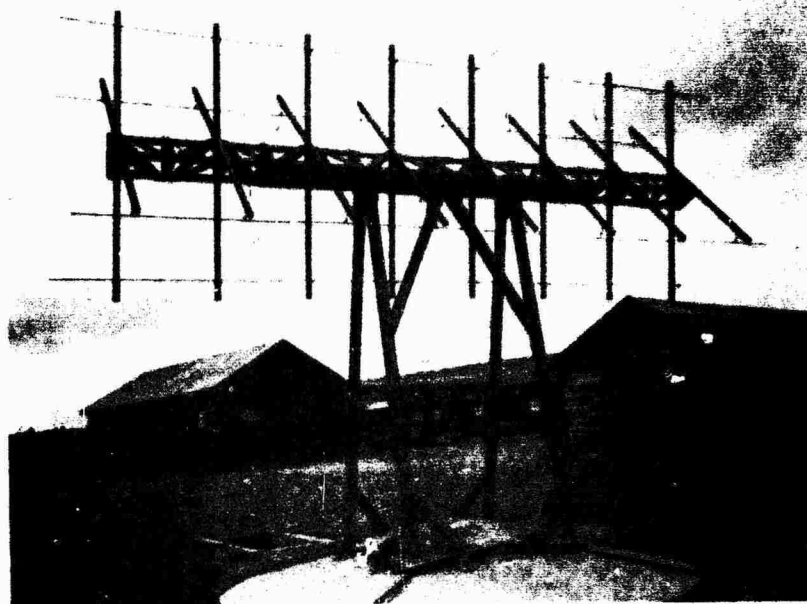
A feature of this set not found in many others is an automatic gain control circuit in the receiver.

Tachi-3 was the main reliance of the army for accurate fire and searchlight control.

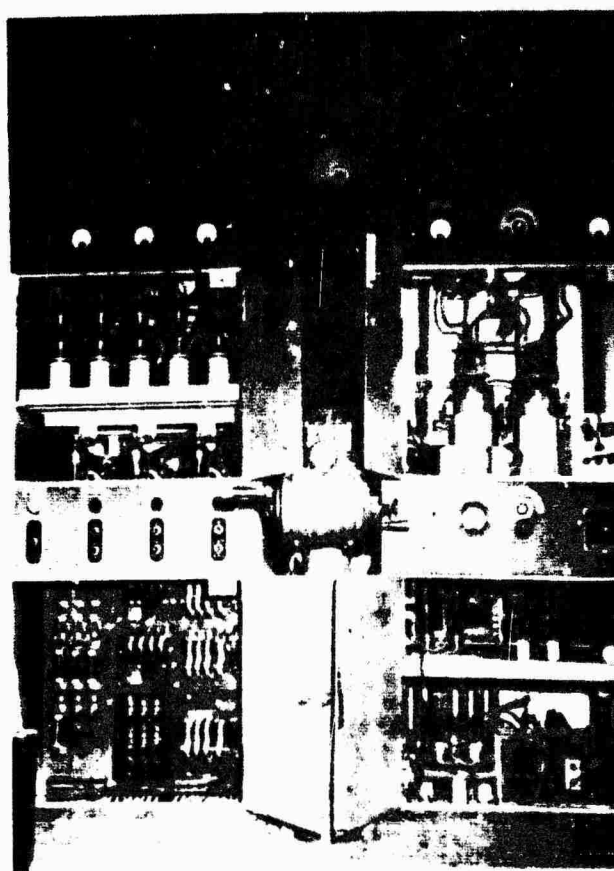
Tachi-3 was tested by the navy at their field laboratory at Chigasaki and although found to have longer range than their fire control equipments, it did not give as good azimuth and elevation accuracy.

Radio Receiver (Type 7) (Radio)

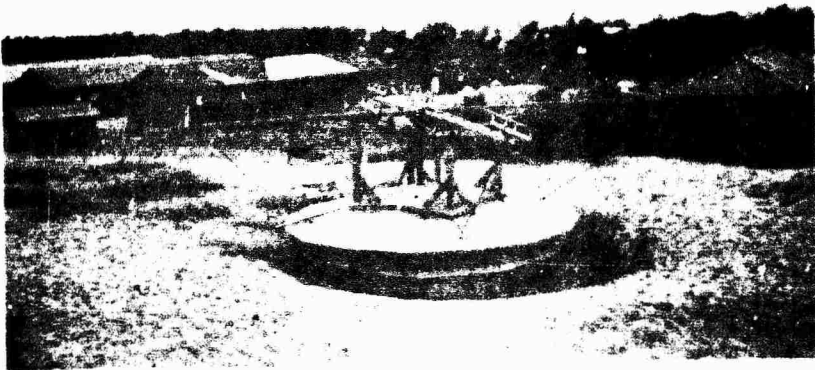




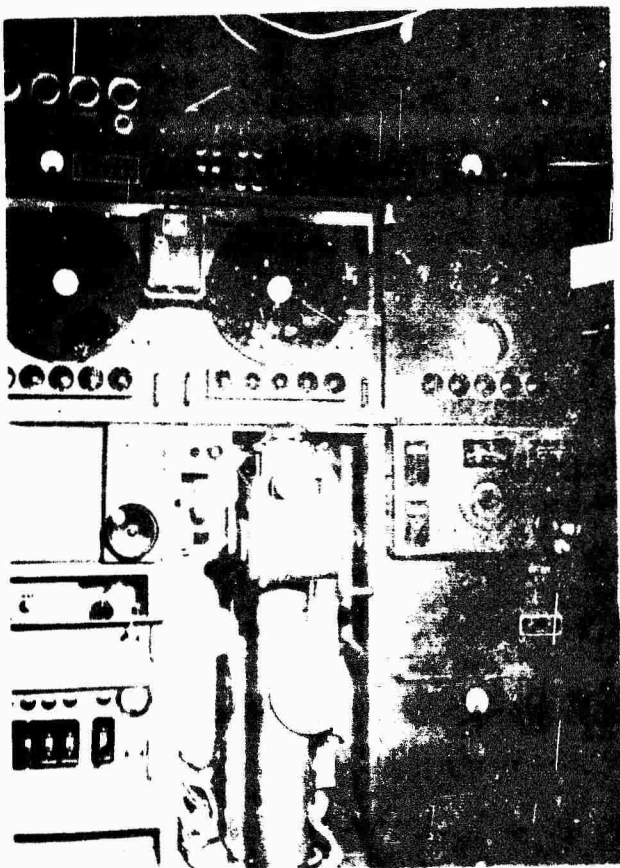
Tachi-3 Transmitting Antenna - Chigasaki.



Close up
Interior View
of Tachi-3
Transmitter.



Tachi-8 Receiving Antenna - Chigasaki.



Front View
of Tachi-8
Receiver

Note Color
Disks.



Rear View
of Tachi-3
Receiver.

TACHI - 4

RADIO LOCATOR TYPE 4

Corresponding Allied Designation: Mark Ta 4.

Technical Characteristics:

f = 200 MC/S. 10 KW. Range 40 Km.

Accuracy: Range, ± 100 M; Azimuth, $\pm 1^\circ$; Elevation, $\pm 1^\circ$.

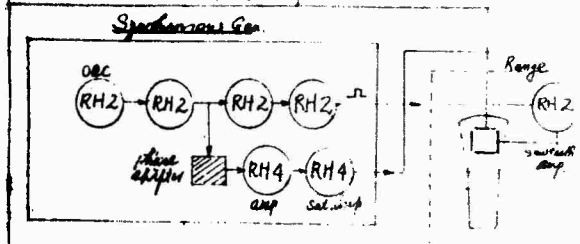
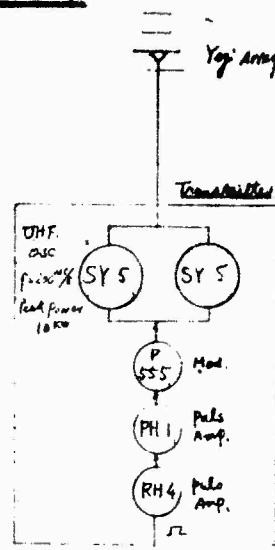
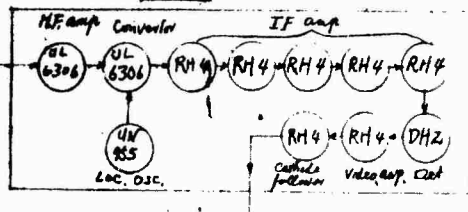
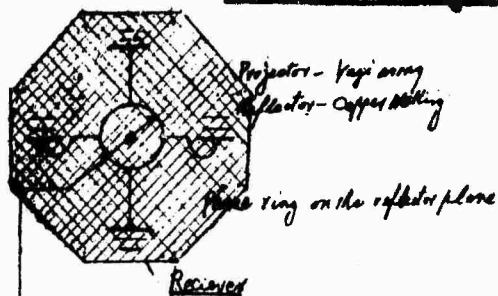
Number Built =

Number Installed =

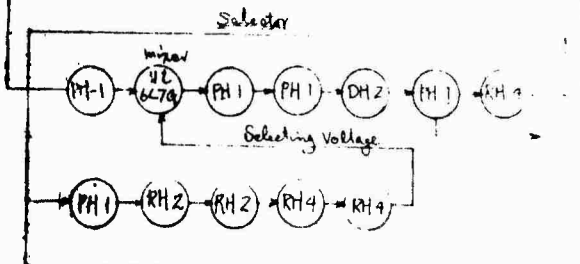
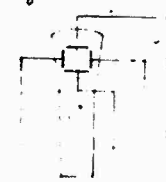
Description:

Tachi 4 was a medium weight set designed to give increased performance over Tachi-1 and -2 for fire and searchlight control. The result was disappointing since only about half of the expected 40 km range was obtained. Moreover the angular accuracy was poorer than either Tachi-1 or -2. Hence the set was used to fill in the warning in otherwise dead zones in mountainous areas, and for searchlight control. As the war ended studies were being made to improve the antenna, which used a separate Yagi mount for transmitting and a group of 4 receiving Yagis mounted on an octagonal shaped screen carried by a trailer; receiver take off from the antennas was through a phasing ring. An A-scan CRT permitted the selection of any target, whose echo was then displayed on a combined azimuth and elevation scope by means of a 4 segment distributor.

Radio Locator 'Type 4' (Tech 4)



Agimuth & Elevation



to AVE



TACHI - 31

RADIO LOCATOR MODIFIED TYPE 4

Corresponding Allied Designation: Mark Ta Model 4 (probably).

Technical Characteristics:

f = 200 MC/S. 10 KW. Range 40 Km.
Accuracy: Range, \pm 100 M; Azimuth, \pm 1°; Elevation, \pm 1°.

Number Built = 70. Number Installed = "only a few"; a new set which was still undergoing development.

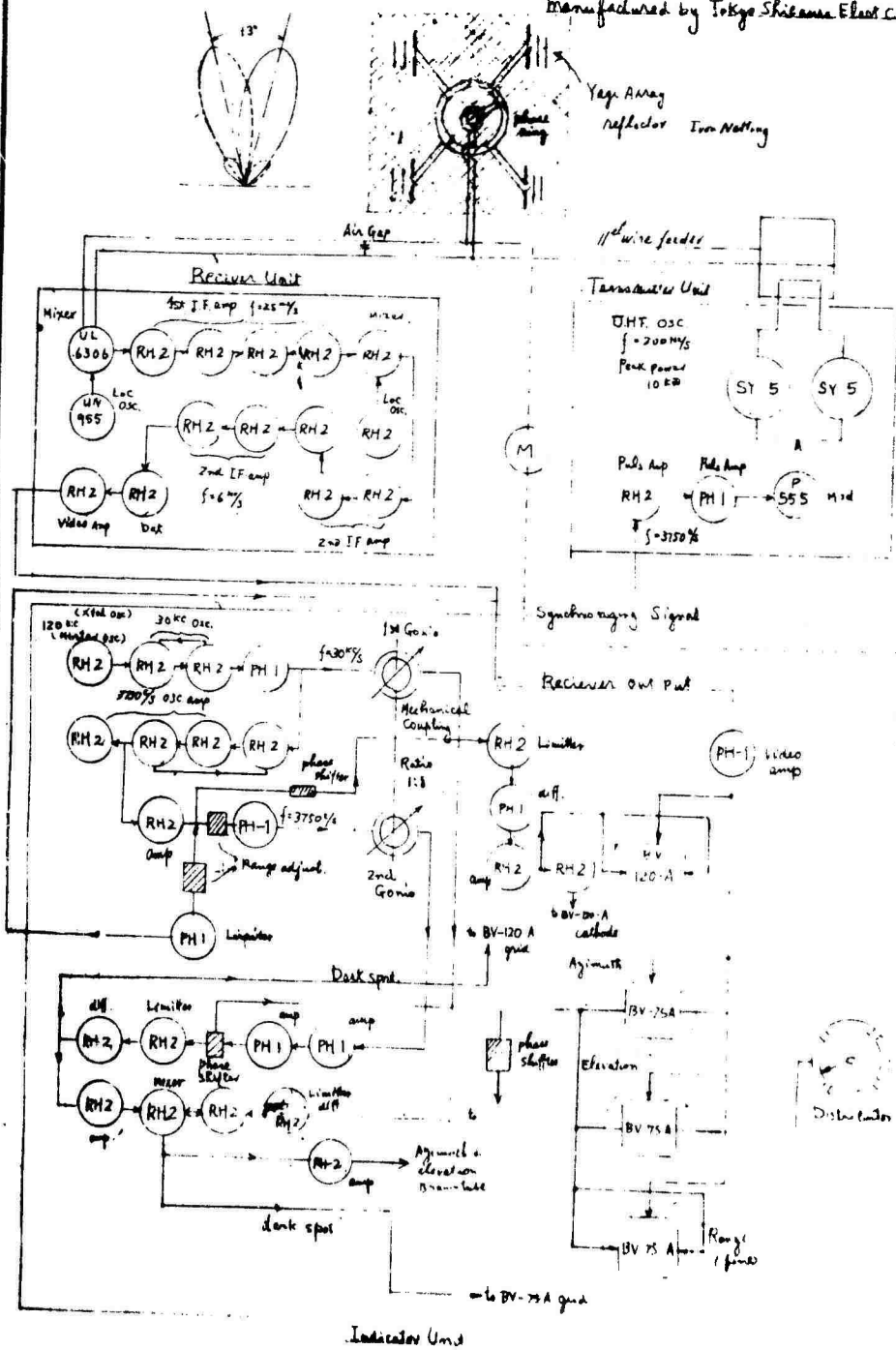
Description:

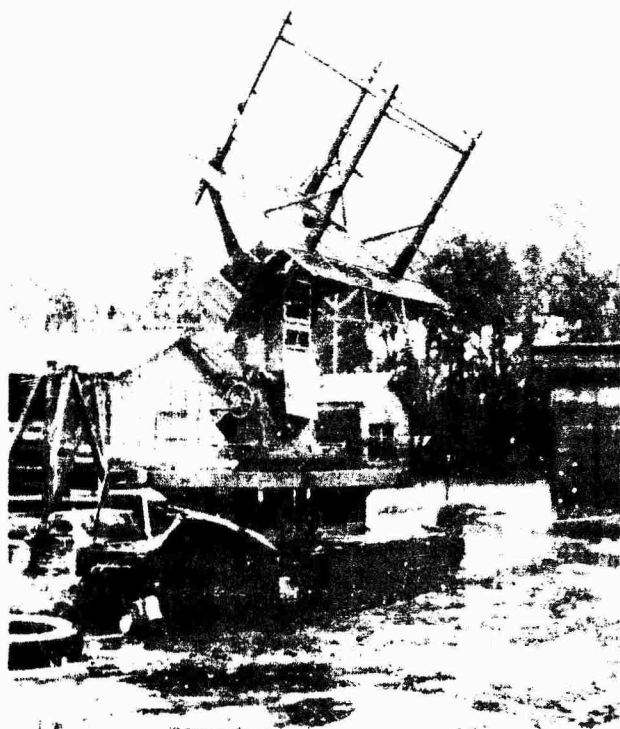
Tachi-31 was developed to provide improved performance over Tachi-1, -2, and -4, the lightweight locators. Unlike its predecessors it uses the same antenna for transmitting as receiving to get more overall antenna gain in the particular off-center angle at which the lobe is pointing at any instant as regulated by the position of the connection of the transmission line to the antenna phasing ring. As indicated on the block diagram the lobe can be swung in a circle $6\frac{1}{2}^\circ$ off center. A four scope presentation is used; coarse range, fine range, azimuth pip matching, and elevation pip matching.

Preliminary results with this set indicated tracking ranges of 18-25 km, and the relatively good accuracies in azimuth and elevation of \pm 1°. It was to have become the standard army radar locator.

Radio Locator "modified type-4" (Jacki-31)

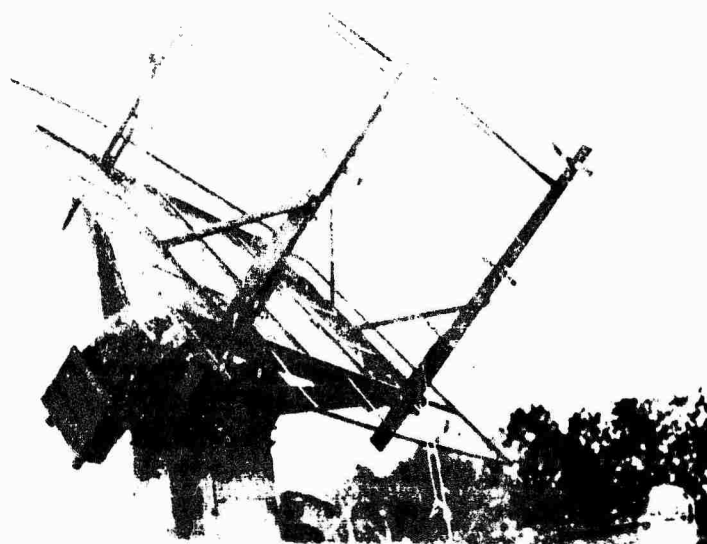
Manufactured by Tokyo Shibaura Elect. Co.





Tachi-31's
Trailer
Mounts both
Equipment
and Antenna

Kodaira
School.



Detail of Tachi-31 Antenna.

TACHI - 24

RADIO LOCATOR WURZBURG TYPE

Corresponding Allied Designation: None.

Technical Characteristics:

Wavelength = 50 cm. 10 KW. Range 40 Km.

Accuracy: Range, ± 40 M; Azimuth, $\pm 1/8^\circ$; Elevation, $\pm 1/8^\circ$.

Number Built = 3. Number Installed = 0.

Description:

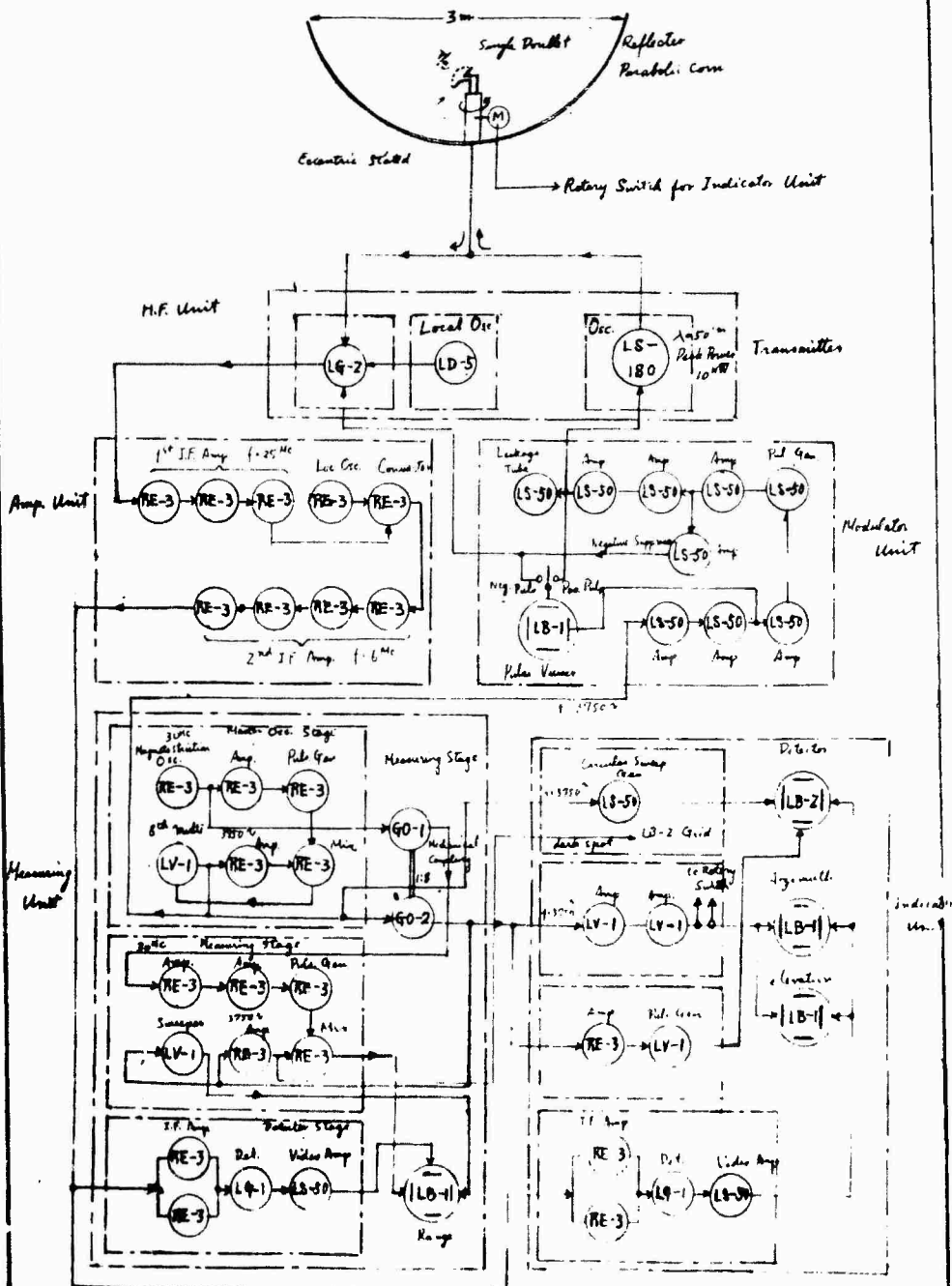
This set was as close a copy as the Japanese firm Nihon Musen could make of the German Small Wurzburg 50 cm gun laying radar. Complete blue prints and certain very special parts including the vacuum tubes were brought over from Germany by submarine in January 1944. Although it is rumored that as many as 20 technicians came with the plans to help on its production, only one German engineer, a Mr. Foders, can actually be identified. It was decided that Nihon Musen would re-engineer the set to Japanese specifications and build three initial sets, two of which would be sent to the Sumitomo and Tokyo Shibaura companies for them to use as models for large scale production. An initial order of 50 was said to have been placed. There is some difference of opinion between the army engineers and the manufacturer as to which was primarily responsible for their requiring 18 months to get the first model built. In any case, these first sets never were operated, largely because certain items such as the CRTs which were to have been supplied by Sumitomo and Shibaura were unavailable, those companies' plants having been badly bombed. The manufacturers stated that "if the war had lasted only one more month" they'd have had a Tachi-24 in operation.

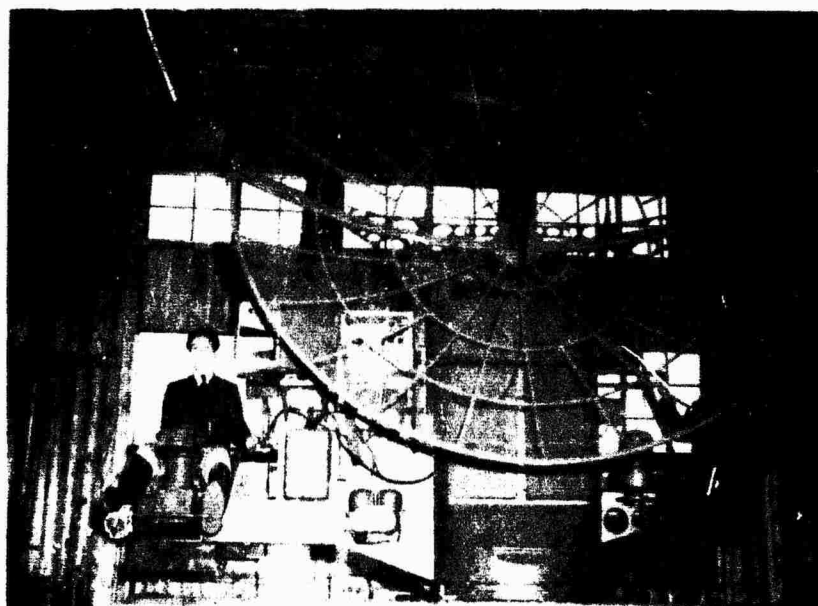
If the Japanese had had this set 6 months earlier with its vastly superior tracking accuracy the effectiveness of their AA defense might have been very greatly increased resulting in a much heavier loss to our B-29 aircraft.

The photos show the first and most nearly completed models of the Tachi-24 set in a barn near Mitaka, Tokyo area.

Radio Locator "Wangburg" type (Tachi-24)

manufactured by Nippon Musen





Front View of Japanese Made Wurzburg, Tachi-24 -
Nihon Musen Factory, Mitaka.



Rear View of Tachi-24.

TAKI - 2

AIRPLANE RADIO LOCATOR

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 80 cm. 2 KW. Range against: aircraft, 8 Km; ships, 8 Km.

Accuracy: Range, \pm 200 M; Azimuth, \pm 1°.

Number Built = A small number

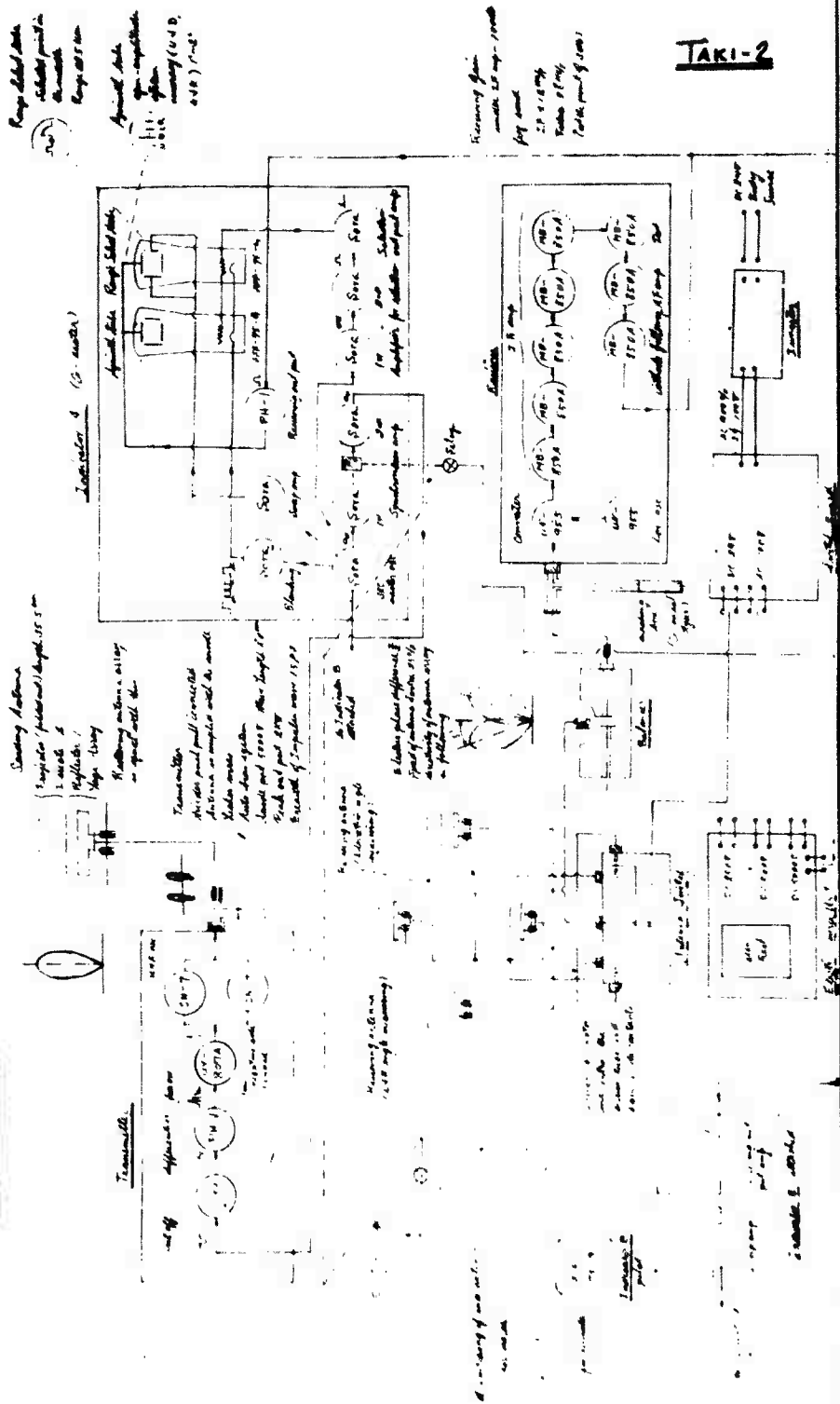
Number Installed = still under test.

Description:

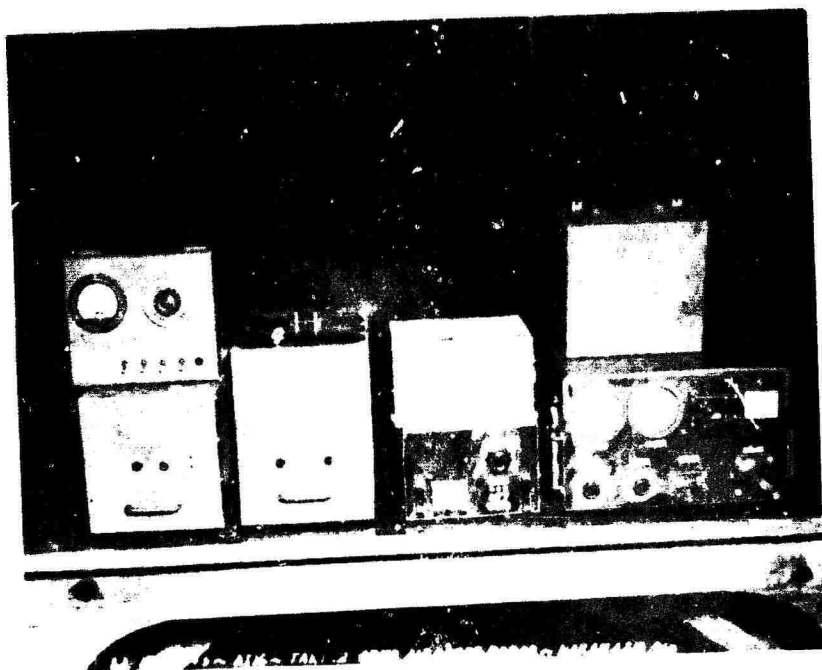
This was the first army AI (air interception) radar built and bears a strong resemblance to the American SCR-540 equipment. The set is for a 2 place airplane. It uses a Yagi array with folded dipole for a nose installed transmitting antenna, and a pair of antennas on either side of fuselage for azimuth estimation and another vertically spaced pair for elevation estimation. A motor driven distributor connects the receiver to each antenna in rapid succession. The display is unique in that one tube is used for ranging (A-type) and another tube shows Up-Down signal strengths on the left half and Left-Right signal strengths on the right half, as suggested in the block diagram. A remote indicator for the pilot duplicates this second display; a meter operated by selsyn control from the indicator unit gives him the range of the target selected for viewing by the radar operator.

Model II of Taki-2 was undergoing tests on night fighters at the time the war ended; studies were being made on a Model III which would have an improved indicator.

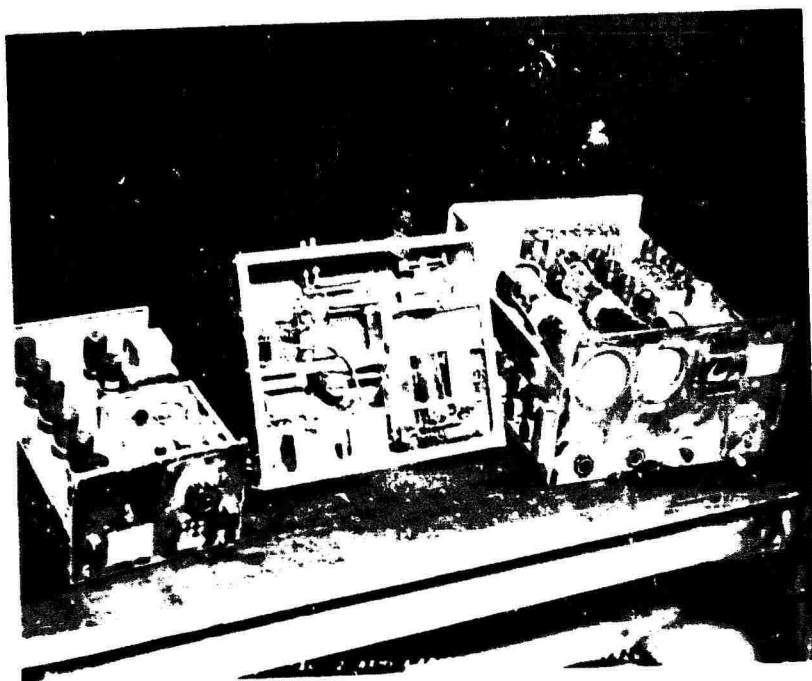
Aeroplane Radio Receiver (WKT-2)



TAKI-2



Bench Set up of Taki-2 Airborne Radar.



View of Interior of Taki-2 Components.

TACHI - 13

GROUND PART OF FPFND LOCATOR

Corresponding Allied Designation: ----

Technical Characteristics:

Transmitter $f = 184$ MC/S. 10 KW. Receiver $f = 175$ MC/S. Range 150 Km.

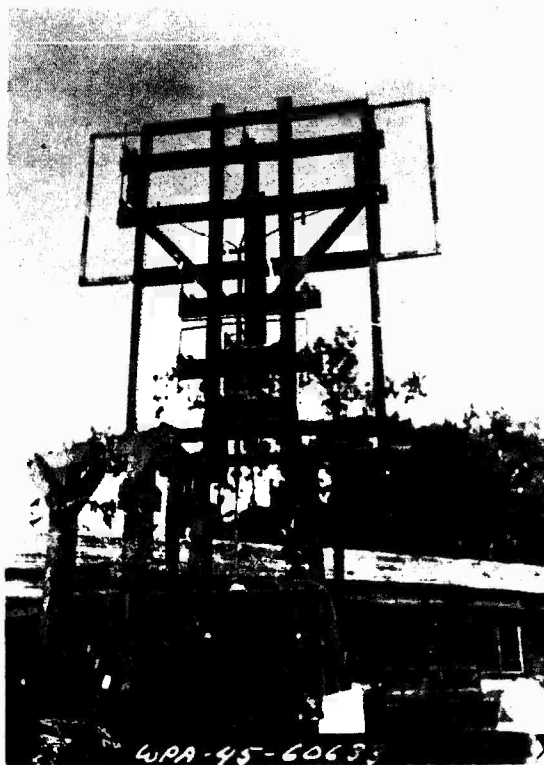
Accuracy: Range, ± 500 M; Azimuth, $\pm 1^\circ$.

Number Built = 20. Number Installed = *Few*

Description:

This is essentially the ground end of a GCI system by which a controller can at all times keep accurately informed of the location of a friendly interceptor. The ground station is really an interrogator for the Taki-15 IFF set carried in the plane. The interrogating frequency is 184 MC/S, while the plane replies at 175 MC/S. This insures that only the friendly aircraft's signal will appear on the indicator.

The transmitter sends out a single lobe broad pattern, while accurate azimuth is obtained by lobe switching the receiving antenna pattern. Range and azimuth scopes are provided; echo heights being matched on the latter. The first equipments were just being installed and ground crews were undergoing instruction at the end of the war.



Tachi - 13
Transmitting
Antenna (Lower)

and

Receiving
Antenna (Upper)

Friend locator assigned (Tachibana)



TAKI - 15 TYPE I

AVIATION PART OF FRIEND LOCATOR

Corresponding Allied Designation: ----

Technical Characteristics:

Transmitter f = 175 MC/S. 100 W. Receiver f = 184 MC/S.
Non-directive.

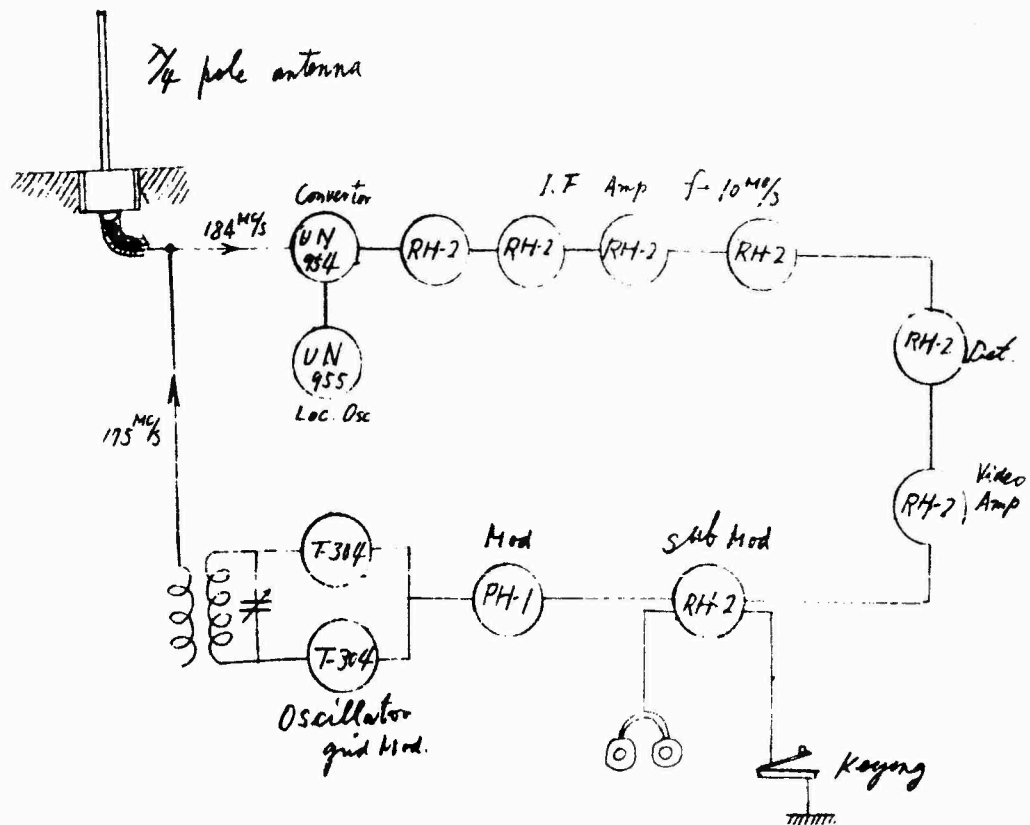
Number Built = 50. Number Installed = *FEW*

Description:

Taki 15 is the Japanese army's IFF set and is a small beacon carried by the aircraft, receiving on 184 MC/S and responding at 175 MC/S. Headphones and a key are provided and with similar equipment at the ground end (Tachi-13) two-way Morse communication can be carried on. In the rudimentary fighter control techniques being worked out this channel was used for passing homing information but not for interception instructions.

See Taki-15, Type II for the refined version of this set, which uses lecher line tuning, and a T-R discharge tube to protect its receiver.

Aviation part of Friend-locator "Taki-15 type 1" (Repeater)



TACHI - 28

LOCATE - LEADER

Corresponding Allied Designation: ----

Technical Characteristics:

$f = 190$ MC/S. Range 300 Km. Signal relay $f = 50-65$ MC/S. 8 W.

Number Built = 1. Number Installed = 1 (being tested).

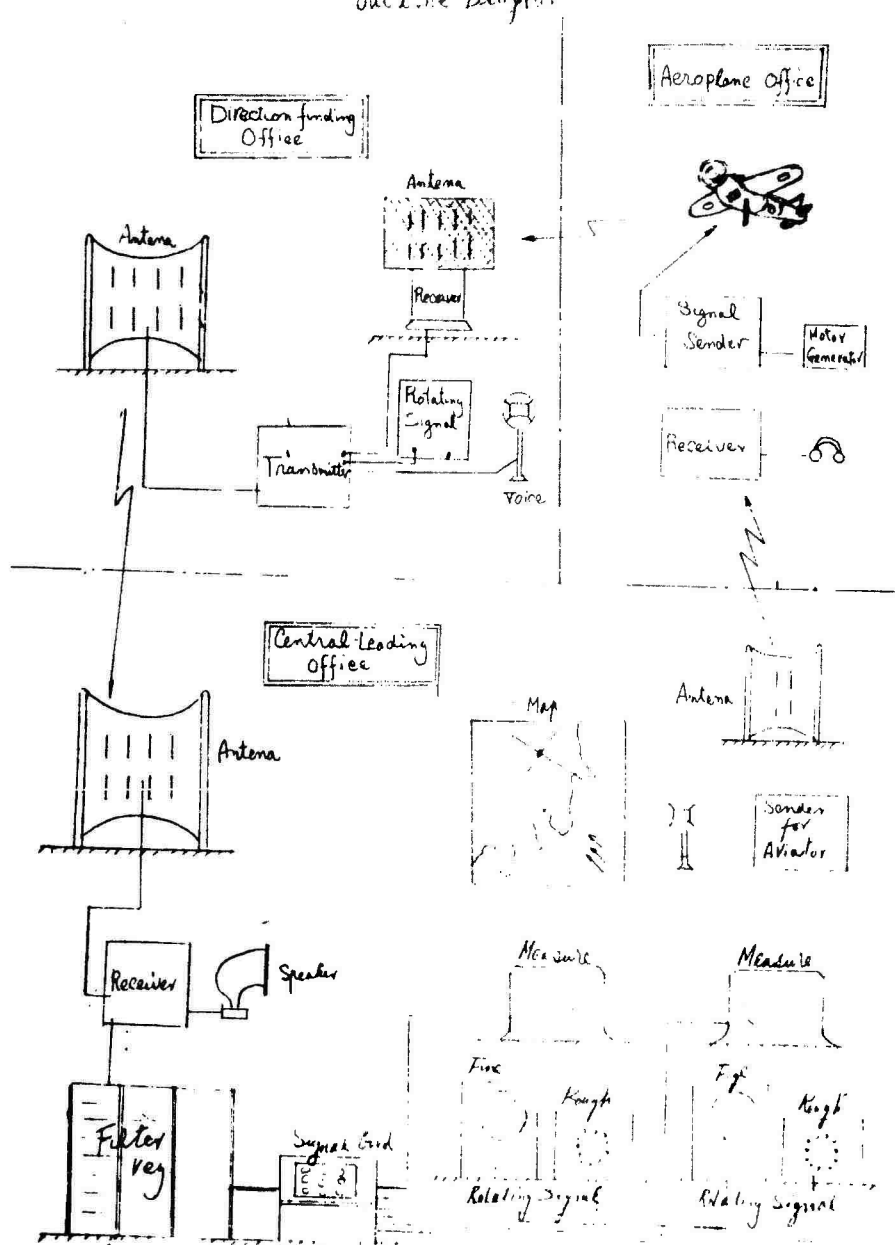
Description:

Tachi-28 is the name of a complete ground equipment system (the associated airborne equipment is Taki-30) which will provide reasonably accurate data on the current positions of up to 30 independently controlled aircraft. Each airplane to be controlled carries a transmitter (Taki-30) radiating a continuous signal on 190 MC/S modulated at some assigned frequency between 30 and 60 kc. Two or more DF (direction finder) stations located at intervals of about 50 miles pick up the signals. Their antennas rotate steadily at 2 rpm, and each is arranged by 50 cycle lobe switching to have a horizontal pattern with two maxima and a sharp minimum between them.

The composite signal picked up by each DF station--a mixture of tones from 30 to 60 kc--is radioed to a control station on a special 5 meter link. In the region below the lowest aircraft signal frequency (from 0 to 30 kc) a voice channel and an azimuth signal are transmitted. The latter indicates the position of the DF antenna and is in two parts: one, for fine data, is continuously variable and repeats itself every 30° ; the other, for coarse data, varies in 12 steps. At the central station the coarse azimuth signal lights one of 12 neon lamps, while the fine azimuth signal positions the spot of a cathode ray tube, causing it to go through a circle for each 30° of the DF antenna's travel. The signal of the particular plane being observed is selected by a filter and displayed radially on the cathode ray tube. Because of the double-lobe pattern of the DF antenna the observed figure will be like that shown on the scope of the diagram for the "Control Leading Office"; the minimum in the center of the figure is at the azimuth of the plane. The operator locating a plane has two such scopes before him, one for each of two outlying DF stations. From the data of both stations he can locate the plane quite accurately. Other operators use the same azimuth signals but select different aircraft signals.

This system is of interest in that it provides instantaneous remote indication of a large amount of data: 2 DF out a minute on each of 30 airplanes. It was intended for GCI use and a large system was being installed in the Tokyo area. The central station was located at Matsudo; initial DF-ing stations were at Choshi and Shirahama, 50 miles east and south, respectively, of Tokyo. In some cases relay stations were to be used in the 5-meter radio link. This grand scale project was interrupted by the ending of the war.

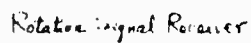
Locate-Leader (Tachi-28)
Outline Diagram

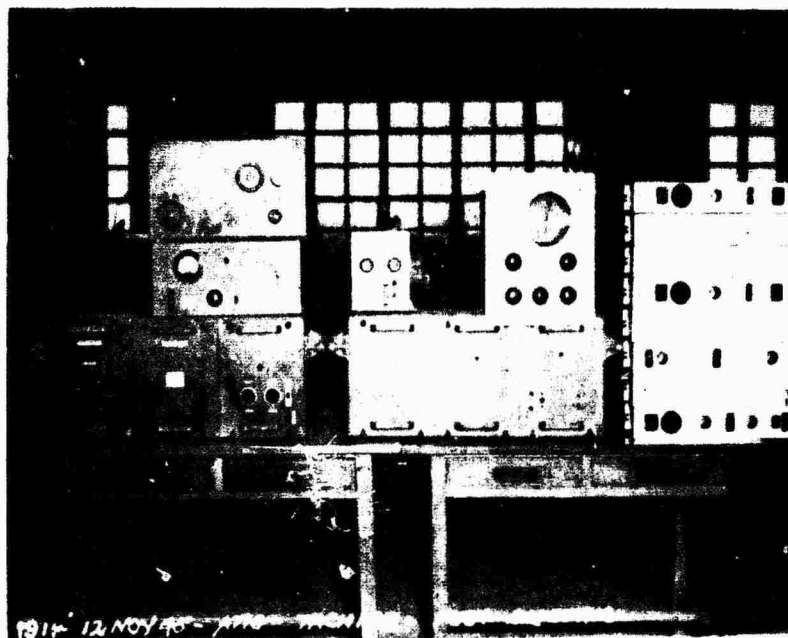


Director-finding office



measuring parts : Central-Leading office).



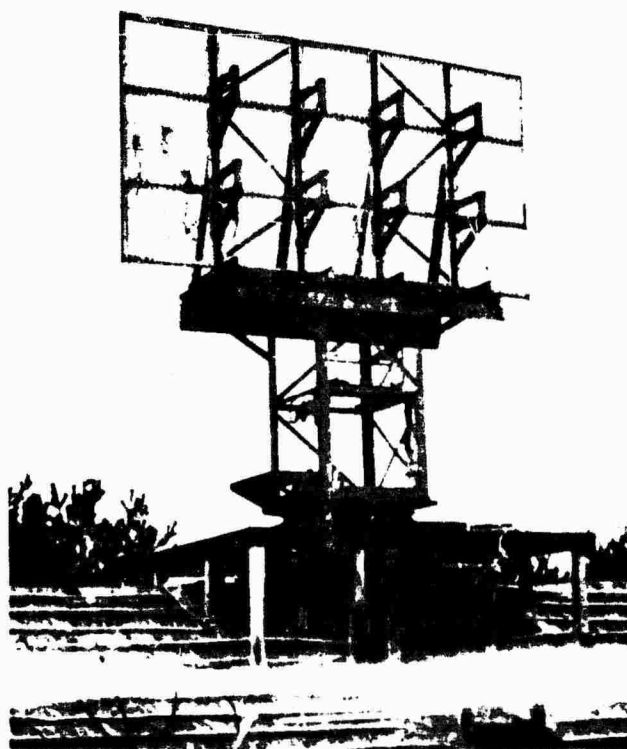


Tachi-28 Central Station Equipment

Left: Fine Indicator, Coarse Indicator,
Auxiliary Equipment

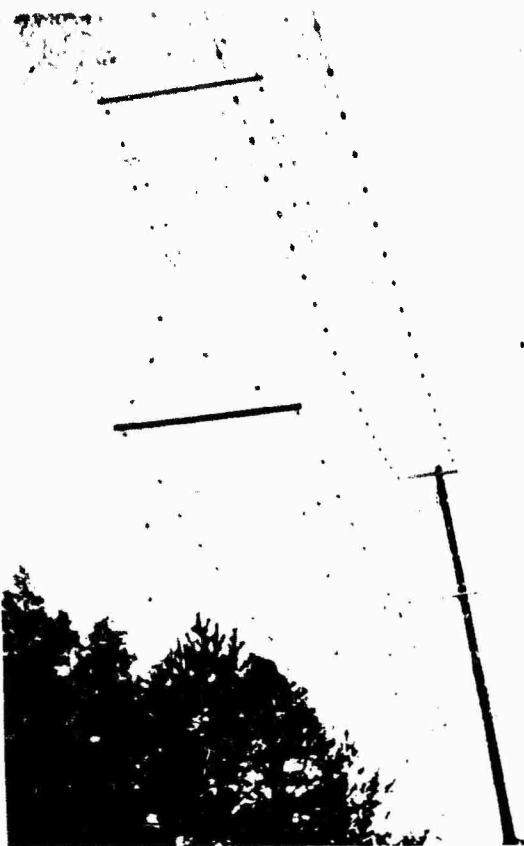
Center: Monitor Scope, Equipment to
Develop Circular Sweep

Right: Filters for Airplane Signals



Tachi-28

D/F Antenna



Tachi-28

5-meter

relay

link

array

TAKI - 30

LOCATE-LEADER - AVIATE PARTS

Corresponding Allied Designation: ----

Technical Characteristics:

Transmitter $f = 190$ MC/S. CW 20 W. Modulation $f = 30-60$ KC/S
(1 KC/S steps). Non-directive.

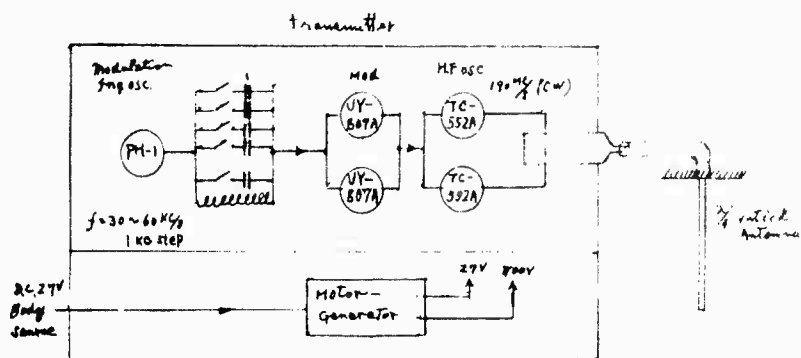
Number Built = 50. Number Installed = a few for test.

Description:

Taki-30 is the small transmitter carried by the interceptor airplane to indicate to the ground system (Tachi-28) its accurate location. It sends out a continuous signal at 190 MC/S modulated by a choice of signals in 1 kc steps between the limits of 30 and 60 kc. Thus 30 different planes, each with a different modulating frequency, can be individually controlled simultaneously.

Locate-Leader (Tabi-30)

Aviate parts



TACHI - 36

ORDER APPARATUS FOR DEFENSIVE-ATTACK-COMPUTER AND TRANSMITTER

Corresponding Allied Designation: ----

Technical Characteristics:

Accuracy of Computation: Bearing, $\pm 2^\circ$; Range, \pm (30 sec x cruising speed).

Accuracy of Transmission: Bearing, $\pm 5^\circ$; Range, ± 200 M; Altitude, ± 500 M.

Number Built = 1 under test. Number Installed = 1.

Description:

Tachi-36 is first an electrical computing device in which is inserted the present course and speed of the foe plane and of the friendly plane. From it comes the proper course for the friendly plane to fly to effect an interception; the distance to fly to that point is also given. The remaining part of Tachi-36 is a transmitter with controls on which the operator sets up the correct course to fly (azimuth) as just determined, the distance yet to go (range) and the altitude to come in at. These three pieces of data are transmitted through three sectors of a rotating contactor, each contact of which is associated with a different low audio frequency modulating a radio transmitter. A corresponding rotary arrangement with tuned reeds is installed in the plane and when the rotating electromagnet carrying the demodulated radio frequency passes the proper tuned reed it sets the latter in violent vibration. These are marked with proper course, range, and altitude scales so that the pilot can at a glance tell the proper next move to make. The rotating elements are kept in step by a synchronizing signal sent once a second at the start of each revolution.

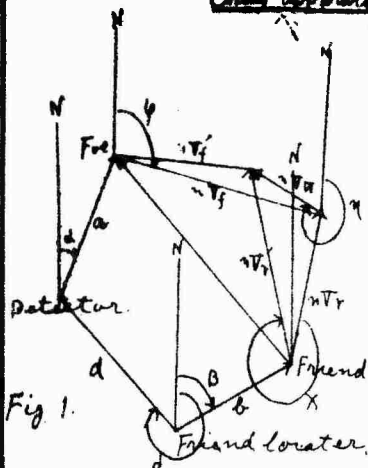
Order apparatus for defensive-attack

"Counting apparatus"

Task-36.

principle

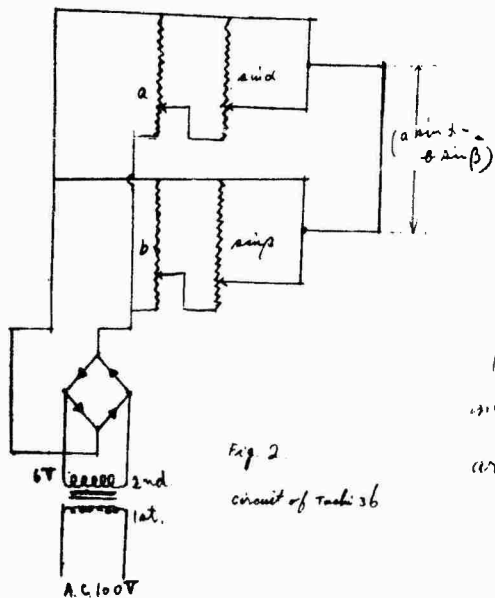
- V_f --- velocity of foe-plane
- V_f' --- velocity of foe-plane
(corrected the wind velocity)
- V_r --- velocity of friend-plane
(in windless condition)
- V_w --- wind velocity



$$V_r \sin X = \frac{1}{n} (a \sin \alpha + d \sin \delta - b \sin \beta) + V_f \sin \varphi + V_w \sin \gamma \quad (1)$$

$$V_r \cos X = \frac{1}{n} (a \cos \alpha + d \cos \delta - b \cos \beta) + V_f \cos \varphi + V_w \cos \gamma \quad (2)$$

$(a \sin \alpha - b \sin \beta)$ is calculated by the circuit of Fig. 2.

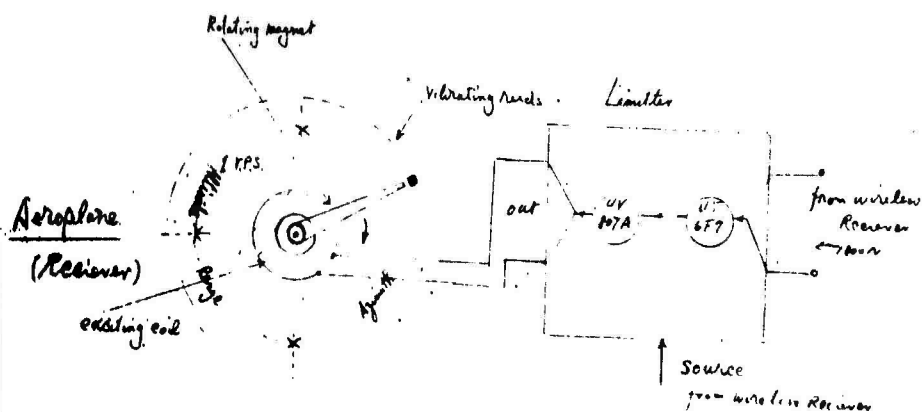
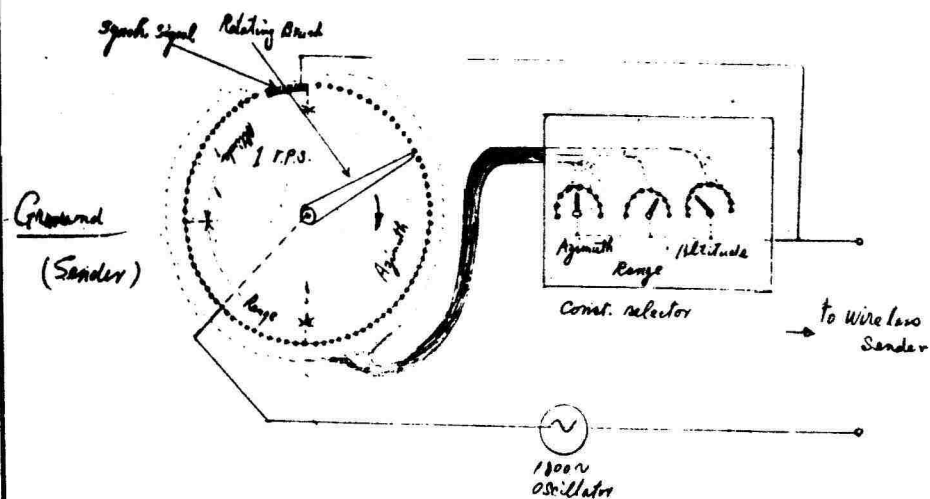


Other Calculation was obtained in same way. From calculation (1) and (2) the direction that friend fighter want, and the distance between the present and the future meeting position of friend are obtained

Order apparatus for defensive-attack

"Transmission of required tone"

Indication Accuracy	
Azimuth	$\pm 5^\circ$
Altitude	$\pm 500'$
Range	$\pm 200'$ max.



TACHI - 17 TYPE I

IDENTIFICATION OF FRIEND GROUND PART

Corresponding Allied Designation: ----

Technical Characteristics:

Transmitter f = 184 MC/S. 10 KW. Receiver f = 175 MC/S. Range
250 Km.

Accuracy: Range, ± 3 Km; Azimuth, $\pm 3^\circ$.

Number Built = 50. Number Installed = 0.

Description:

Tachi-17 Type I is a ground IFF interrogator to perform the same function as Tachi-13. Tachi-17, however, has a greatly increased antenna gain theoretically raising the maximum range from a figure of 150 km to 250 km.

The equipment was to have been installed in conjunction with strategic detector stations such as the Tachi-6. Modifications were already being made however in its design leading to the Model II.

(Tedi-17-Type-1)

Antenna height:-
10 mtr above ground
Antenna rotation:-
hand drive

integrated system



TACHI - 17 TYPE II

IDENTIFICATION OF FRIEND GROUND PART

Corresponding Allied Designation: -----

Technical Characteristics:

Transmitter f = 184 MC/S. 10 KW. Receiver f = 175 MC/S. Range
250 Km.

Accuracy: Range, \pm 2 Km; Azimuth, \pm 1°.

Number Built = *FEN*

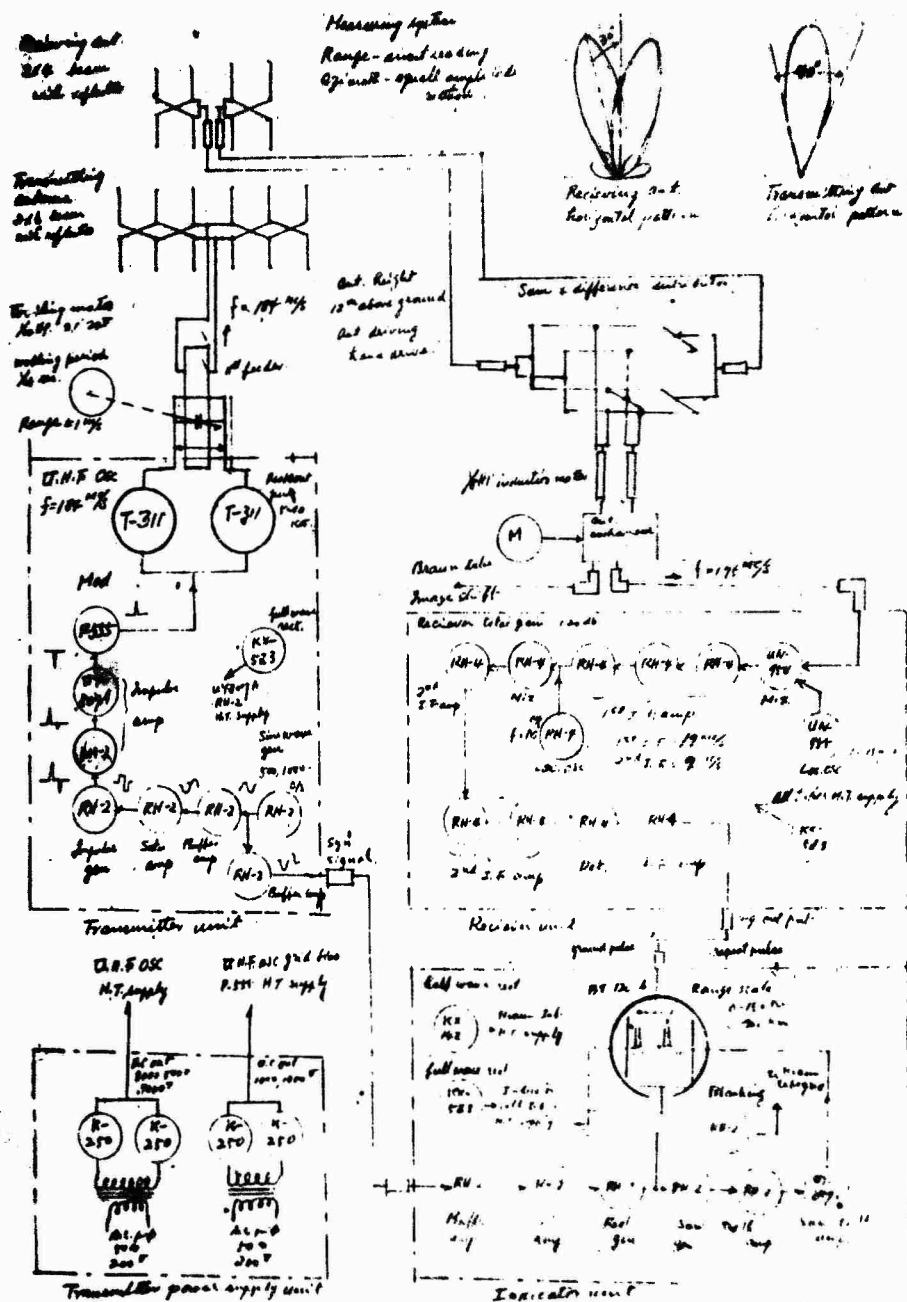
Number Installed = *UNDER TEST*

Description:

Tachi-17 Type II was developed from Type II, the principal difference being that lobe switching has been introduced in the receiving antenna system which is now distinct from the transmitting antenna. By this means the azimuth accuracy of the set is increased threefold. This feature was undergoing tests as the war ended.

Identification of friend (Radio-17 type 3)

(- On the Band 1706) manufactured by Suvaco Communications Co Ltd



TAKI - 15 TYPE II

IDENTIFICATION OF FRIEND AIRCRAFT PART

Corresponding Allied Designation: ----

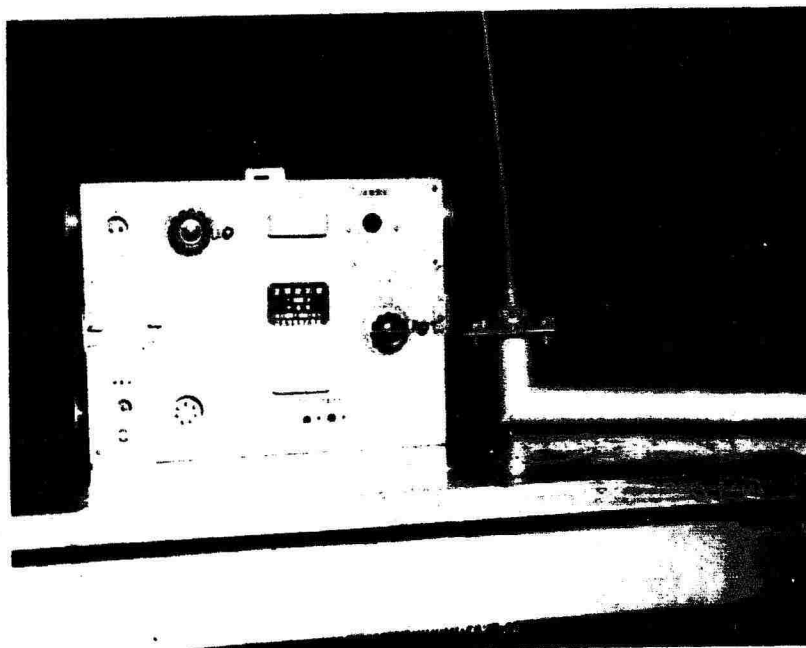
Technical Characteristics:

Transmitter f = 175 MC/S. 100 W. Receiver f = 184 MC/S. Non-directive.

Number Built = 120. Number Installed = Few, if any.

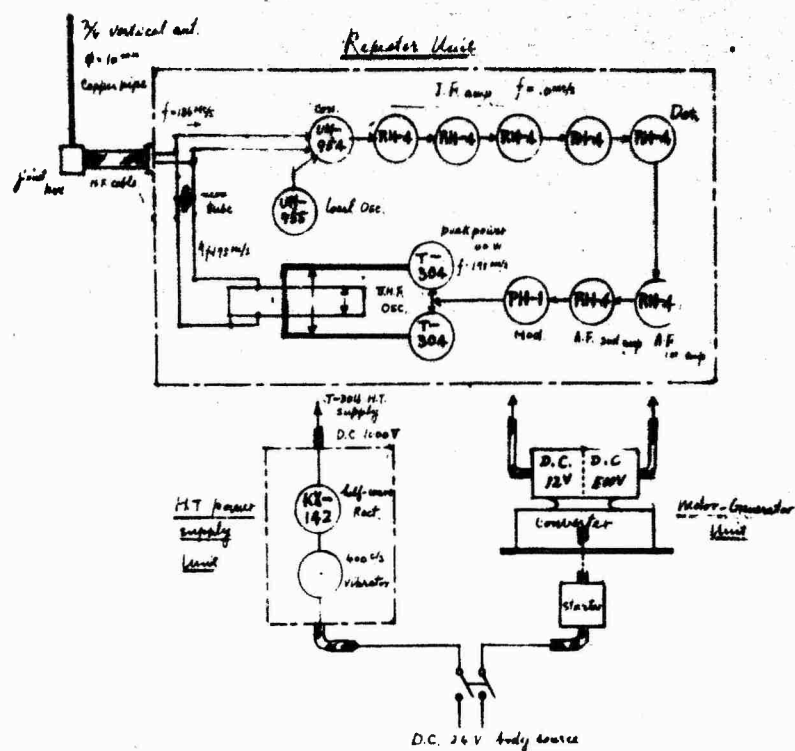
Description:

This is a considerably refined Taki-15 Type I transponder equipment, using lecher rod tuning for the transmitter and a T-R tube to protect the receiver.



Army IFF Set, Taki-15, Type II.

Identification of Fessend (or variation part)
 (Repeater)
 (Table 13, type E.) manufactured by Westinghouse Electric Co.





Interior
View of
Army IFF
Set,
Taki-15,
Type II.

TACHI - 39

HYPERBOLIC NAVIGATION APPARATUS-GROUND PART

Corresponding Allied Designation: ----

Technical Characteristics:

$f = 1.5 \text{ MC/S}$. 150 KW. Range during: day 900 Km; night 3000 Km.
Range accuracy $\pm 1\%$.

Number Built = First system partially completed, some destroyed by bombing.

Description:

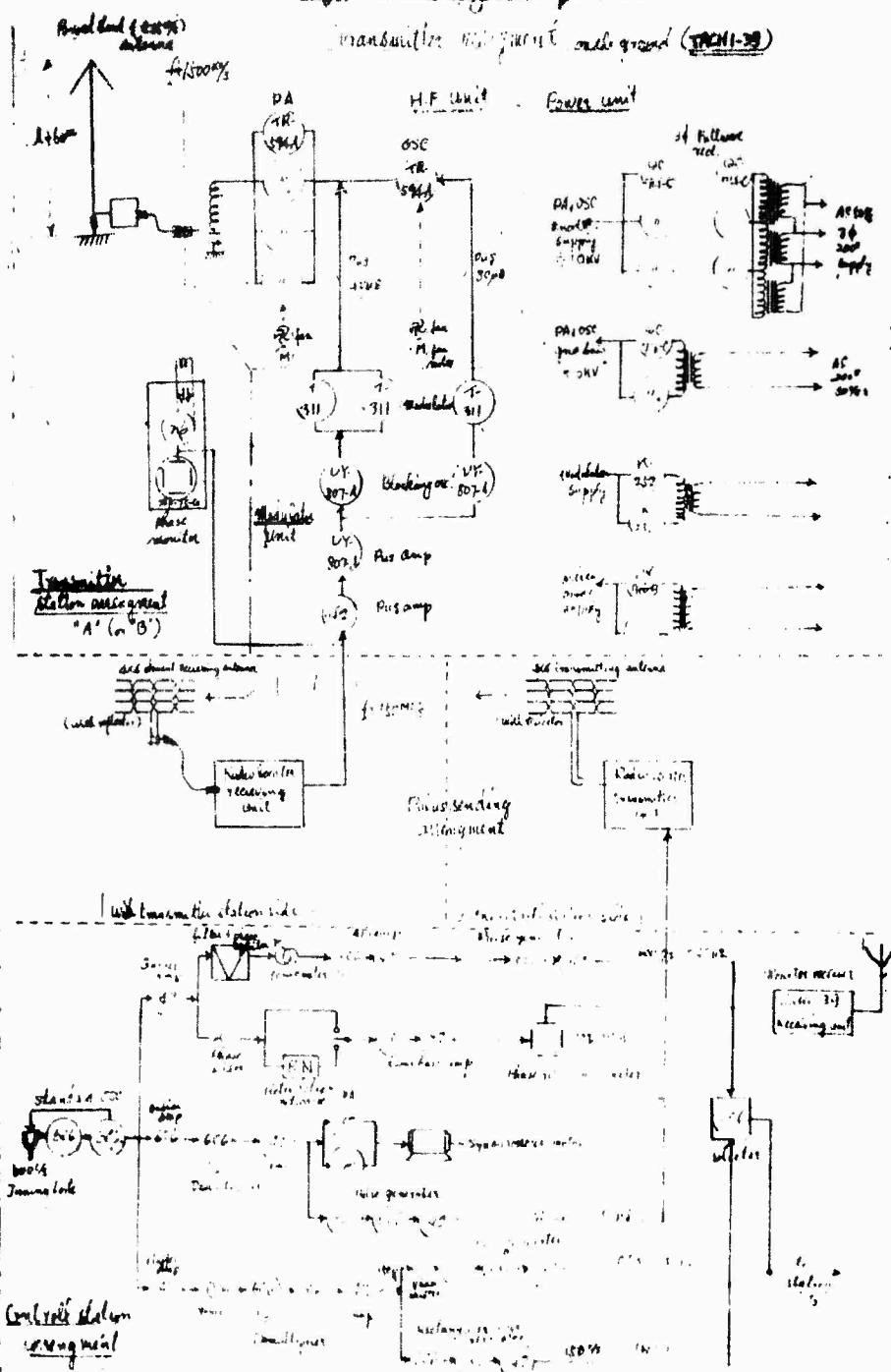
Tachi-39 is the ground equipment for a hyperbolic navigation system similar to LORAN. Instead of having a "master" and a "slave" station, both stations in a pair are controlled over a 75 or 150 MC/S radio link by a separate master station which itself does not transmit pulses on low navigation frequency (1.5 MC/S). One station (station B) transmits a drift pulse as well as its regular pulse. The drift pulse moves at a carefully controlled rate, and the time between its coincidence with the A-signal and the B-signal (as viewed on the scope in the plane) is measured there with a stopwatch. This gives a quite accurate measure of the time by which regular pulse from B lags (or leads) the pulse from A, and hence establishes which hyperbola the airplane is on on the navigation chart. A similar fix from another pair of stations establishes the plane's location on another hyperbola. Where the two intersect is the plane's position.

This method is ingenious in that the stopwatch is the only time measuring equipment needed in the plane, and thus their airborne equipment can be much simpler than ours. The obtainable accuracy is probably not as good as that of LORAN. However, by careful control of main pulses, and the rate of the drift pulse a time difference of say 10 seconds might understandably be read to less than 1.0% error on a stopwatch, the claimed accuracy for the system.

Japanese army electronics engineers claim to have thought up the ideas themselves for Tachi-39 about August 1943. Several of the units for the first system had been built by the Sumitomo Company by the end of May 1945. A second set was made at the end of July but was destroyed by bombing on 2 August. This was to have been quite a formidable equipment, the total weight for a master and two slave stations coming to some 600 tons.

Hypobolic navigation apparatus

transmitter and receiver (TAC-1-39)



HYPERBOLIC NAVIGATION APPARATUS-AIRCRAFT PART

Corresponding Allied Designation: ----

Technical Characteristics:

$f = 1.5 \text{ MC/S}$. Non-directive.

Number Built = A few models. Number Installed = Probably none.

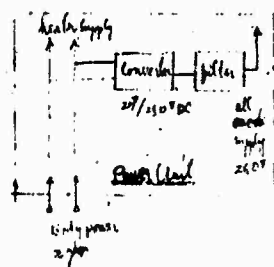
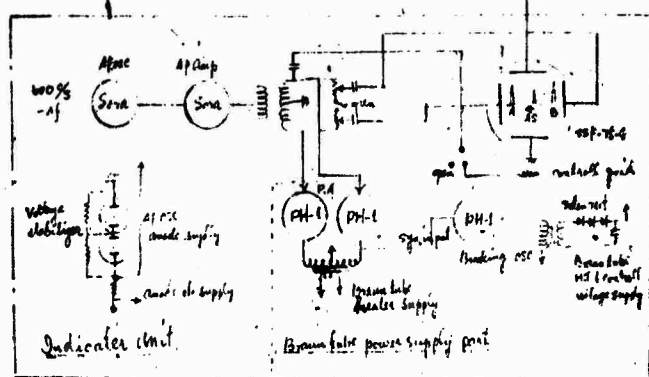
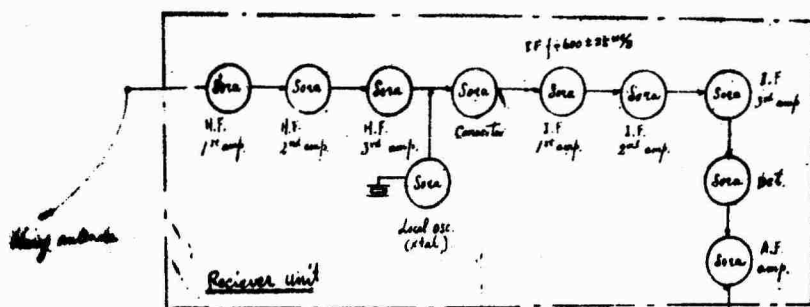
Description:

The airborne end of the hyperbolic navigation system consists of a simple superheterodyne receiver at 1.5 MC/S feeding the rectified r.f. pulses to the vertical deflection plates of an oscilloscope. The sweep is locally generated and is varied in rate until the received station pulses are held stationary. The time required for the drift pulse to walk from the A to the B pulse, or vice versa is read on a stopwatch; a chart then shows the line of position on which the aircraft must be located.

Hypobrya sanguinea Quintus

Aircraft recovery agreement (TAKI-39)

- self-synchronous system



and Ghost.

Second which

TAKI - 14

PATHFINDER

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 27 cm. 2 KW. Range in radius 20 Km (5000 M altitude).
Accuracy: Range, \pm 2 Km; Azimuth, \pm 3°. PPI display.

Number Built = 2 or 3. Number Installed = 1.

Description:

Taki-14 was to have been the Japanese counterpart of the American SCR-717B, for use in navigation, search for ships, and possibly for bombing. It uses a grid modulated triode T-327 for transmitting which generates a pulsed power of 2 kw at 27 centimeters. The antenna is comprised of a clipped 60 cm parabola carrying a horizontal dipole and a 6 x 4 array of directors, which is claimed to give a beam 6° wide (half power point) and 60° deep in the vertical plane. The antenna which rotates at 20 rpm and has no tilting facility, is mounted in a paper fiber radome beneath the plane fuselage. A 120 mm cathode ray tube gives a PPI type of display. Rotary joint and hydrogen filled T-R tubes followed American practice. Circuit schematics of Taki-14 are given in Appendix II.

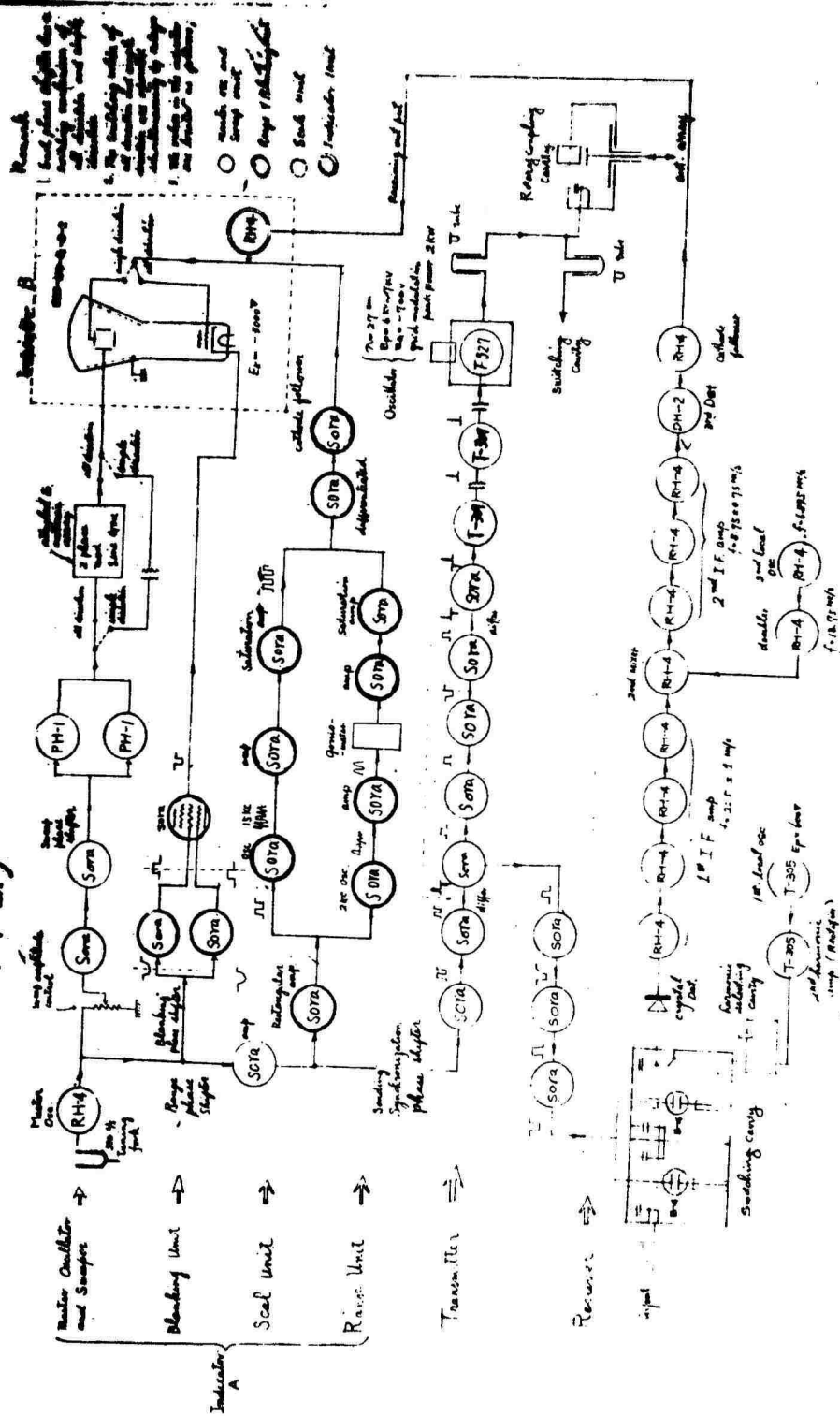
This set weighed much less than the corresponding microwave navy airborne search radar (120 kg vs 300 kg). Plans were being formulated to pool the joint army-navy experience in building a 5 cm airborne set to rival the American APQ-13.

The first Taki-14 produced (by Tokyo Shibaura Electric Co.) was installed for test in a Ki-21 plane. Preliminary flights gave shore outlines at 30 km. The war ended while repairs were being made at Fusa airdrome to bomb damage inflicted on the plane.

Two models, I and II, were made of Taki-14. The second type differed chiefly from the first in that cavity tuning of r.f. circuits was used, and that the transmitter power was increased to 10 kw. This improvement nearly doubled the effective range to 70-80 km on large land masses.

The following recital of the development of Taki-14 was written by Maj. Uozumi, "project engineer" on the set for Tama Institute. It is given in full with the wording used on the original copy as an interesting view of the problems and difficulties confronting Japanese radar engineers in the later days of the war, as well as a review of their latest airborne radar construction.

(P.F.I.)



RESEARCH OUTLINES OF TAKI-14 (P.P.I.)

by Major Uozumi, Tama Research Institute

1. The starting time of research and the outlines of design. We started the research at the end of August in 1943. As we finished the collection of fundamental data for the set design, we started the trial production of Taki-14 at Toshiba-Tsushin Company according to the following data; i.e.

Transmitter:

wave length = about 25 cm
oscillator type = Back-coupling with cavity resonator
modulation type = grid modulation
peak output = 2-4 KW
pulse width = 1.5 μ s
repeating frequency = 500 o/s

Receiver:

Type = double superheterodyne
1st I.F. = 21.5 MC/S + 1.5 MC/S
2nd I.F. = 8.75 MC/S + 1.5 MC/S
Sensitivity = about 110 db after the I.F. stage.

Antenna System:

1. Cooperation type of transceiving by the glim-relay method.
2. Yagi array with 3-dimensional parabolic reflector.

Weight:

120 kg excluding rectifier and inverter; rectifier = 40 kg.

2. The probable faculties expected of the set when we started the 1st trial production:

about 70-80 Km at unidirectional indication, and the most visible radius when we adopted the panoramatic indication is about 50 Km.

3. Process of Research.

We completed the No. 1 trial set on August in 1944, and then we tried the experimental flights aboard the Ki-21 (97 Type heavy bomber), but we found its faculties very poor and insufficient for practical use. That is to say, the most visible radius is about 25-30 Km only.

Thus we continued our efforts to improve mainly the antenna system and the feeder parts, and we succeeded to find a new wave-canal type antenna and low-loss contact of U type feeder.

On the base of the above mentioned improvement, we completed the No. 2 trial set at the beginning of February in 1945. We tried again the experimental flights. In this time the most-visible radius improved to about 40-50 Km, sometimes the reflection images of large objects, for instance, high mountains further than 50 Km, appeared. Thus we found the set practical at any rate though not so satisfactory.

Since then we have planned the production of 20 sets, calling them Taki-14 Type I, and in parallel to the production we continued our research to improve the set more and more.

But the production company in Kawasaki has often been bombed and burnt until the nearly all parts of the sets on the way of production have been reduced to ashes completely except No. 3 trial set only.

In spite of the mortal damages we have planned the production again and again, even after August in 1945, but in vain until we met the end of War. On the other hand, we completed a experimental set in our laboratory, improving the transmitter output to above 10 Kw and the all high frequency circuits to cavity ones. We expected to call this type of set Type II.

The most visible radius of this experimental set attained certainly to about 70-80 Km. But, before the official trial production, the war ended.

Still more, we engaged with the fundamental research of 10 cm (Taki-24) and 5 cm (Taki-34) sets, and have had nearly complete design data except a powerful transmitter magnetron for 5 cm. They were different from Taki-14 only in the two points, i.e. the dimensions of high frequency circuits and the transmitter valves. But before the start of production, the war ended as similarly as above mentioned Type II of Taki-14.

4. The disposal of the sets that we had in our laboratory. As above mentioned the fact was that the war ended suddenly before the sets were applied for practical use, only finishing the experiments in laboratory. And the faculties of the trial set of Taki-14 at the end of the war as follows;

Most-visible radius is about 40-50 Km in Type I and about 70-80 Km in Type II. Well, on August 14th in this year, the war situation became too imminent to continue the research in laboratory even for our technical officers. We were obliged to prepare as we were able to go to the front to die--I dare say "to die".--

Thus at last we partialized and burnt down all our lovely sets--(Please pardon me to say "lovely") with all important documents of investigations or experiments, and then we suddenly met the end of War before we went to the front as you know. I'm very sorry as one engineer that we partialized and burnt down to ashes all the sets and technical documents. I can say with my responsibility that we have

never burnt our lovely sets if we knew the war would end on August 15th at once, and you American army or air forces would land such peacefully as we saw actually.

For the reason above mentioned, if we would like to find even the parts of Taki-14, we have probably a chance only at Toshiba-Tsushin Company, I think. But frankly speaking I doubt it because your bombs were too many and tremendous to residue something without reducing to ashes.

5. The circuit diagrams were written by the collection of the memories and random notes of my own, but I am convinced to be sure, correct. Type II is different from Type I only in the high frequency circuits and the oscillator, that is to say, in the former, the H.F. circuits were improved to completely cavity-type circuits, and its oscillator is push-pull.

TAKI - 11

ALTIMETER FOR HIGH ALTITUDE

Corresponding Allied Designation: -----

Technical Characteristics:

Wavelength = 80 cm. ($f = 375$ MC/S). 200 W. Range 12,000 - 200 M.
Error $\pm 10\%$.

Number Built = ? Number Installed = Some in use.

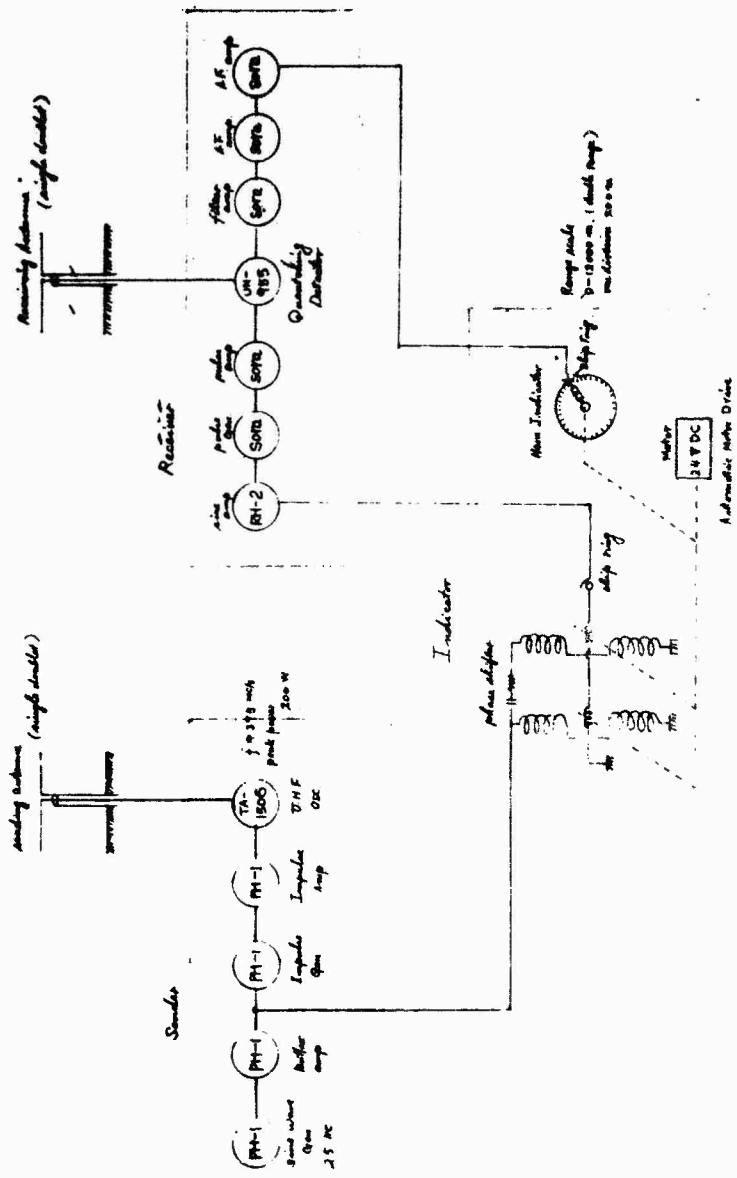
Description:

Taki-11 is a high altitude pulsed type absolute altimeter with a neon light indicator. Army electronics personnel agreed that it was a highly unreliable instrument.



Taki-11 High Altitude (Pulsed) Altimeter.

Meister for High Struck (Table II)



TAKI - 13

ALTIMETER FOR LOW ALTITUDE

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 80 cm (375 MC/S). Continuous power output 4 W. Frequency modulation 15 MC/S. Range 150 - 20 M. Error 5%.

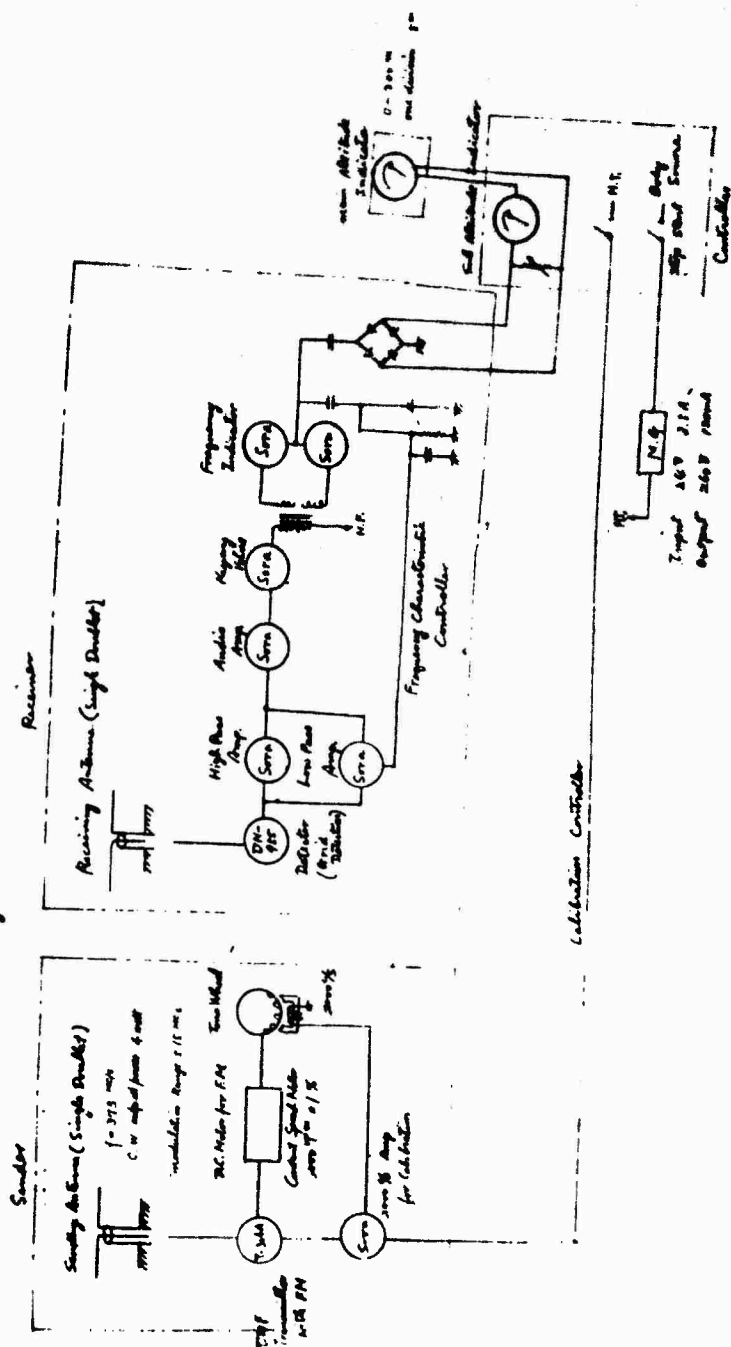
Number Built = 1000. Number Installed = Many in use.

Description:

Taki-13 is a frequency modulated CW low altitude altimeter corresponding to the American equipment AN/APN-1. The Japanese employed these, and so they claim, very successfully in their torpedo bombing attacks.

Alternator for Low Absolute (Tab: 18.12)

System Diagram



TAKI - 4

RECORDING WAVE COUNTER MEASURING APPARATUS

Corresponding Allied Designation: ----

Technical Characteristics:

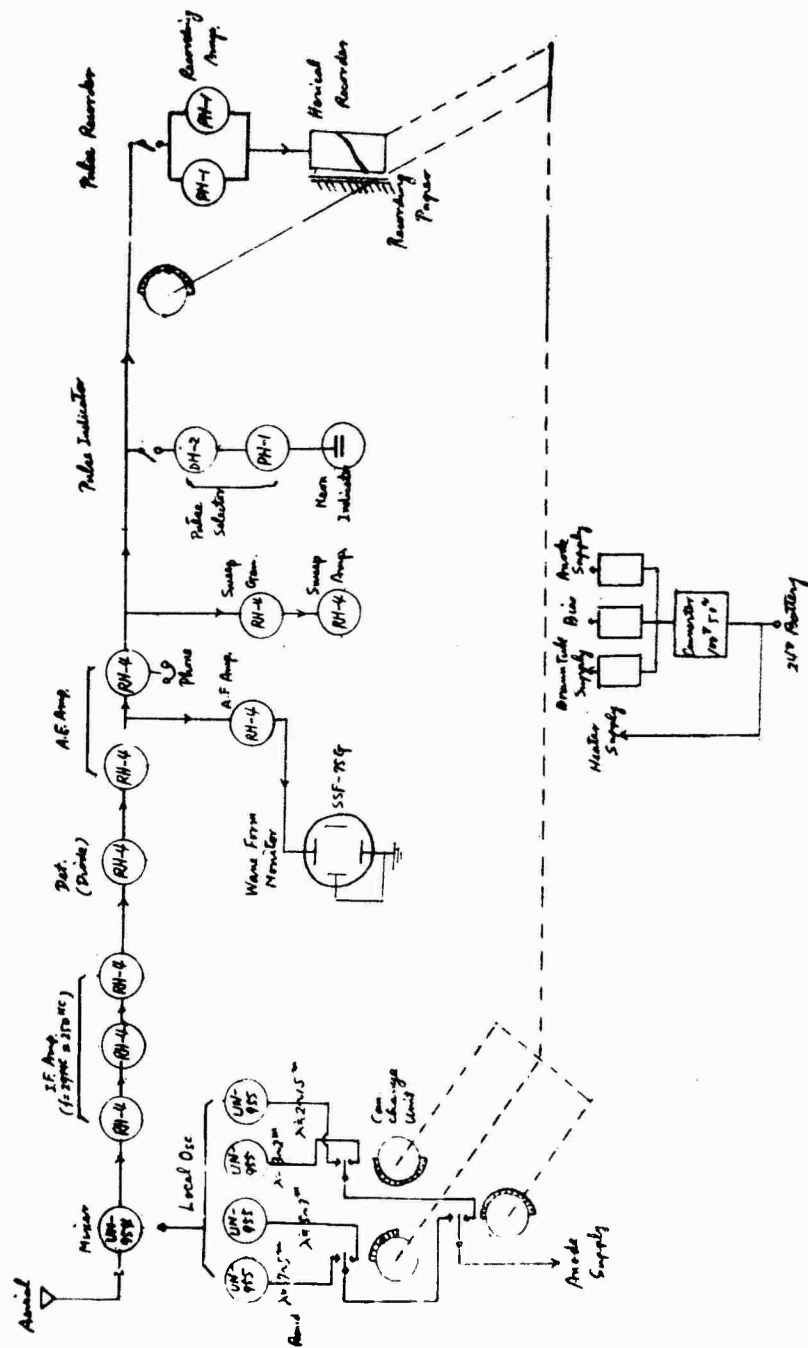
Wavelength = 7-1.5 M. Gain 100 db. Range 250 Km.
Accuracy of wavelength computation + 1%.

Number Built = 10. Number Installed = 6.

Description:

Taki-4 is an RCM search receiver covering the range of 7 to 1.5 meters. The cam mechanism operating the local oscillator connections sweeps through the entire band in one second, and any signals picked up are marked on a helical spark tape recorder geared to the sweep mechanism which shows the time and wavelength of any signals received. A neon light flickers when any signals are being recorded. In alternate seconds the receiver is switched to a hand tuned local oscillator so that any spot of the frequency spectrum can be examined continuously. The signals in this case are switched to a variable sweep cathode ray tube on which the pulse form, width and repetition rate can be estimated.

Recording Wave Converter Measuring Apparatus (Table - 6)



TAKI - 5

WAVE COUNTER MEASURING APPARATUS

Corresponding Allied Designation: ----

Technical Characteristics:

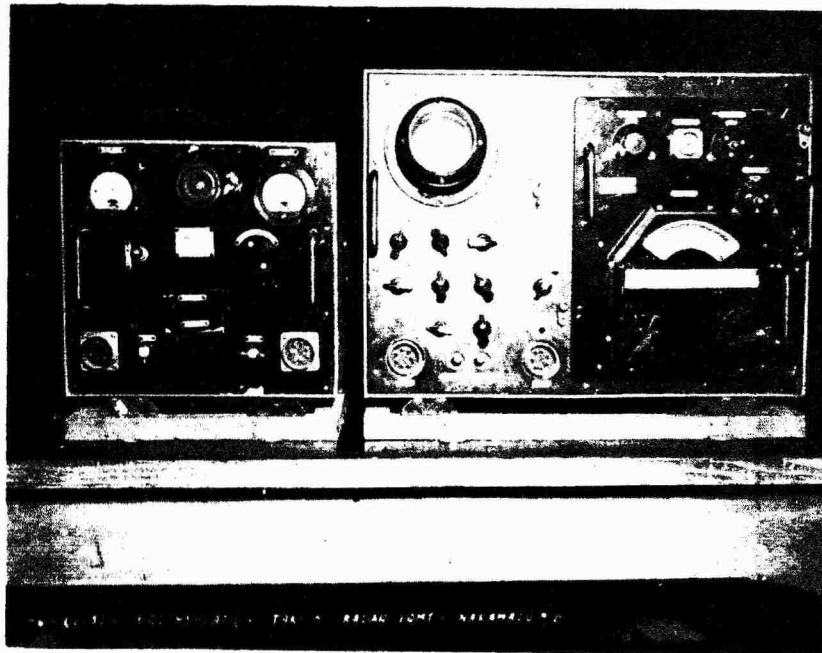
Wavelength = 4.5-1.6 M. Receiver gain 120 db. Range 300 Km.
Accuracy of wavelength computation + 1%. Accuracy of determining
direction + 5° at 200 Km.

Number Built = 30.

Number Installed = Doubtful if any.

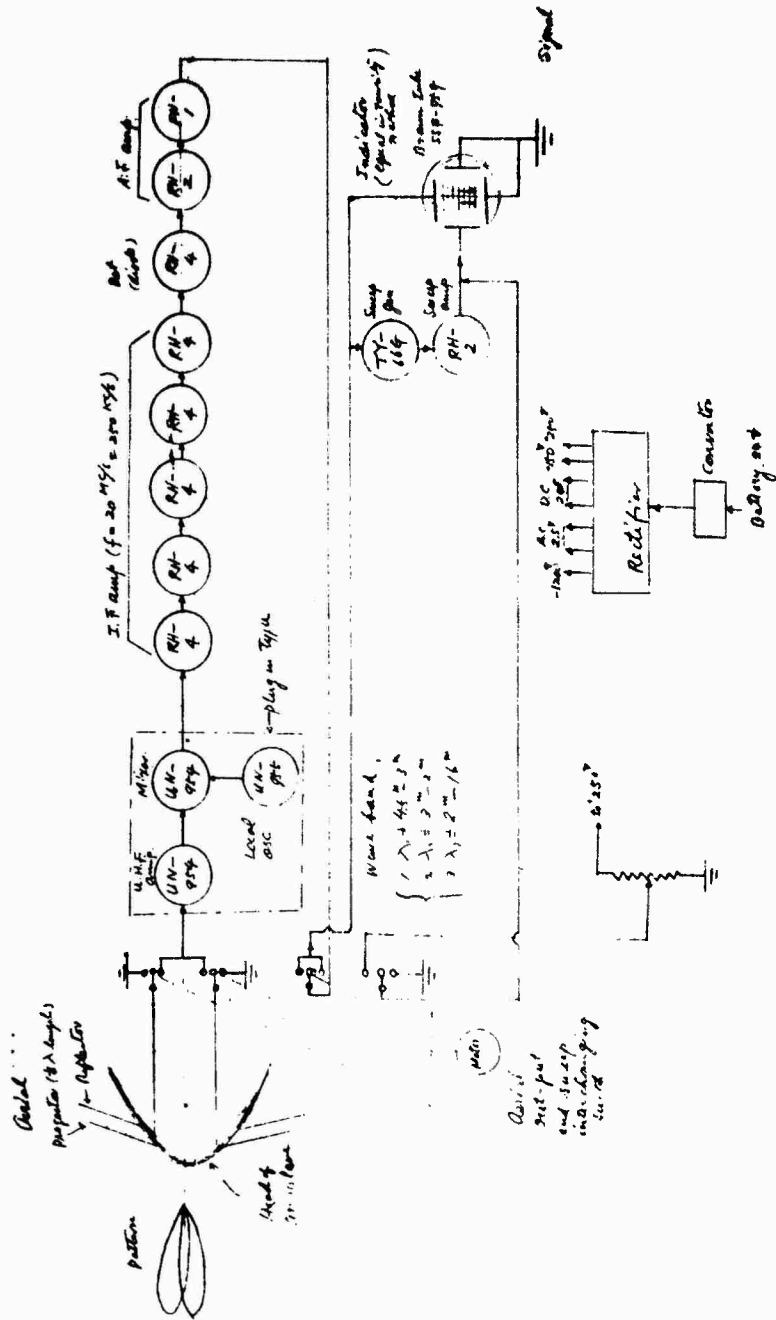
Description:

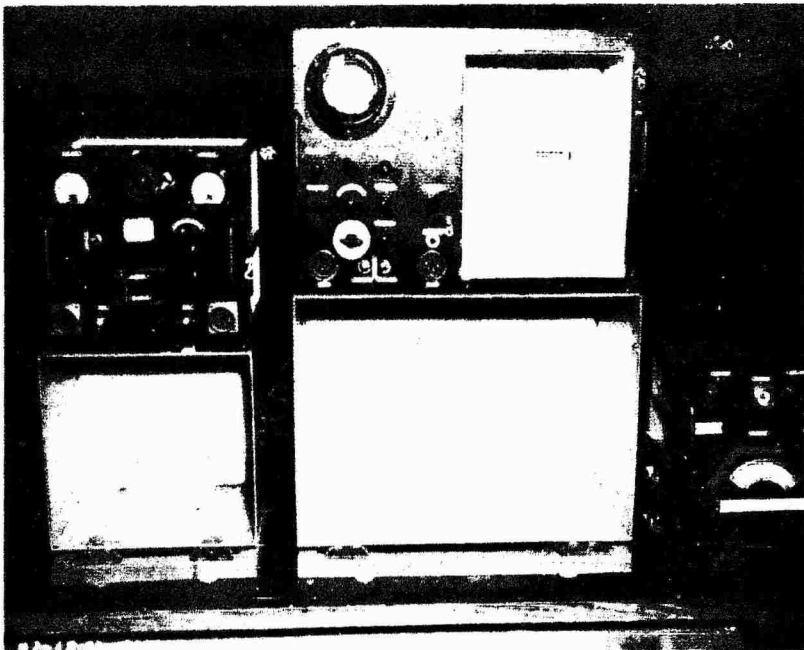
Taki-5 is a search receiver covering the 1.6 to 4.5 meter band, primarily designed for homing on intercepted signals. Azimuth is determined by lobe switching the receiving antenna pattern, and matching the resulting pip heights on a cathode ray tube.



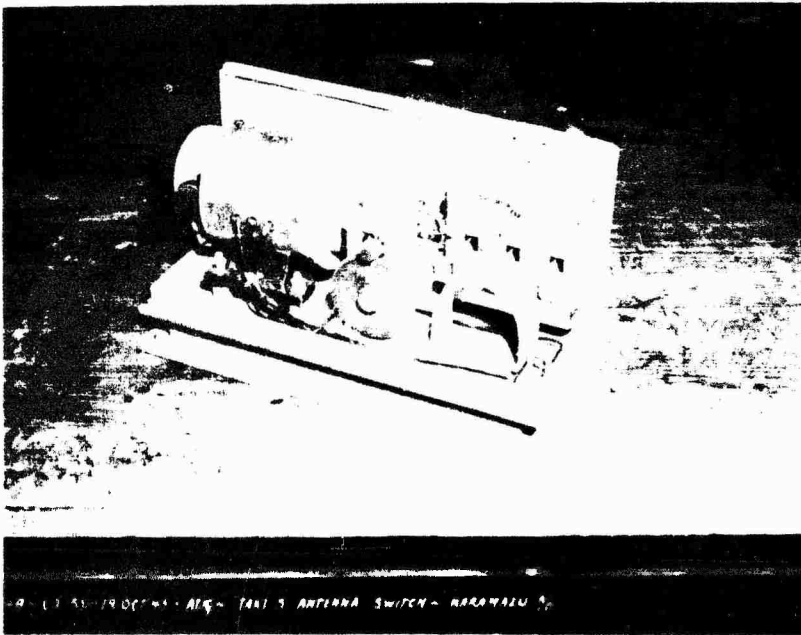
TAKI-5 Search Receiver with Plug In Tuning Units

Wave Counter measuring apparatus (Figs. 5-5)





Taki-5 Search Receiver - with Tuning Unit
Withdrawn.



Taki-5 Antenna Switch Detail.

TAKI - 6

SIMPLE WAVE COUNTER MEASURING APPARATUS

Corresponding Allied Designation: ----

Technical Characteristics:

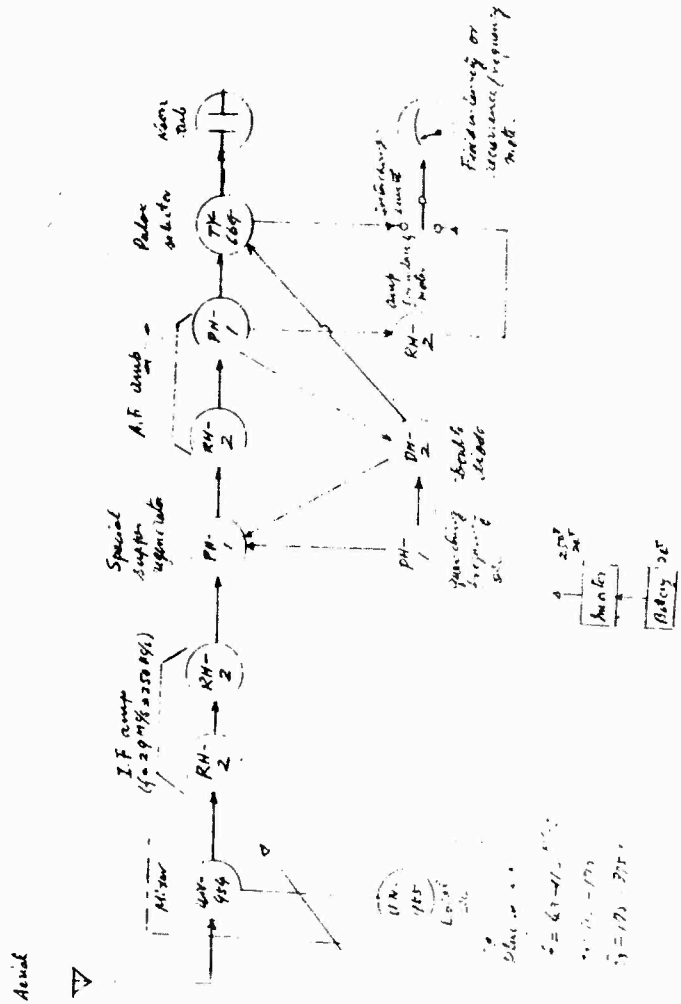
Wavelength = 7. M-0.8 M. Gain 110 db. Range 300 Km.
Accuracy of wavelength computation $\pm 1\%$.

Number Built = 30 Number Installed = 6

Description:

This is a simple receiver tunable by hand over a range of 7 meters to 80 cm. Signal reception is noted on a neon tube. A meter reads averaged signal strength received, giving an estimate of the pulse repetition rate.

Simple wave counter measuring apparatus (Table 6)
wave band (4" to 5")



TACHI - 30

WAVE COUNTER MEASURING APPARATUS

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 70-3 cm. Gain 40 db. Crystal detector. Range 50 Km.
Accuracy of direction $\pm 3^\circ$.

Number Built = 30.

Number Installed = 2 used for Ground Observing.

Description:

This is an unusual RCM search receiver working in the centimeter range. A wide band dipole antenna is mounted at the focus of a parabolic reflector, and a crystal detector is associated with it by very short leads. A 4 stage audio amplifier brings up the signal loud enough to be heard in earphones.

TAKI - 8 AND TAKI - 23

WAVE DISTURBERS

Corresponding Allied Designations: ----

Technical Characteristics -- TAKI-8:

Wavelength = 7-1.5 M. Continuous 50 W. Impulse 500 W. Automatic or manual synchronizer.

TAKI-23:

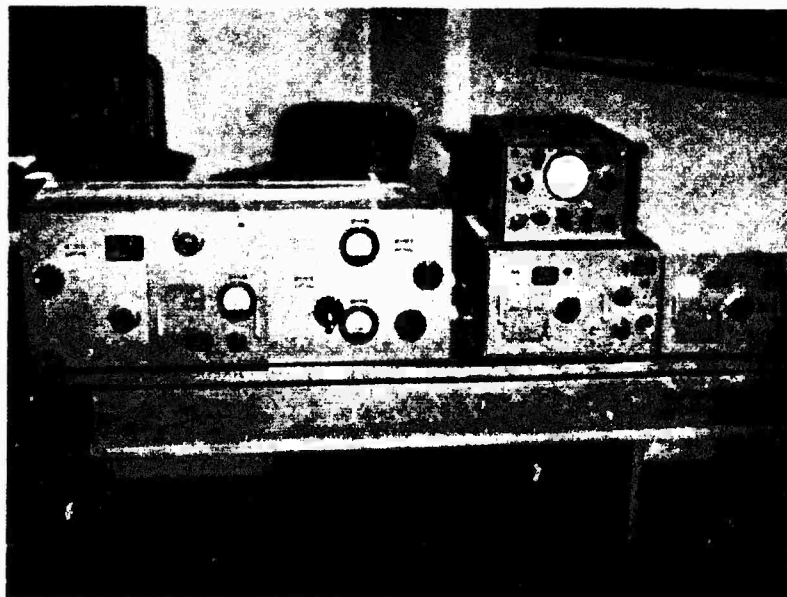
Wavelength = 1.5-0.8 M. Continuous 10 W. Impulse 200 W.

Number Built: Taki-8 = 10.
Taki-23 = 5.

Number Installed = Taki-8 a few.
= Taki 23 = 0.

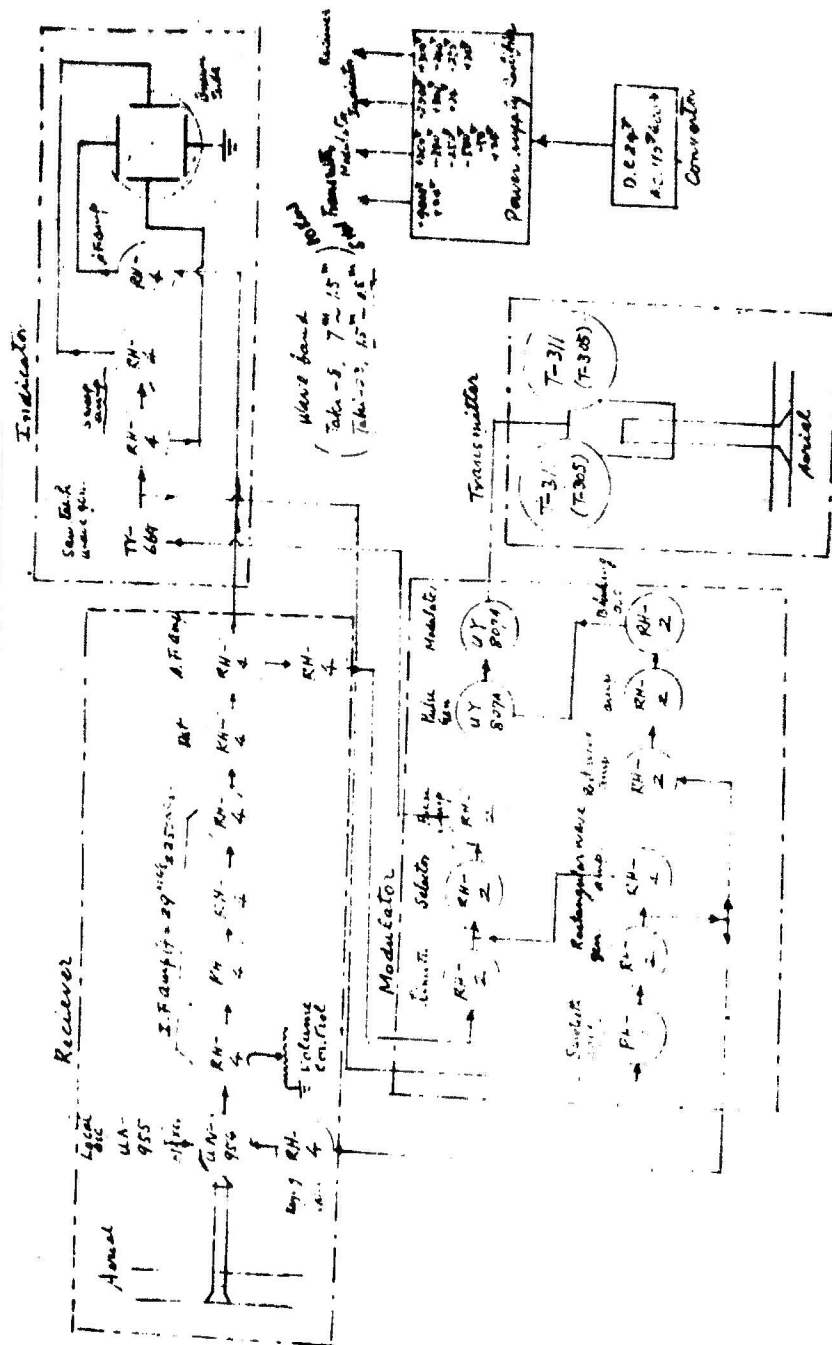
Description:

These are two spot jamming equipments covering the range from 80 cm to 7 meters. A receiver is so arranged that when a signal is found it may be amplified up and used to key the jamming transmitter. Although "spoofing" could have readily been arranged on these sets, there was no delay device built in them. The received signal may be viewed on a cathode ray tube. The jamming signal may be either pulsed or continuous; no arrangement is provided for viewing the received signal through the jammer's output when continuous wave transmission is being used. Horizontal dipoles with reflectors, one for receiving and one for transmitting, are located under opposite wings of the plane. Total weight of both sets, 210 lbs.



Taki-23 "Disturber"

Wave detector (Taki-8 & Taki-22)



TACHI-35 A and B

MICROWAVE "DISTURBER"

Corresponding Allied Designation: ----

Technical Characteristics:

Tachi-35A: $f = 350$ to 1200 MC/s. 20 watts CW.
PRF, 2000-5000. Weight 800 lbs.

Tachi-35B: $f = 10,000$ MC/s.

Number Built: Tachi-35A, one experimental model built Decemb. - 1944;
Tachi-35B, one under construction.

Description:

Both Tachi-35A and -35B were ground based jammer transmitters powered by magnetrons. Tachi-35B was especially designed to operate against American B-29 APQ-13 radars. The first model was scheduled to be completed by 15 September 1945.

TACHI - 200 AND TAKI - 200

INDUCEMENT OF SPECIAL FIGHTER

Corresponding Allied Designation: ----

Technical Characteristics:

f = 200 MC/S. Accuracy of direction + 5°. Ground section partly modified version of Model 4 locator. Semi-automatic control or course indicator planned for aircraft component.

Number Built = 0.

Number Installed = 0.

Description:

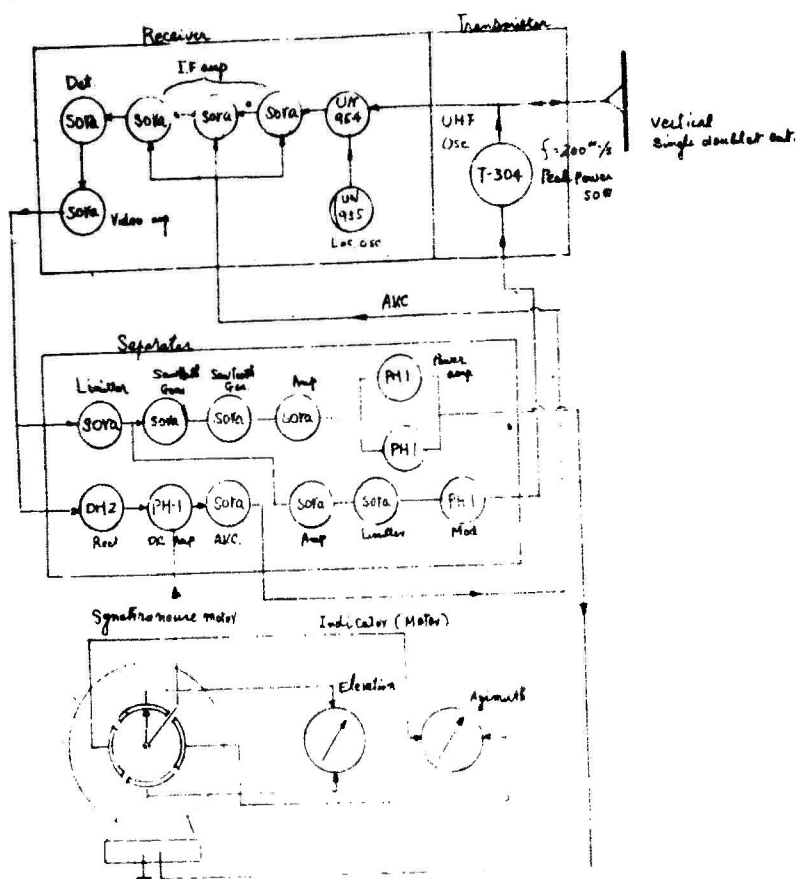
Tachi-200 (with Taki-200) is a proposal, with both pulsed and CW versions, for guiding a special high speed rocket fighter up a radar beam for the purpose of making interceptions. The transmitter of the pulsed system would be of the Tachi-31 type sending out a strong lobe with a circular orbit about the central pointing axis of the antenna. Superimposed on the transmission would be a synchronizing pulse to keep a rotating brush in the airborne receiver in step with the ground lobing. The strength of the lobe viewed in the plane in all four quadrants would be indicated on differential elevation and azimuth meters. By means of these, pilot is expected to "stay on the beam."

The aircraft for this job was supposed to have been built last March; but it was never available for experimental flight.

The C.W. system for guiding a "fighter" up a radar microwave beam, employed a scheme of switching lobes with different audio tone p.r.f.'s. These when heard by the pilot in the plane (or seen on a differential indicator) would tell him which move to make to get back in the center of the beam again. (This plan is not too dissimilar to one that was being flight tested as the war ended by 2d and 3d Operations Analysis Sections (Det), Thirteenth Air Force, in which close support bombers were to fly up an SCR-584 beam, the azimuth error signals received on the ground being translated to AN signals for the pilots guidance).

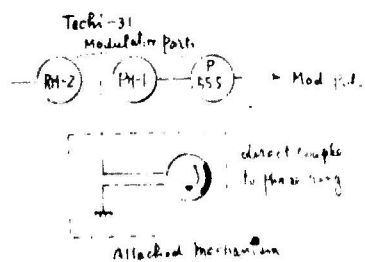
Instrument of Special Flyer Impulse system (Techi-200) (Techi-200)

Techi-200



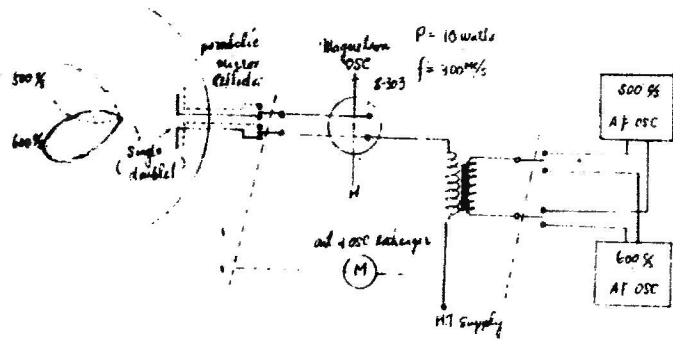
Techi-200

Some attached to (Radio Locator 'Improved type 4' (Techi-31))

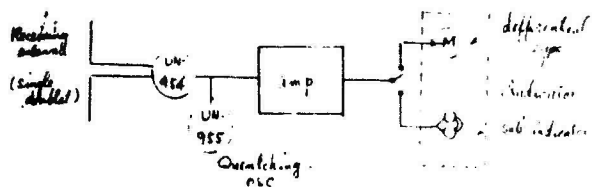


Inducement of special filter (Jaki-200)
(C.W. system)

Transmitter (Jaki-200)



Receiver (Jaki-200)



TASE - 100

AUTOMATIC ADHERING APPARATUS FOR BOAT

Corresponding Allied Designation: ----

Technical Characteristics:

Wavelength = 4.5-7.5 M. Effective distance 3 Km. Indicator of Taki Mk 5 omitted and auto control device attached.

Number Built = An experimental model only. Number Installed = 0.

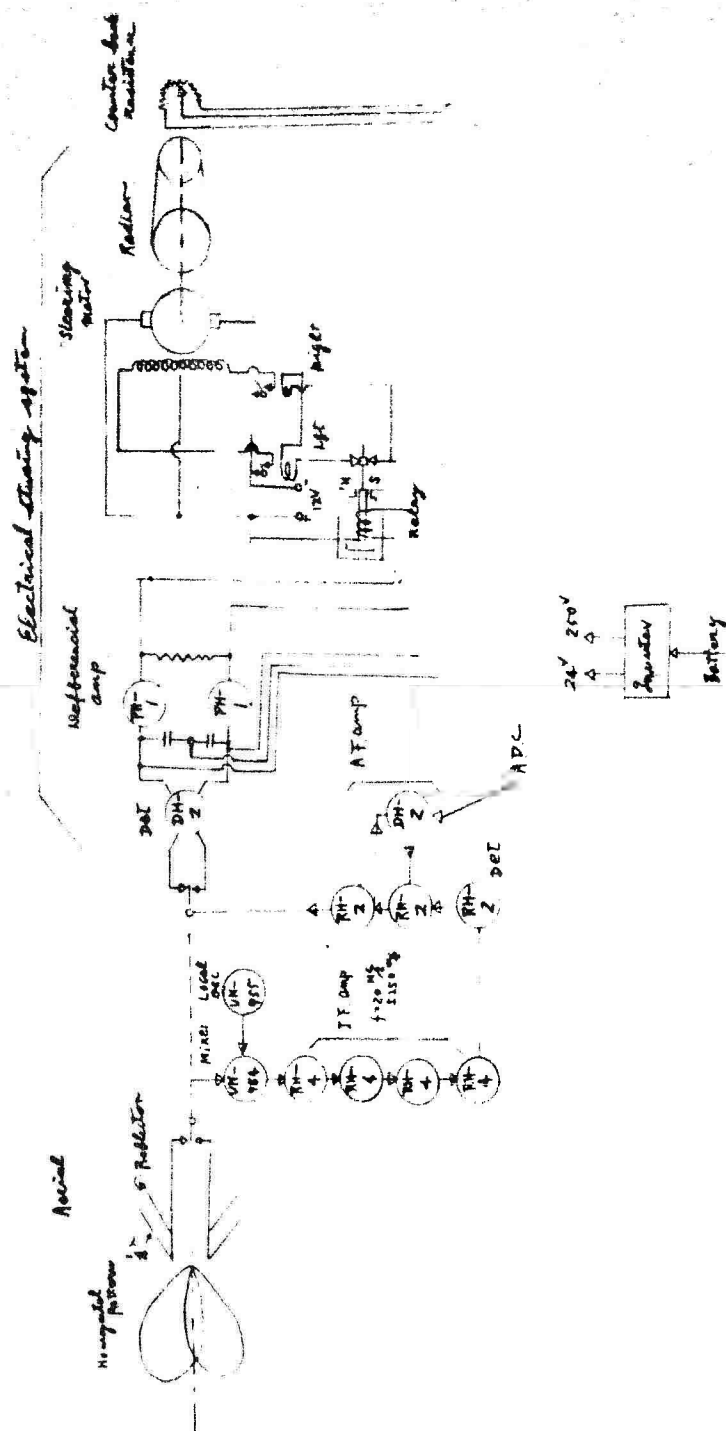
Description:

This device built around the Taki-5 homing search receiver was expected to be installed on explosive loaded motorboats to guide them automatically towards an enemy ship emitting radar signals in the prescribed band. A differential amplifier controlled by the relative strengths of received signals in the two azimuth lobes would operate a steering motor which in turn would keep the boat on a pursuit course toward the enemy ship.

Automatic deicing apparatus (Tave - 100)

(for foot)
width band (4.5" - 1.4")

Water bond (4.5^m - 1.4^m)



SUPPLEMENTARY

INFORMATION

DEPARTMENT OF THE AIR FORCE
AIR INTELLIGENCE AGENCY

AD-895892

17 January 1994

MEMORANDUM FOR DTIC-BCR

ERRATA

FROM: NAIC/MSIR
4115 Hebble Creek Rd Ste 14
Wright Patterson AFB OH 45433-5618

SUBJECT: Freedom of Information Act (FOIA) Request, Case I-FASTC
93-37

1. Reference your letter 22 December 1993 and 18 October 1993 NAIC letter, same subject.

2. NAIC OPR has reviewed documents AD ~~895891~~ Volume I, AD ~~895892~~ Volume II and AD ~~895893~~ Volume III and determined that the records are fully releasable.

3. The documents identified above may be released to future Freedom of Information Act requesters.

ERRATA AD-895892

Marlyene A. Harrison
MARLYENE A. HARRISON, GS-11, USAF
Chief, Freedom of Information
Information Management Operations

Attachment:

1. OPR Comments
2. Releasable Documents

DEPARTMENT OF THE AIR FORCE
AIR INTELLIGENCE AGENCY

~~AD-895892~~
~~AD-895892~~

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3. The documents identified above may be released to future Freedom of Information Act requesters.

ERRATA AD-895892

Marlyene A. Harrison
MARLYENE A. HARRISON, GS-11, USAF
Chief, Freedom of Information
Information Management Operations

Attachment:

1. OPR Comments
2. Releasable Documents

DEPARTMENT OF THE AIR FORCE
AIR INTELLIGENCE AGENCY

MEMORANDUM FOR NAIC/DXL

6 January 1994

FROM: NAIC/MSIR

ERRATA

SUBJECT: Freedom of Information Act (FOIA) Request R-FASTC-93-37

1. The attached FOIA request is forwarded for your review and releasability.
2. It is regards to a previous request from Mr. Edward Kettler for paper copies of documents AD 895891 Volume 1, AD 895892 Volume 2 and AD 895893 Volume III entitled "A Short Survey of Japanese Radar." No documents were located in NAIC per telecon with DTIC, the request was forwarded to them. DTIC located the requested documents and has forwarded them to NAIC for review and release determination.
3. Please ensure the branch chief signs the 1st Ind and records the time expended on DD Form 2086. After completing the required actions on this request, please call extension 77236 for pickup.

ERRATA



JOHN A. MCGUIRE, MSgt, USAF
Asst Chief, Freedom of Information
Information Management Operations

3 Attachments

1. AD 895891 Volume 1
2. AD 895892 Volume 2
3. AD 895893 Volume 3

1st Ind, NAIC/DXLA

DATE: 6 Jan 94

TO: NAIC/MSIR

1. The following apply:

 x Records are fully releasable.

Records should be:

 Fully denied under: Partially denied under:

Exemption: 1 2 3 4 5 6 7 8 9

2. Individual who worked this request/point of contact:

Name: Sherry Jennings

Office Symbol: DXLA

Phone number (black): 72435

3. Remarks:



ANITA L. MILLER, CHIEF
DOCUMENT REQUIREMENTS & ACQUISITION BRANCH