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U. S. NAVAL TECHNICAL MISSION TO JAPAN
CARE OF FLEET POST OFFICE
SAN FRANCISCO, CALIFORNIA

29 December 1945

RESTRICTED

From: Chief, Naval Technical Mission to Japan.
To : Chief of Naval Operations.

Subject: Target Report - Japanese Airborne Radar.

Reference: (a)"Intelligence Targets Japan" (DNI) of 4 Sept. 1945.

1. Subject report, covering Target E-02 of Fascicle E-1 of reference (a), is submitted herewith.

2. The investigation of the target and the target report were accomplished by Comdr. M. C. Mains, USN.,Ret.

C. G. GRIMES
Captain, USN

31760

RESTRICTED

E-02

JAPANESE AIRBORNE RADAR

"INTELLIGENCE TARGETS JAPAN" (DNI) OF 4 SEPT. 1945

FASCICLE E-1, TARGET E-02

DECEMBER 1945

U.S. NAVAL TECHNICAL MISSION TO JAPAN

SUMMARY

ELECTRONICS TARGETS

JAPANESE AIRBORNE RADAR

The Japanese Navy had only three airborne radars of sufficient interest to merit detailed study. These were the Type 51, 10-centimeter pathfinder radar, the FD-2 night-fighter set on 500 Mc, and the Gyuku-3, 150 Mc, night-fighter set. None of these were in production, and the standard set in use was the Type 3, Air Mark 6, Model 4 (H-6), on 150 Mc.

There was an IFF set in development, the M-13, which was put into service on a small scale. About 600 sets were said to have been produced. The Japanese Army and Navy used different frequencies for their IFF, hence were unable to interrogate each other.

During the course of the investigation of this target, it was ascertained that the subject was being thoroughly covered by the Air Technical Intelligence Group of Far Eastern Air Forces, and to a lesser degree by the Technical Liaison and Investigation Department, Office of Chief Signal Officer. Accordingly, to avoid duplication of effort, all information discovered on airborne radar was made available to those agencies and none was uncovered which is not contained in the referenced reports of those agencies.

This report consists of schematic and block diagrams of Japanese airborne radar sets, including those mentioned above, and a chart of the characteristics of Japanese airborne radar. Details and discussion of this subject can be found in the referenced reports.

Electronic altimeters are covered in NavTechJap Report - "Japanese Navigational Aids", Index No. E-09.

TABLE OF CONTENTS

LIST OF ENCLOSURES

REFERENCES

Location of Target:

Second Naval Technical Institute, Kanazawa, YOKOHAMA.

Second Naval Technical Institute, Tokyo Branch, 13 Mita, Meguro-Ku, TOKYO.

Japanese Personnel Interviewed:

Vice Adm. NAWA TAKESHI, IJN, Head of Radar and Communications Department, Second Naval Technical Institute, Kanazawa, YOKOHAMA and Meguro-Ku, TOKYO.

Capt. TAKAKARA HISAE, IJN, Head of Direction Finder and Airborne Radar Section, Second Naval Technical Institute.

Mr. Fred K. UYEMINAMI, Second Naval Technical Institute, RDF and Airborne Radar Section. Born in Seattle; graduated from University of Washington, 1933; graduate student at Massachusetts Institute of Technology. Later on staff of WASEDA University and consultant to Japanese Navy. Age, about 33. Speaks fluent English, and acted as interpreter during some of the interviews.

Reports of Other Agencies:

Air Technical Intelligence Group, Electronics Section, Far Eastern Air Forces. (Copies to BuAer and Wright Field).

1. ATIG #14 - Radar and Communication Equipment (Airborne).
2. ATIG #35 - Aircraft Antenna Design,
3. ATIG #115 - A Short Survey of Japanese Radar (Vol VI).
4. ATIG #275 - Japanese IFF.
5. ATIG #276 - Catalog of Radio, Radar and Special Devices.
6. ATIG #277 - List of miscellaneous electronic documents (which were sent to Air Documents Division T-2 Wright Field).

Technical Liaison and Investigation Department (TLID), Office of Chief Signal Officer, Supreme Commander for the Allied Powers (Available through G-2, War Department, Washington, D.C.).

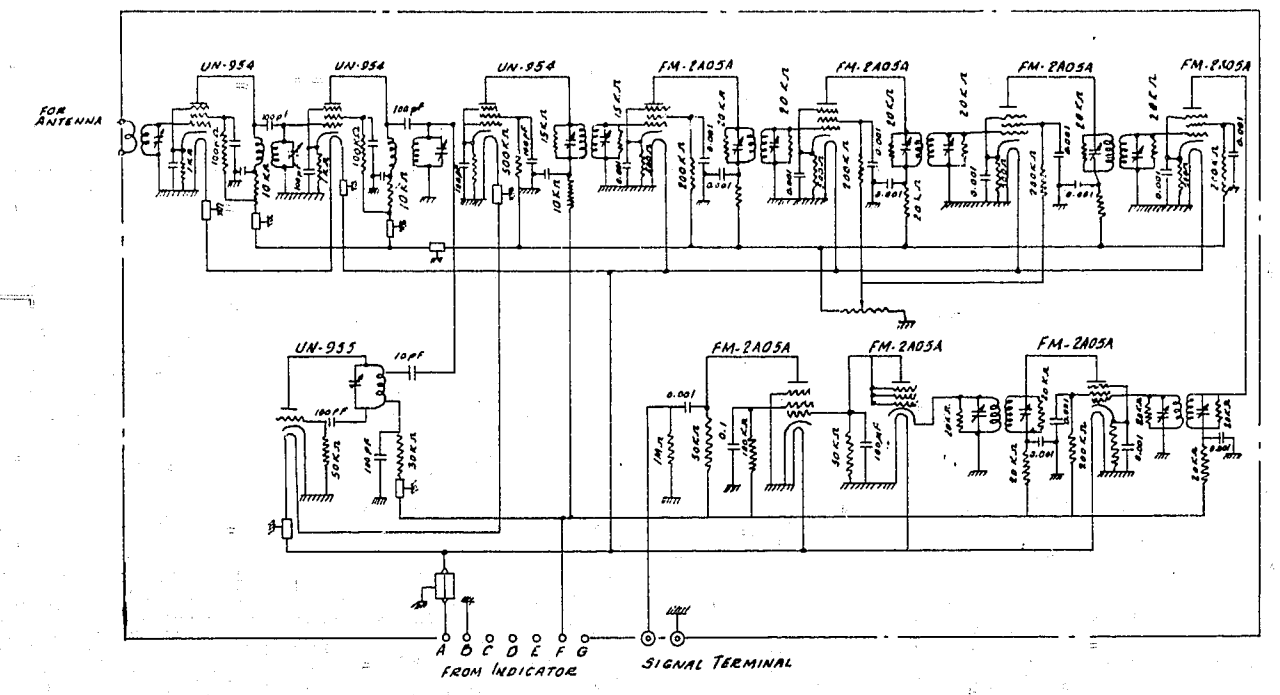
Equipment Seized By Air Technical Intelligence Group (Sent to Wright Field):

One FD-2 Equipment
One Type 51 Equipment

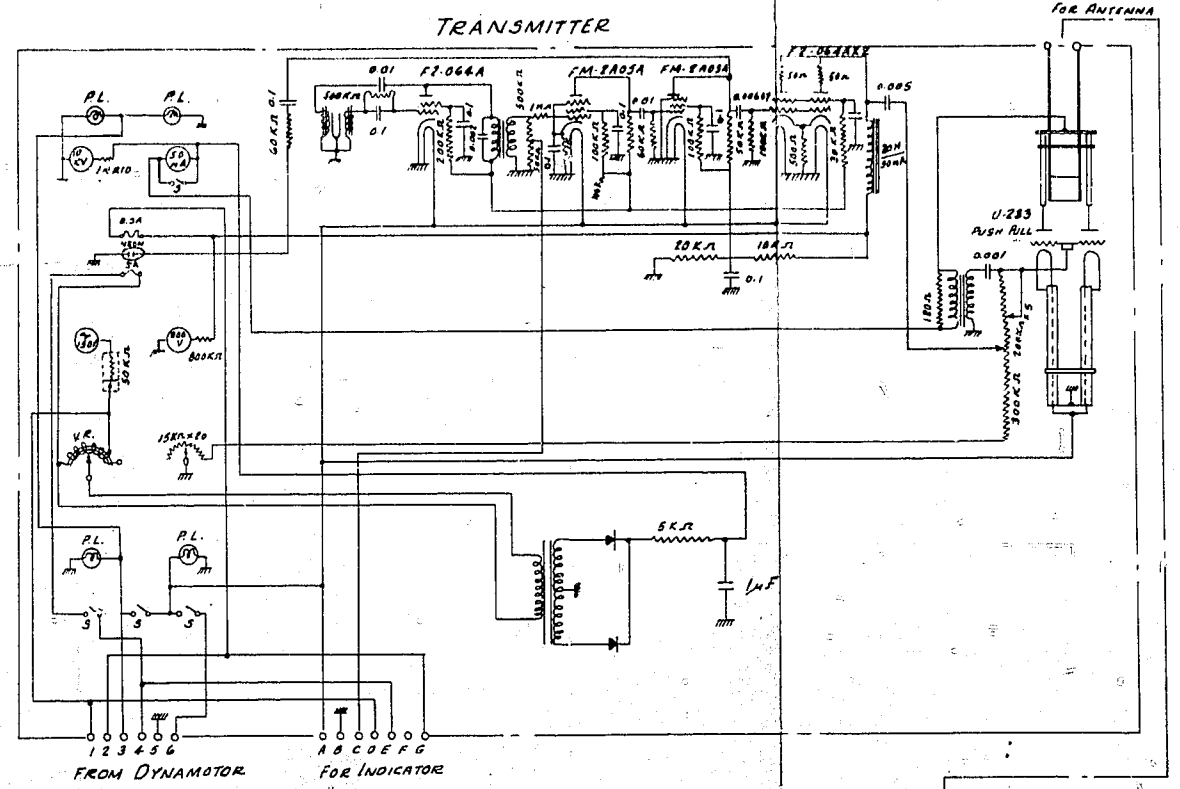
ENCLOSURE (A)

Type 3, Mk 6, Mod 4 (H-6) Radar,

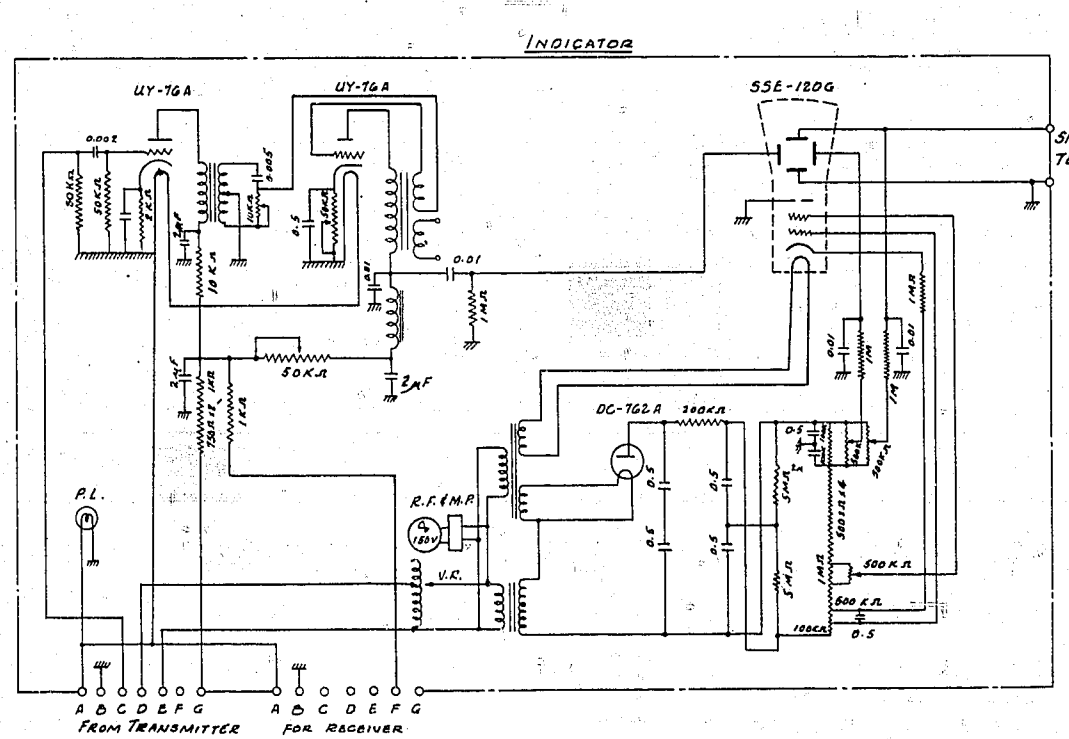
RECEIVER



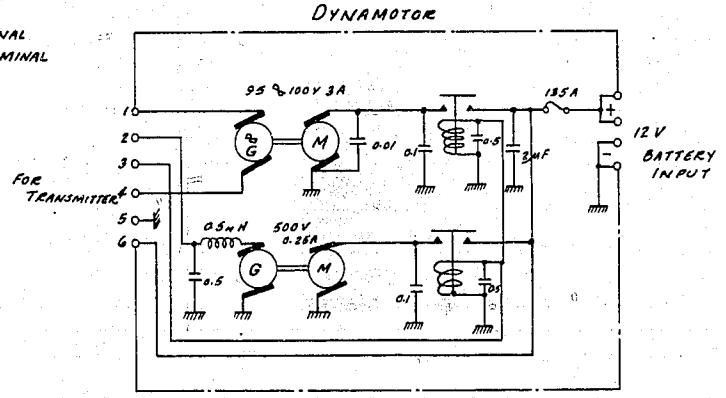
TRANSMITTER

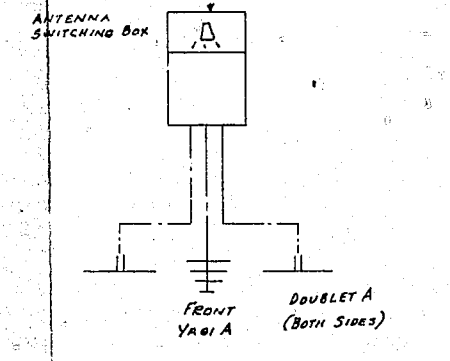


INDICATOR



DYNAMOTOR





FREQUENCY: — 150 Mc (2M)
OUTPUT: — ABOUT 3 KW
PULSE LENGTH: — ABOUT 10 μS
RANGE: — ABOUT 60 MILES FOR A BIG SHIP
ACCURACY: — ΔR ABOUT ±5%
ΔΘ ABOUT ±3%

NOV 8TH 1945
PREPARED FOR THE 5TH FLEET OF US NAVY
BY THE RADAR DEPARTMENT OF THE 2ND
NAVAL TECHNICAL INSTITUTE OF JAPAN

ENCLOSURE (A), continued

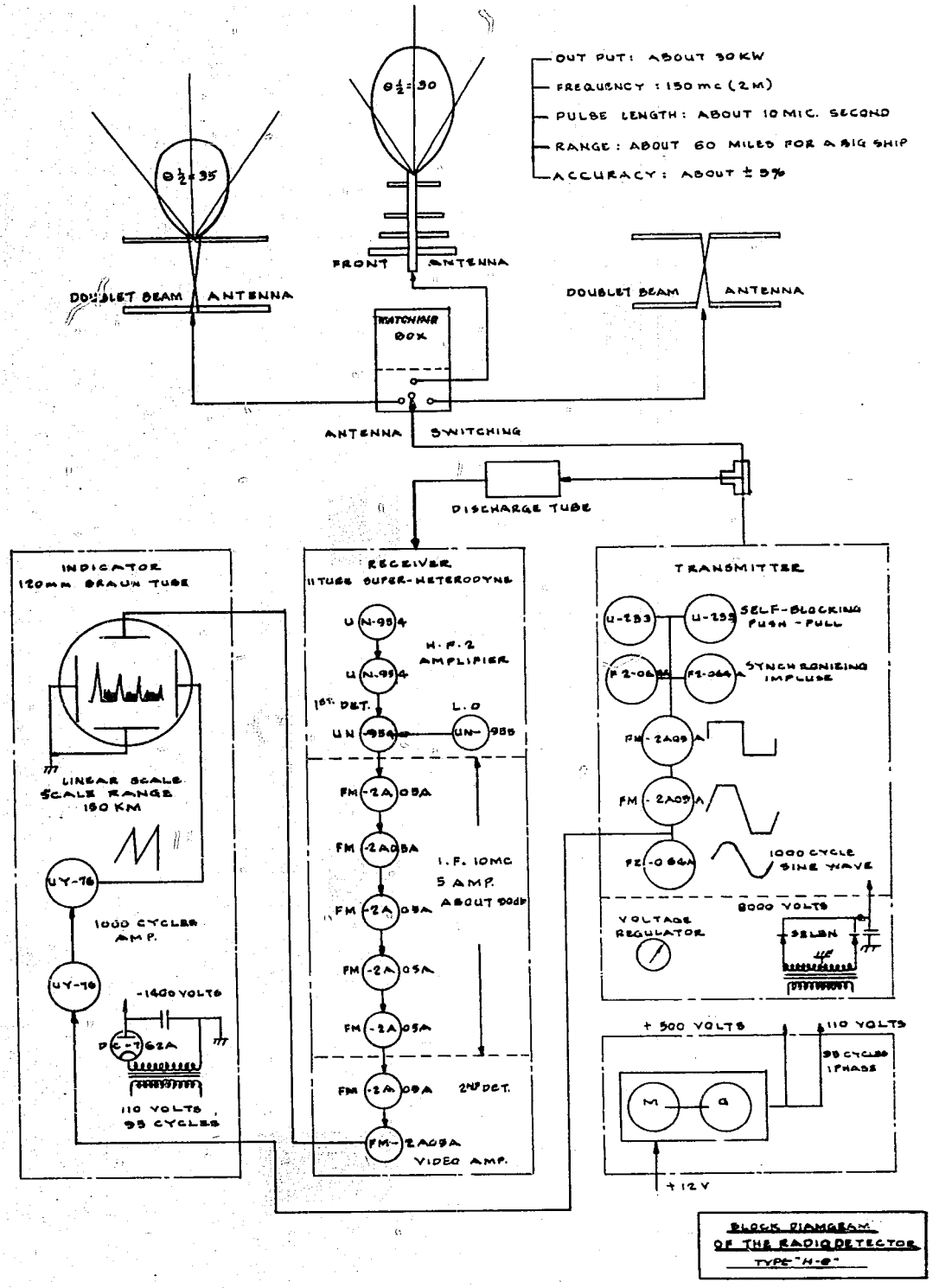
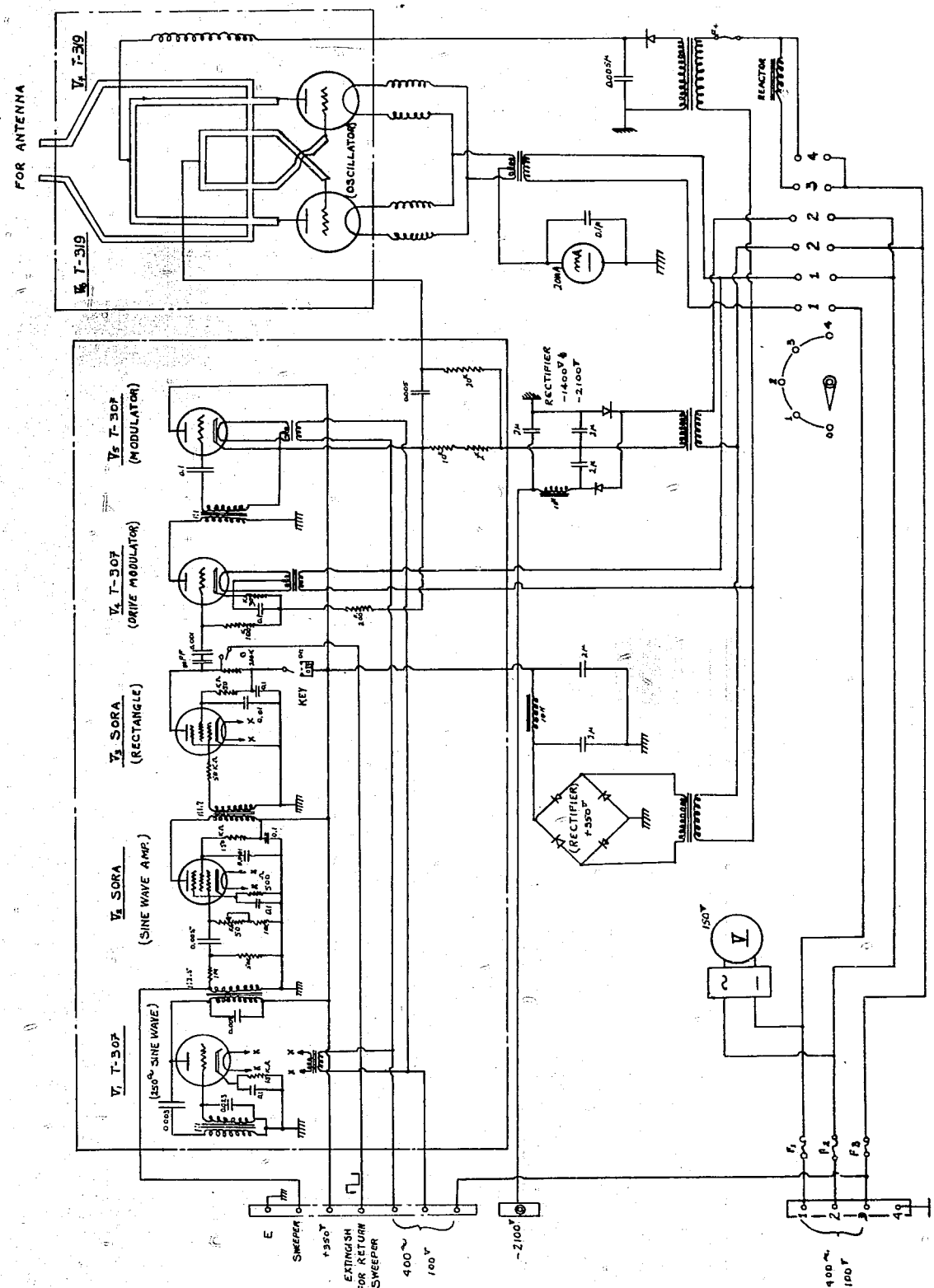


Figure 2(A)

ENCLOSURE (B)

TYPE 4, MK 6, MOD 3 (FM-1) RADAR



ENCLOSURE (B), continued

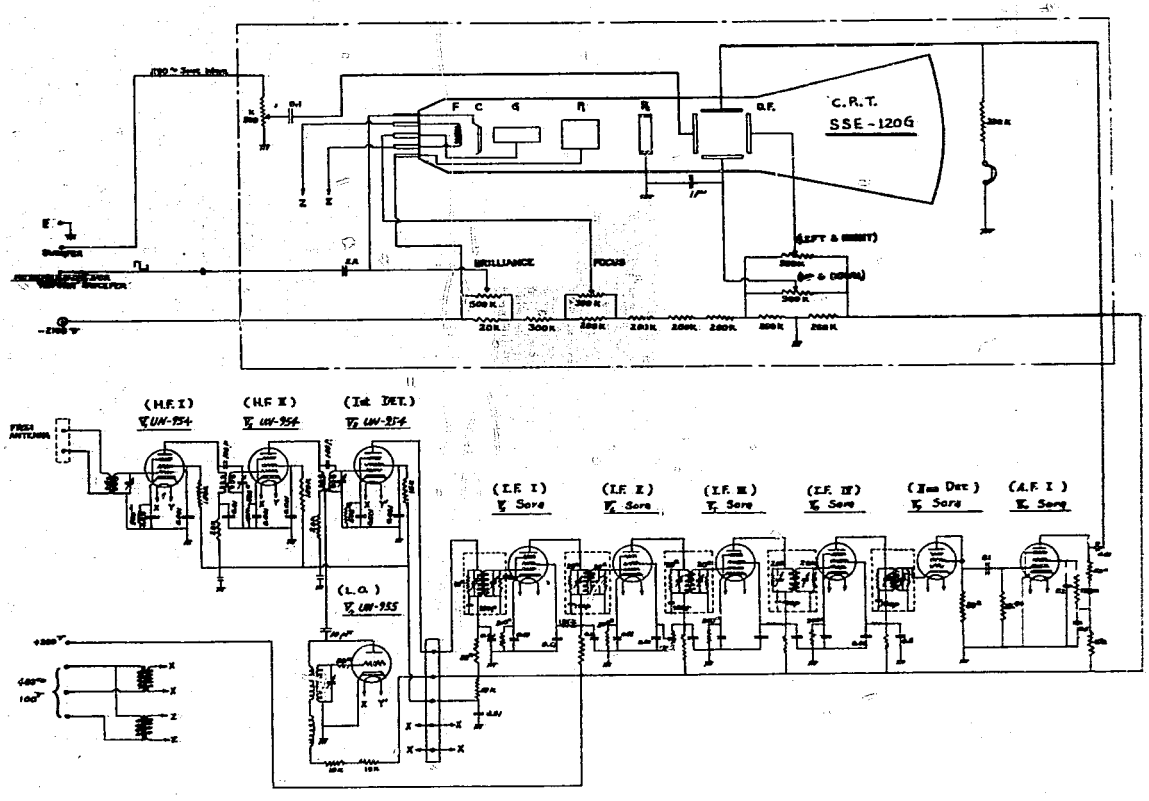
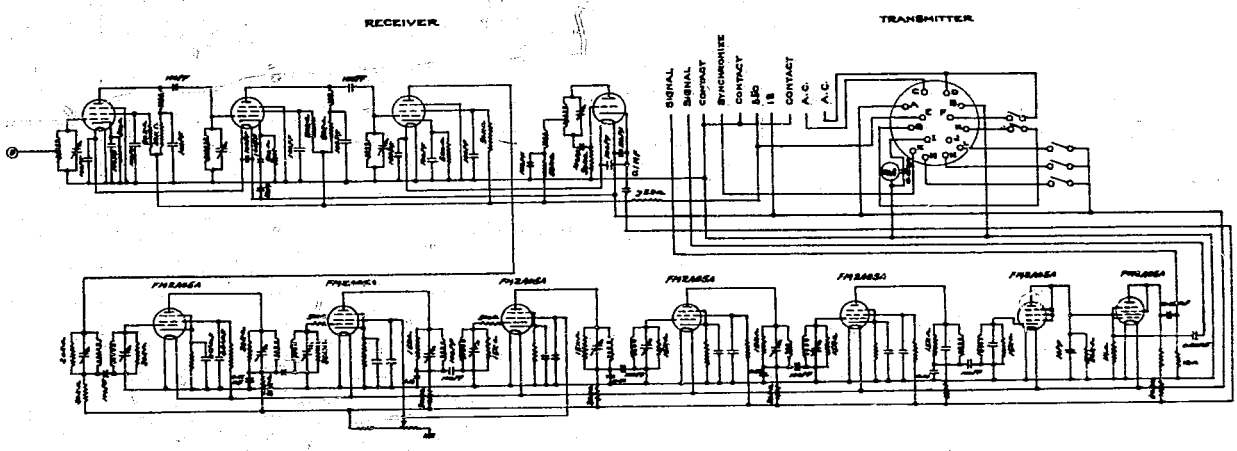


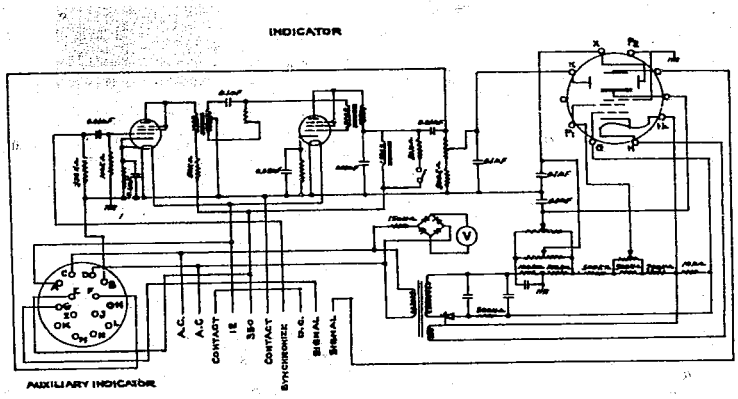
Figure 2(B)

CONNECTION DIAGRAM OF THE TYPE "FM-1" RADAR (RECEIVING BOX)

ENCLOSURE (C)

TYPE 19, MK 1, MLD 12 (FK-3) RADAR





ENCLOSURE (C), continued

FK3

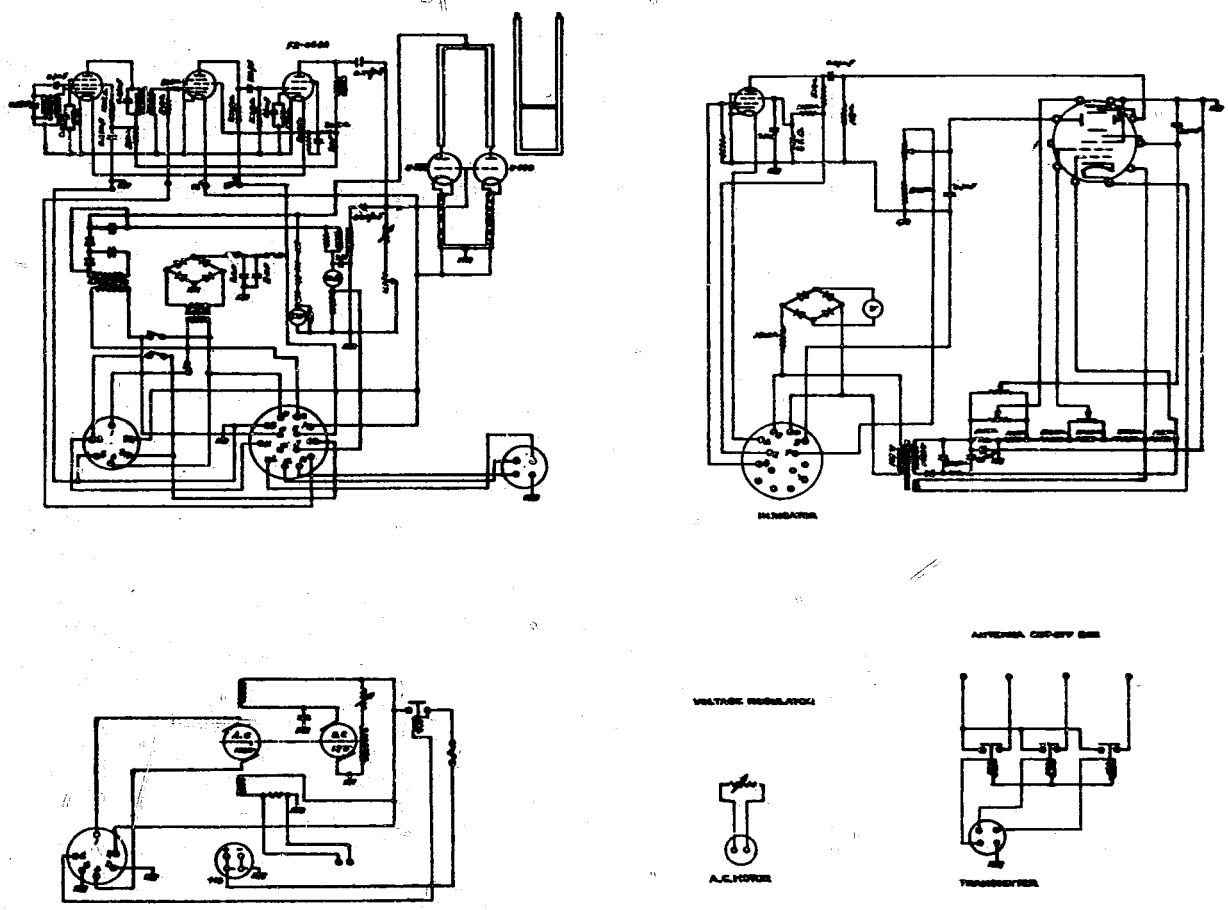


Figure 2(C)

AIRBORNE RADAR TYPE 19, MK 1, MOD 12 (FK-4)

ENCLOSURE (C), continued

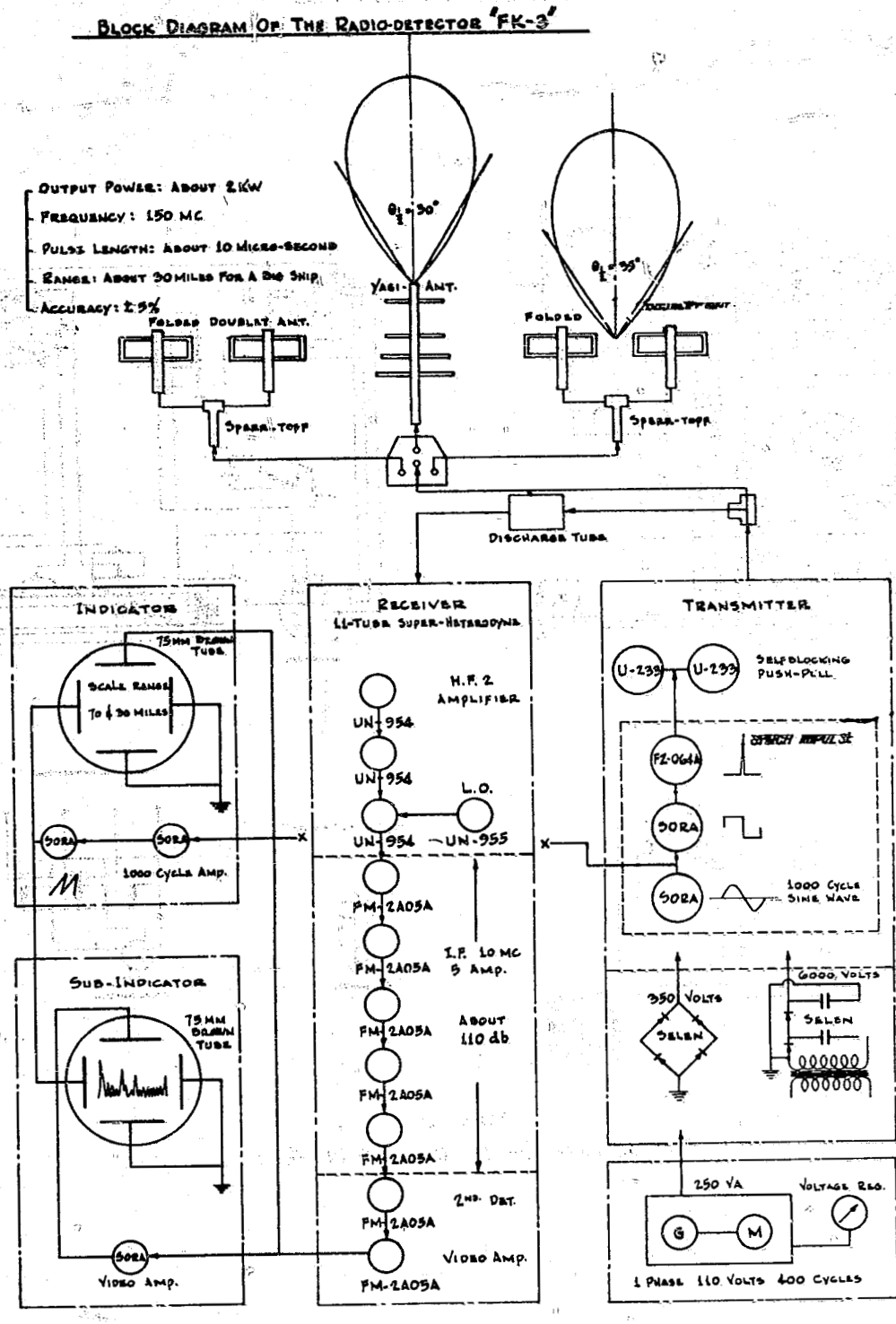
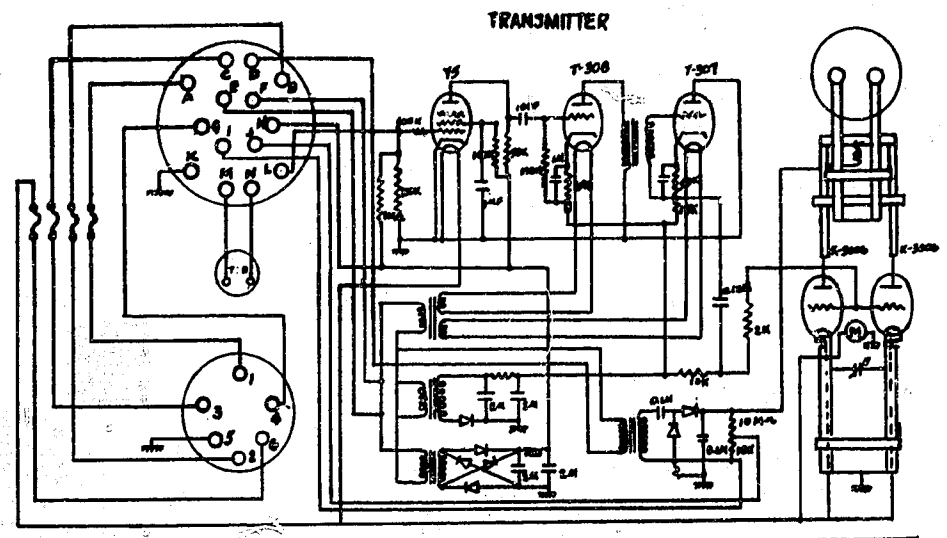


Figure 3(C)

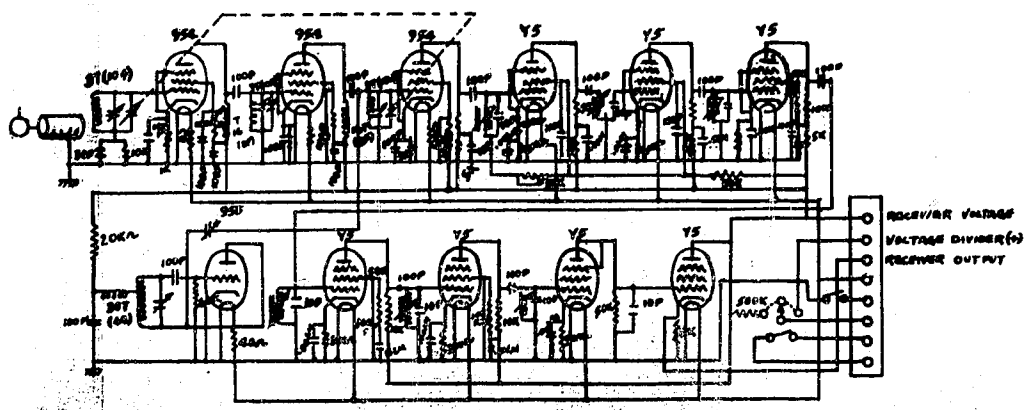
ENCLOSURE (D)

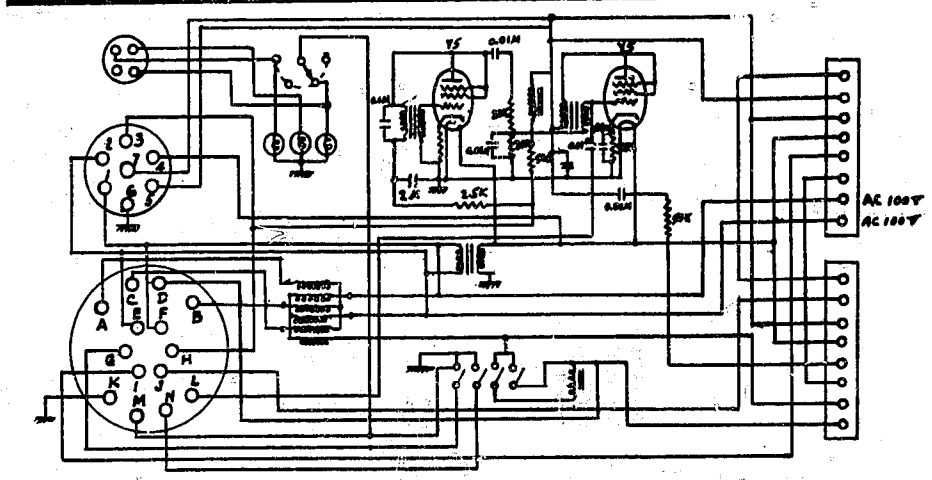
WARNING RADAR FOR LARGE AIRCRAFT (FK-4)

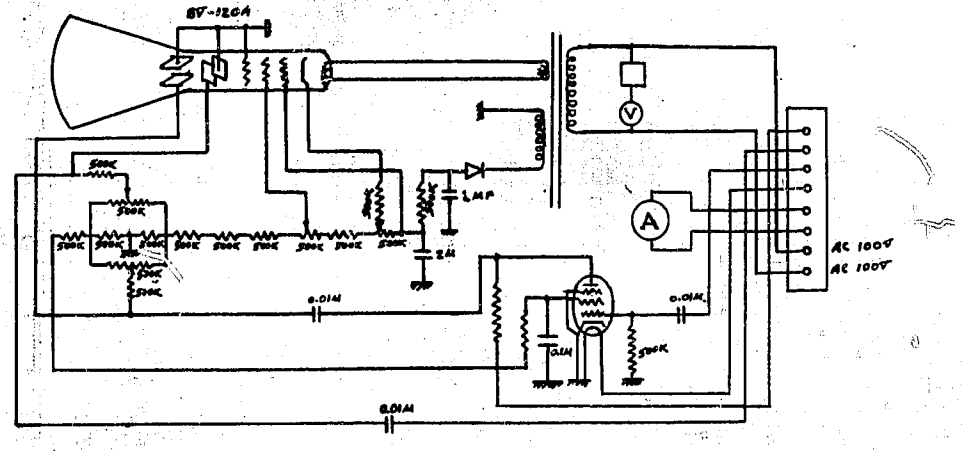
TRANSMITTER



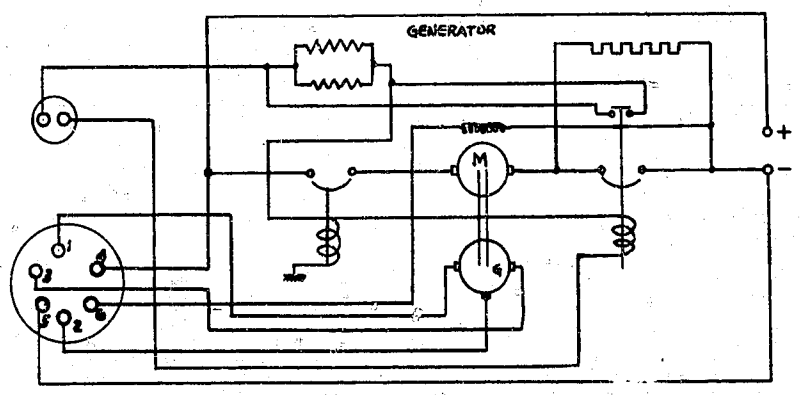
RECEIVER



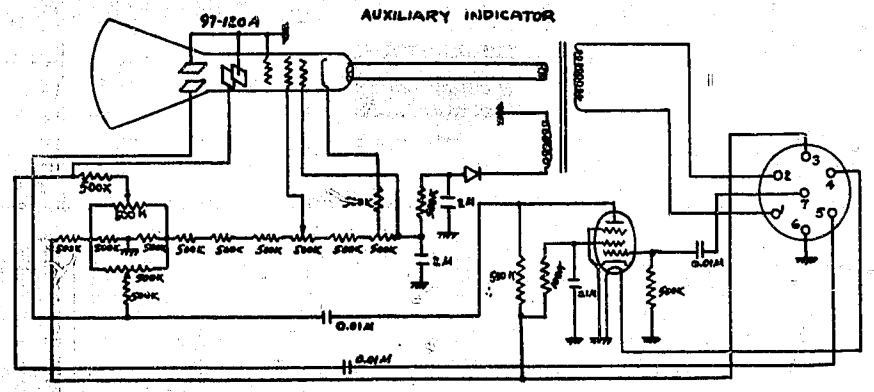




GENERATOR



AUXILIARY INDICATOR



ENCLOSURE (D), continued

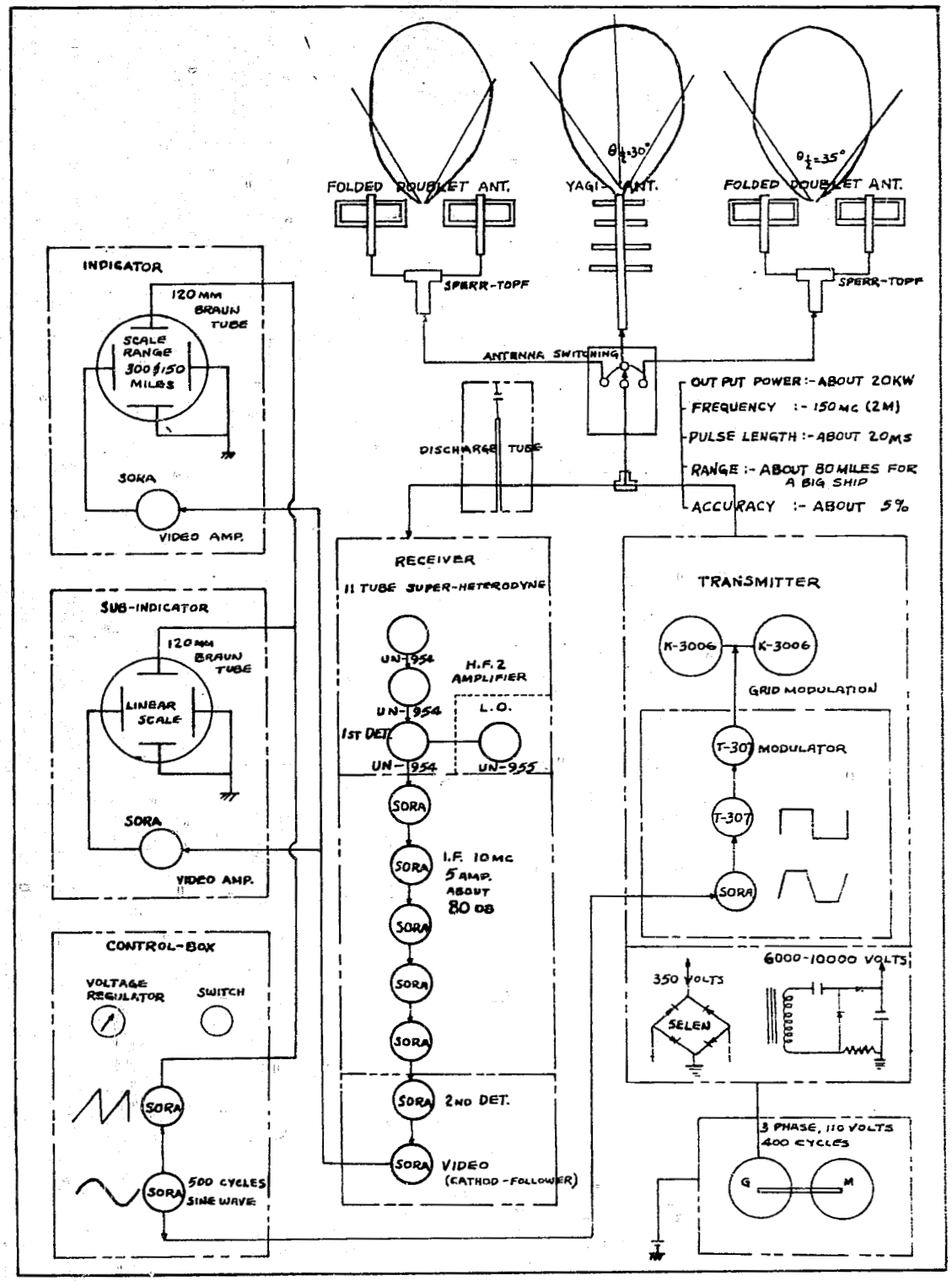
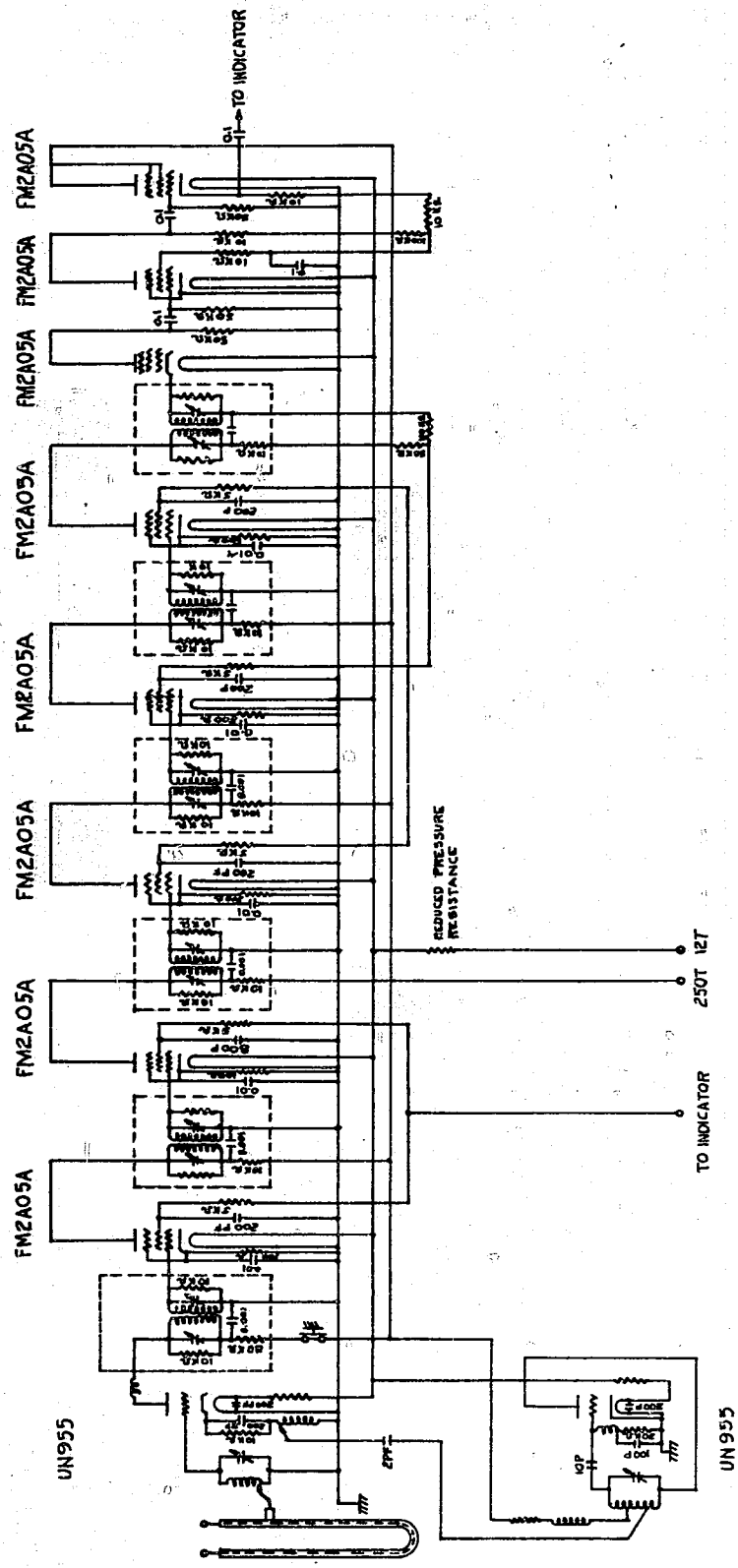


Figure 2(D)

BLOCK DIAGRAM

ENCLOSURE (E)

TYPE 19, MK 1, MOD 11 (N-6) RADAR



ENCLOSURE (E), continued

N6 TRANSMITTER

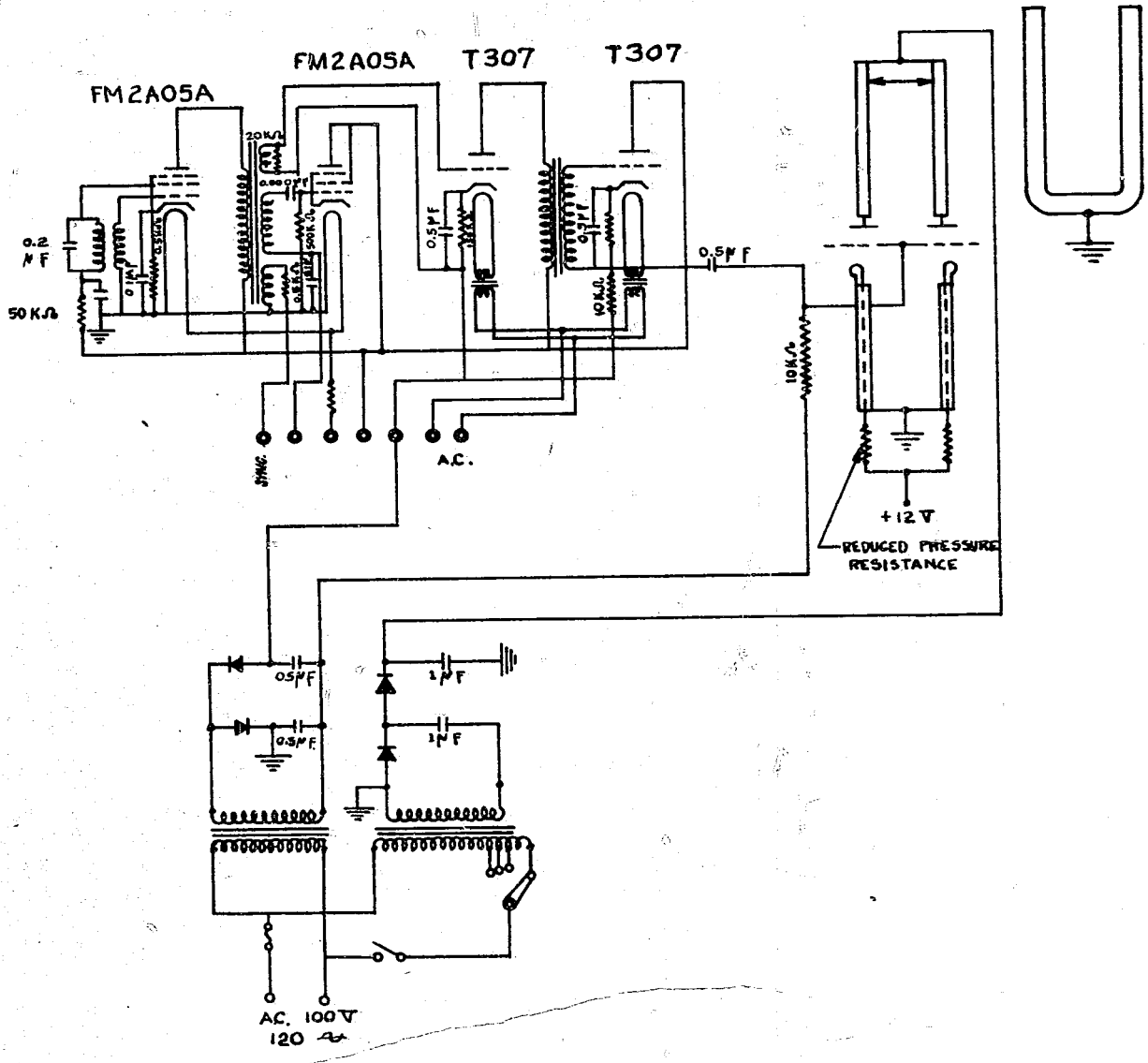


Figure 2(E)
TRANSMITTER

ENCLOSURE (E), continued

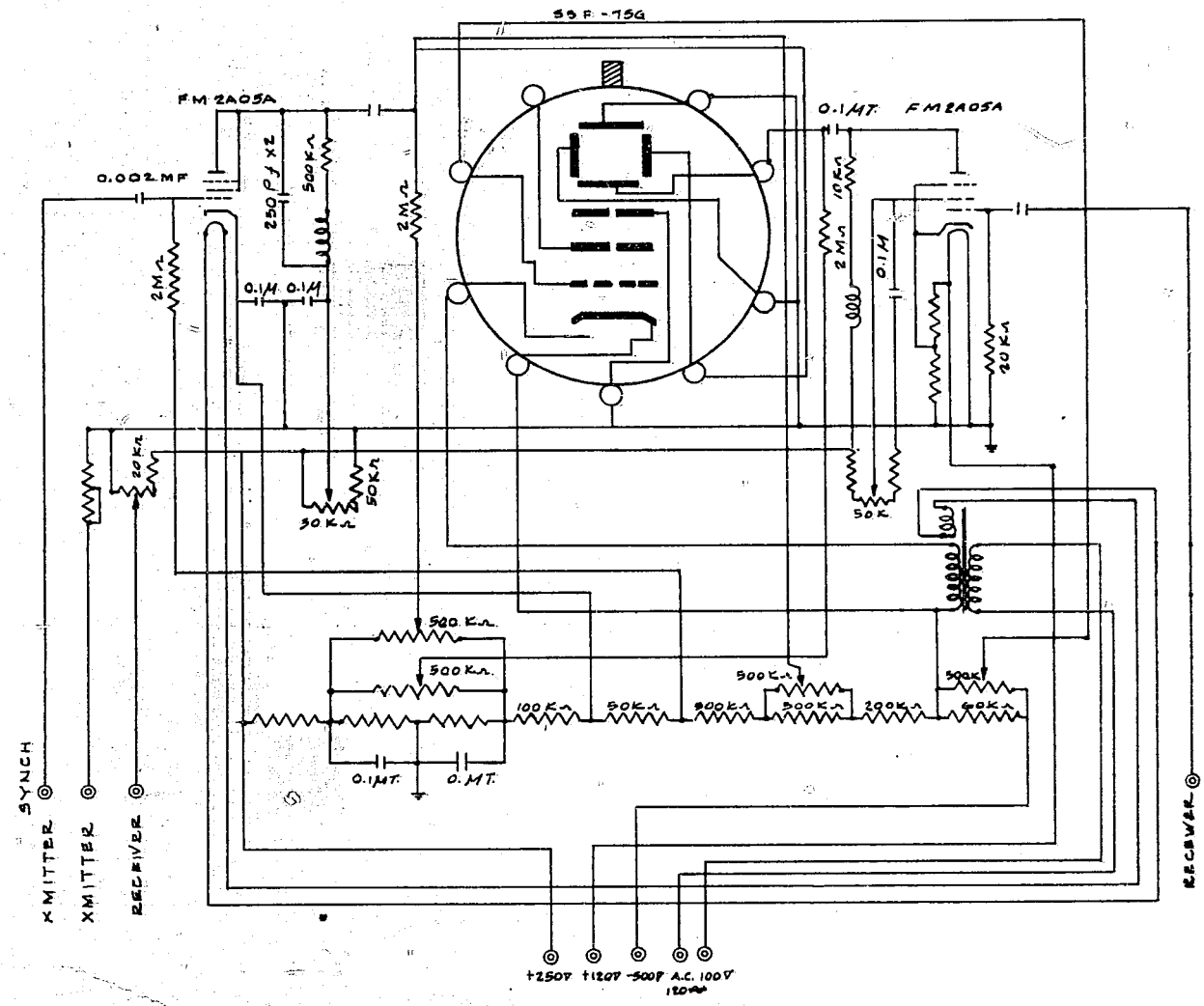
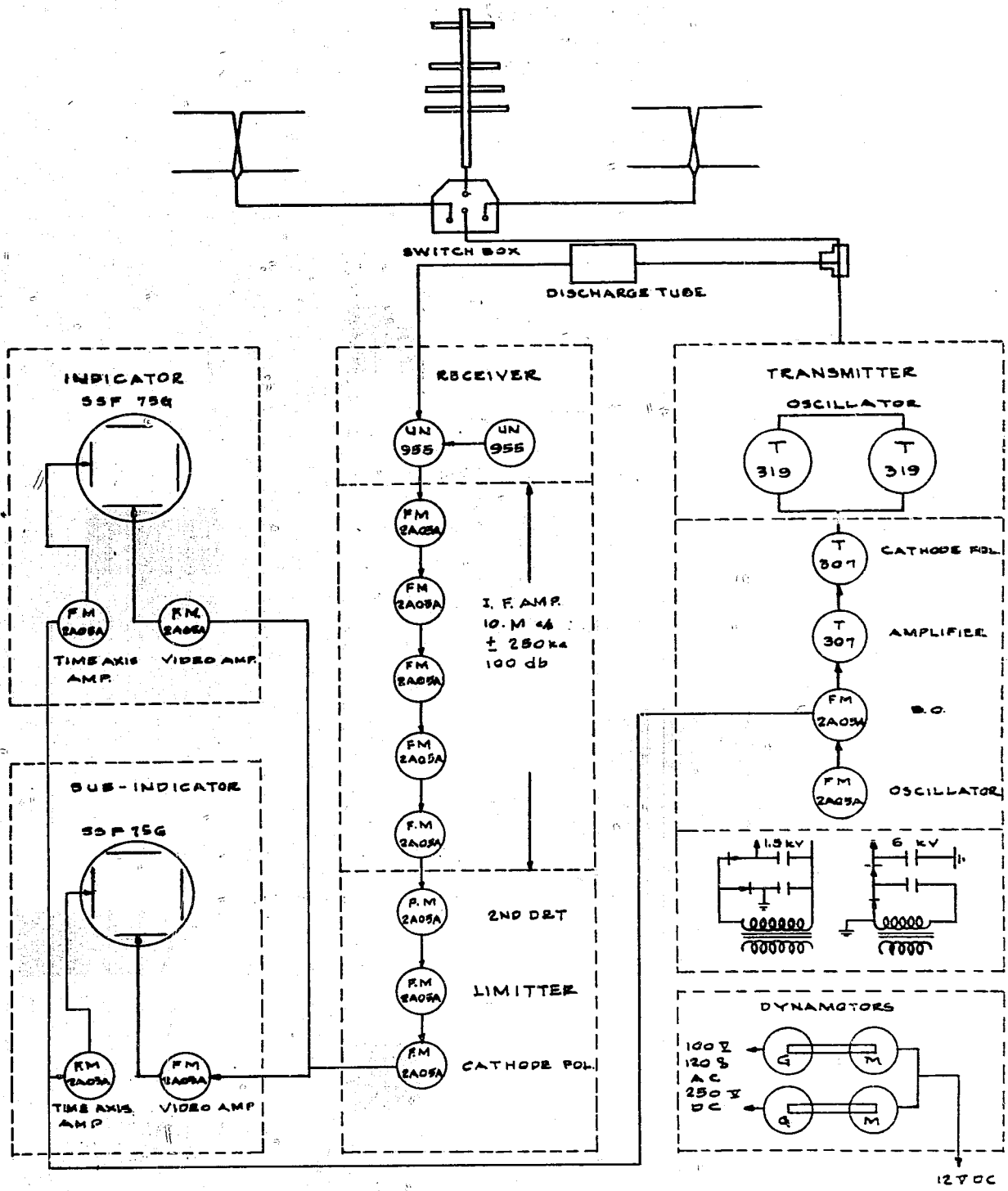


Figure 3(E)
INDICATOR



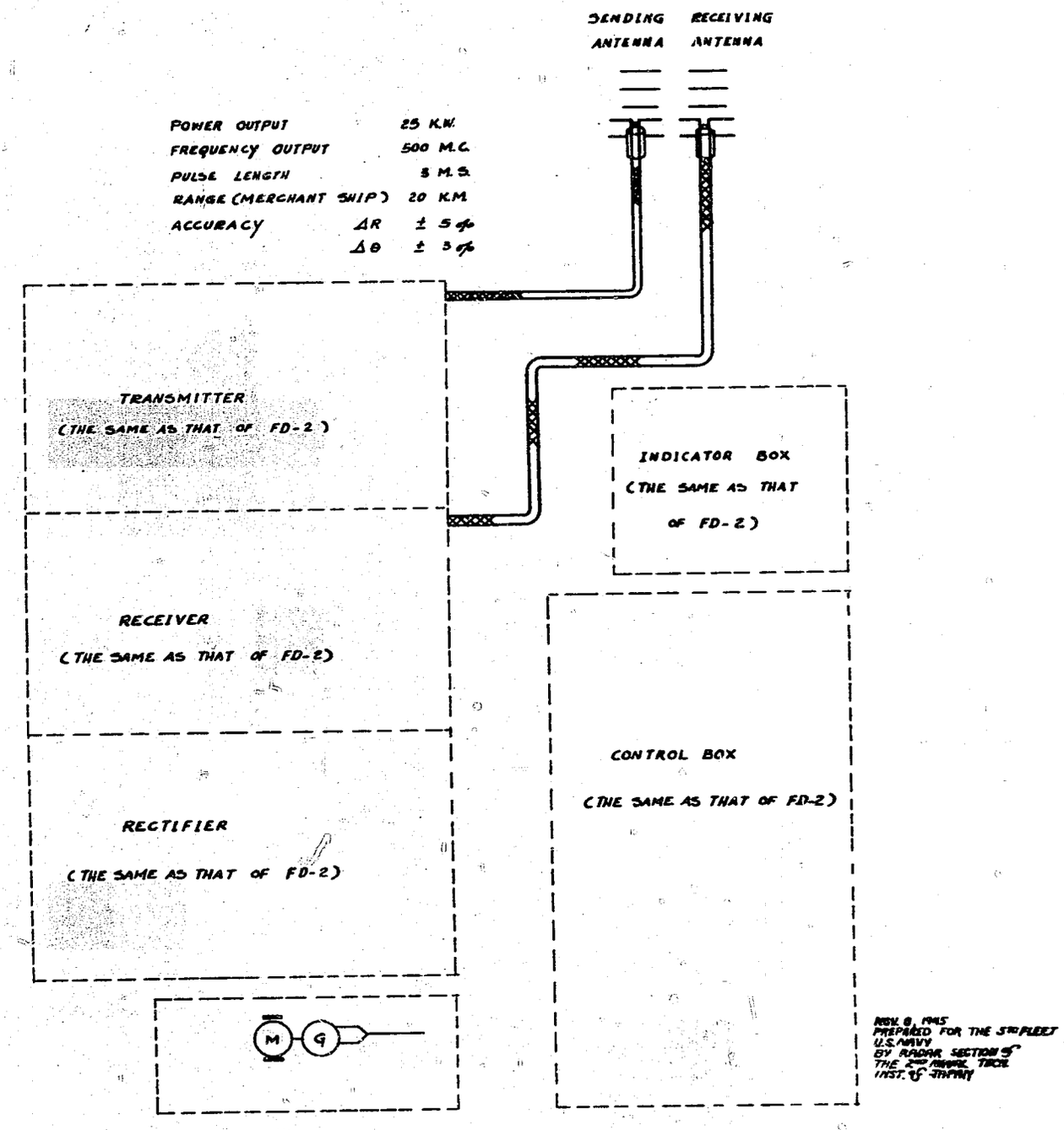
POWER OUTPUT	2 KW
FREQUENCY	250 M c/sec.
PULSE LENGTH	7 μ sec
RANGE	20 KM FOR A DESTROYER
ACCURACY	± 5 %

Figure 4(E)

BLOCK DIAGRAM

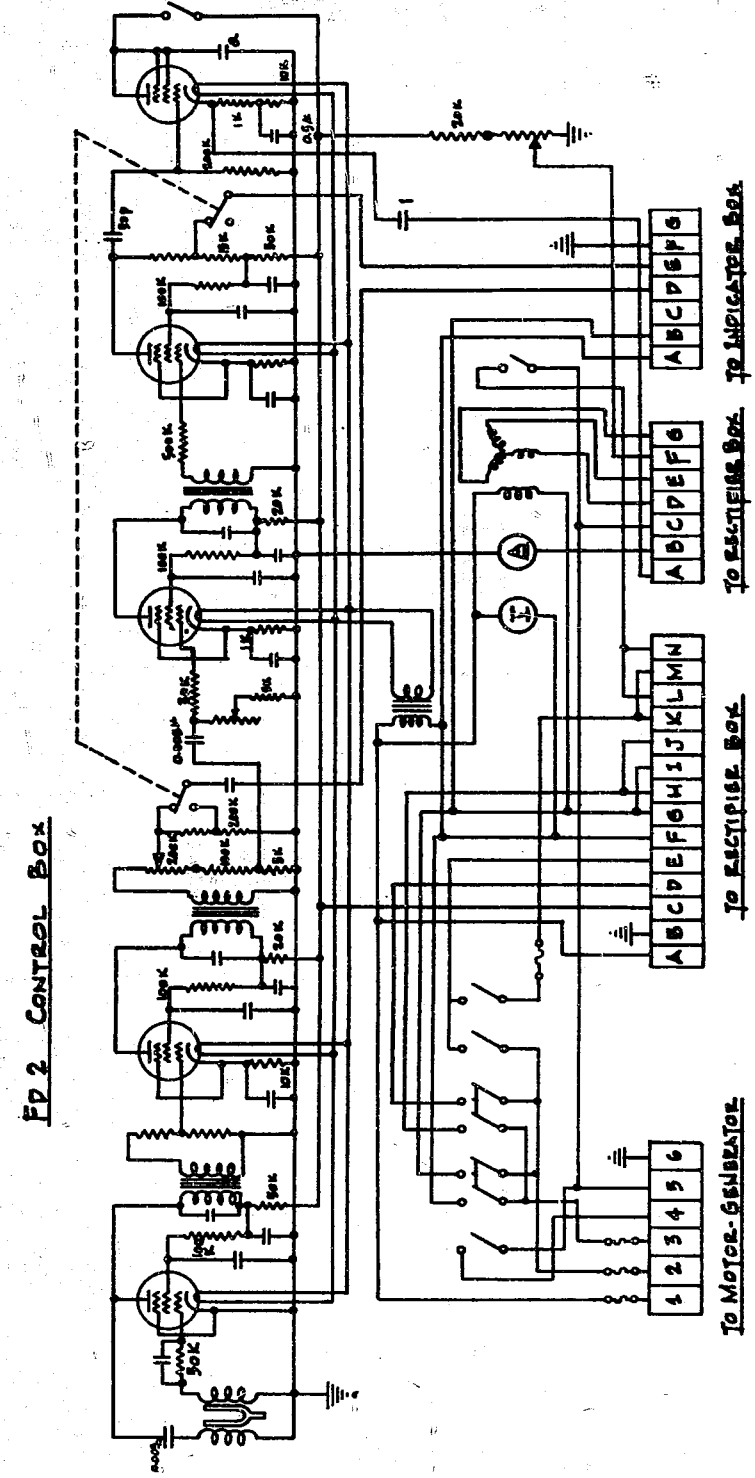
ENCLOSURE (F)

TYPE 18, MK 6, MOD 2 (FD-1) RADAR



ENCLOSURE (G)

TYPE 18, MK 6, (FD-2) RADAR



ENCLOSURE (G), continued

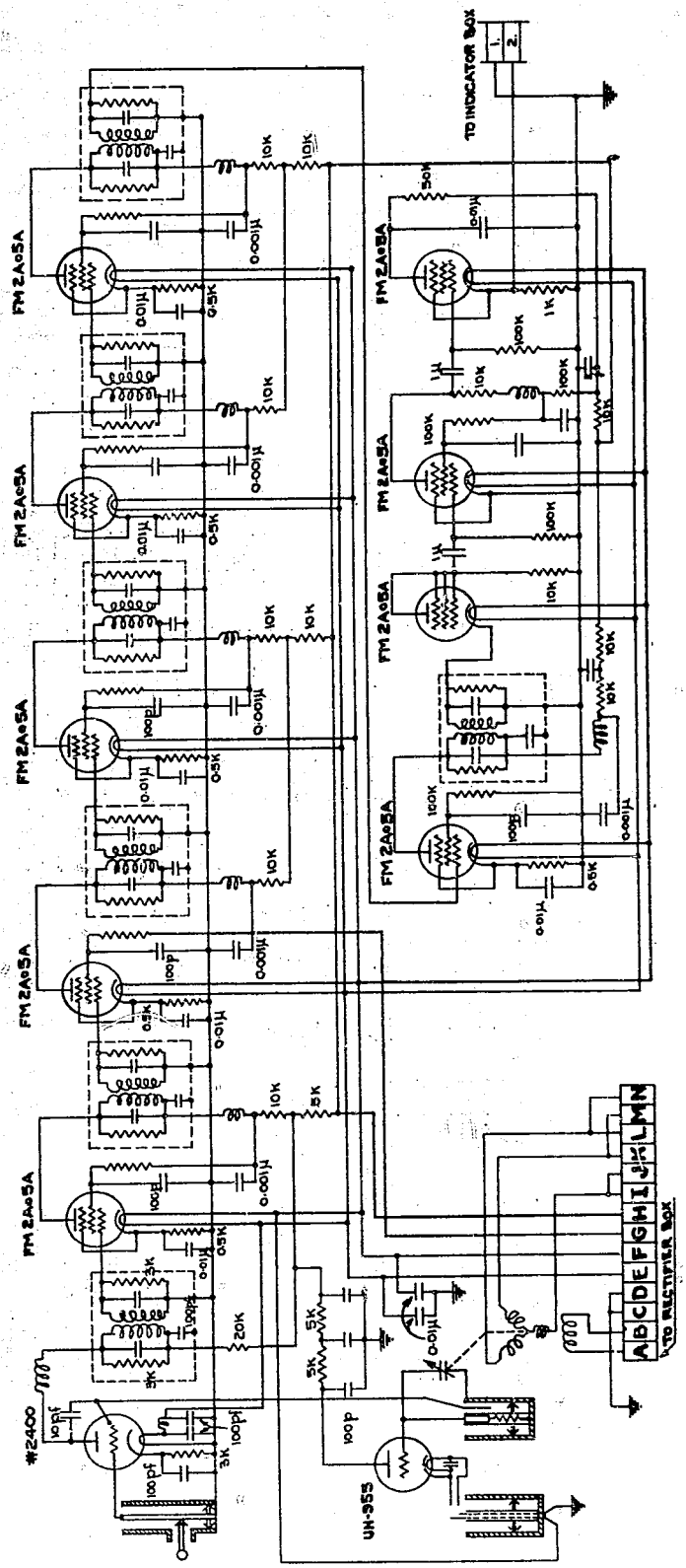


Figure 2(G)
RECEIVER

ENCLOSURE (G), continued

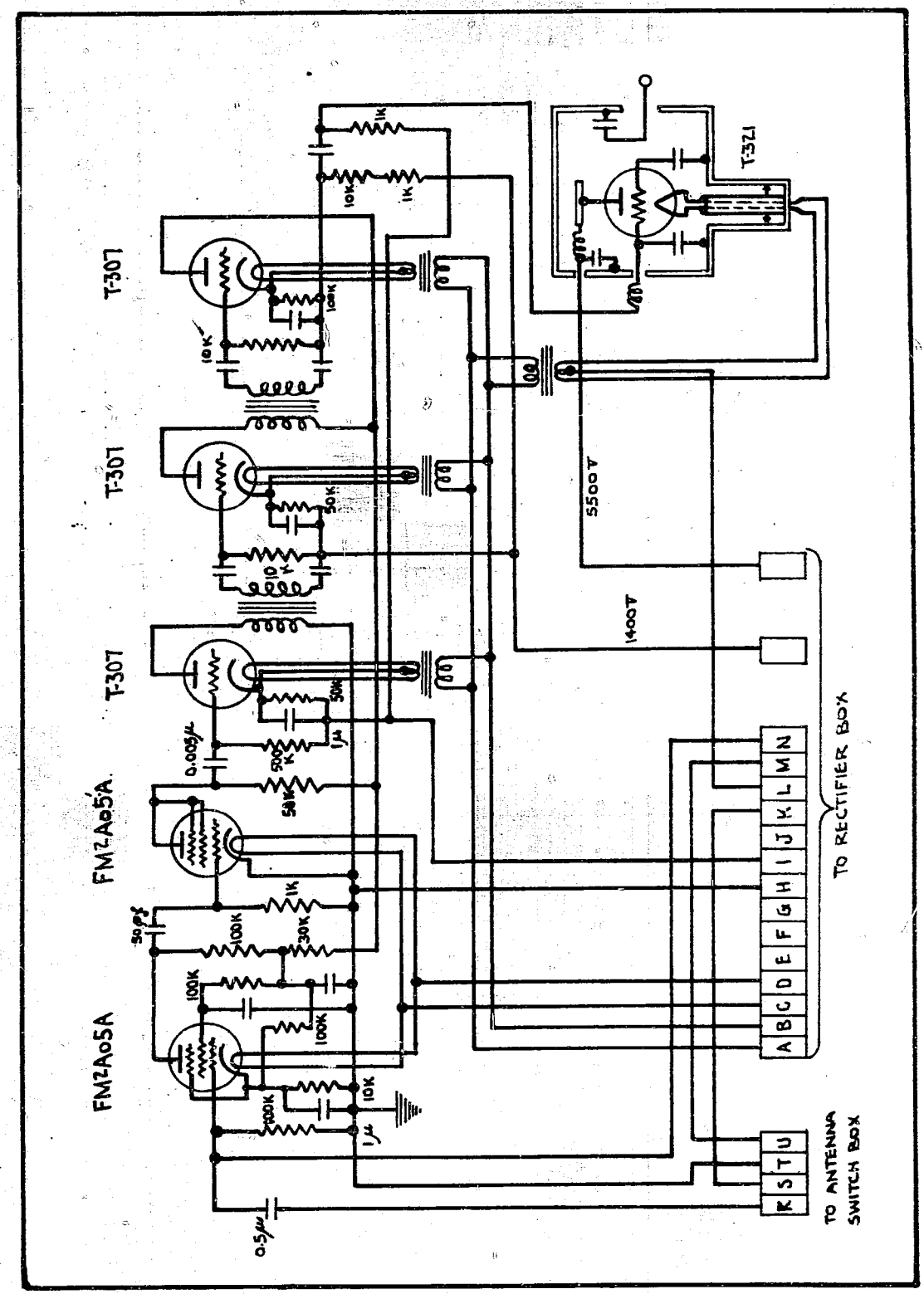


FIGURE 3(G)
TRANSMITTER

ENCLOSURE (G), continued

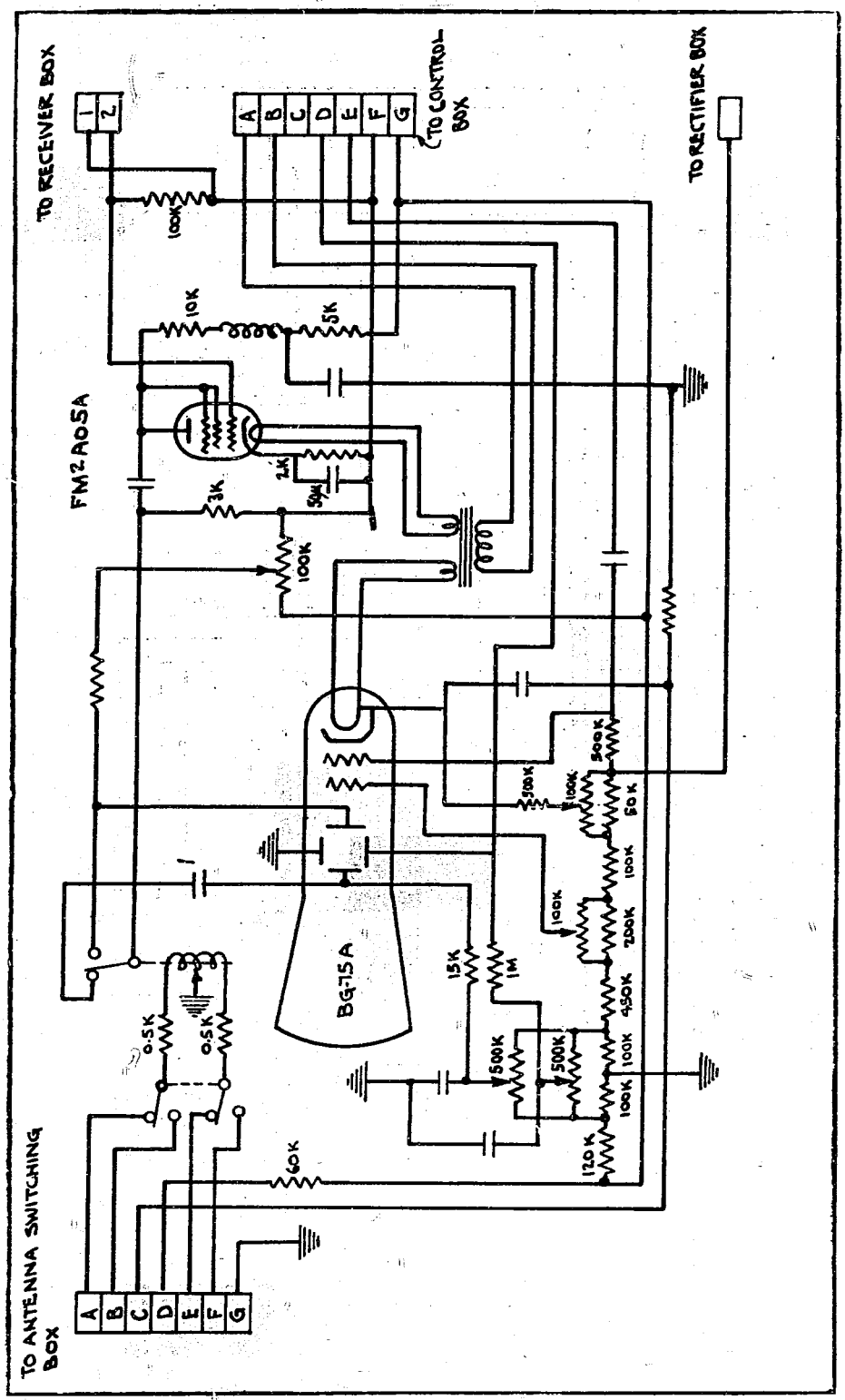


Figure 41G
INDICATOR

ENCLOSURE (G), continued

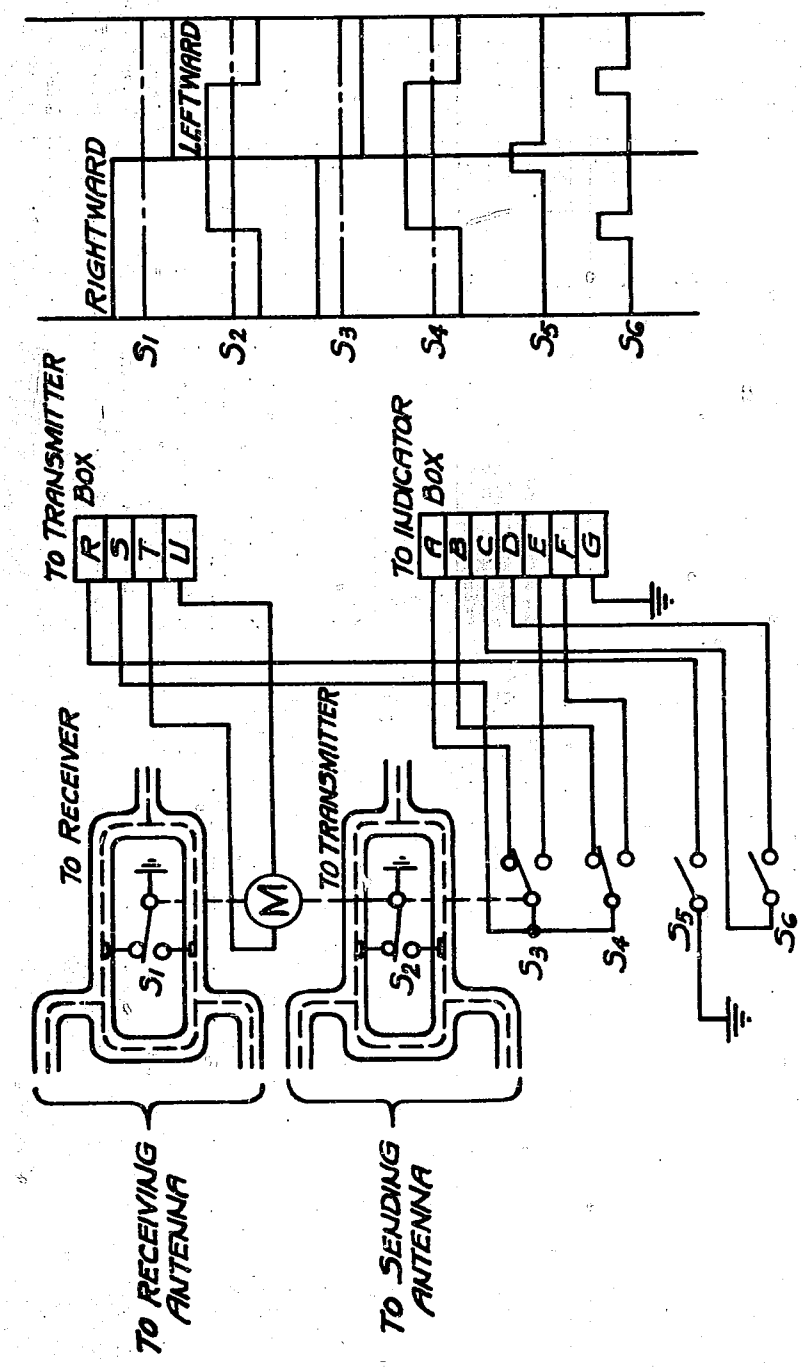


Figure 5(G)
ANTENNA SWITCHING BOX

ENCLOSURE (G), continued

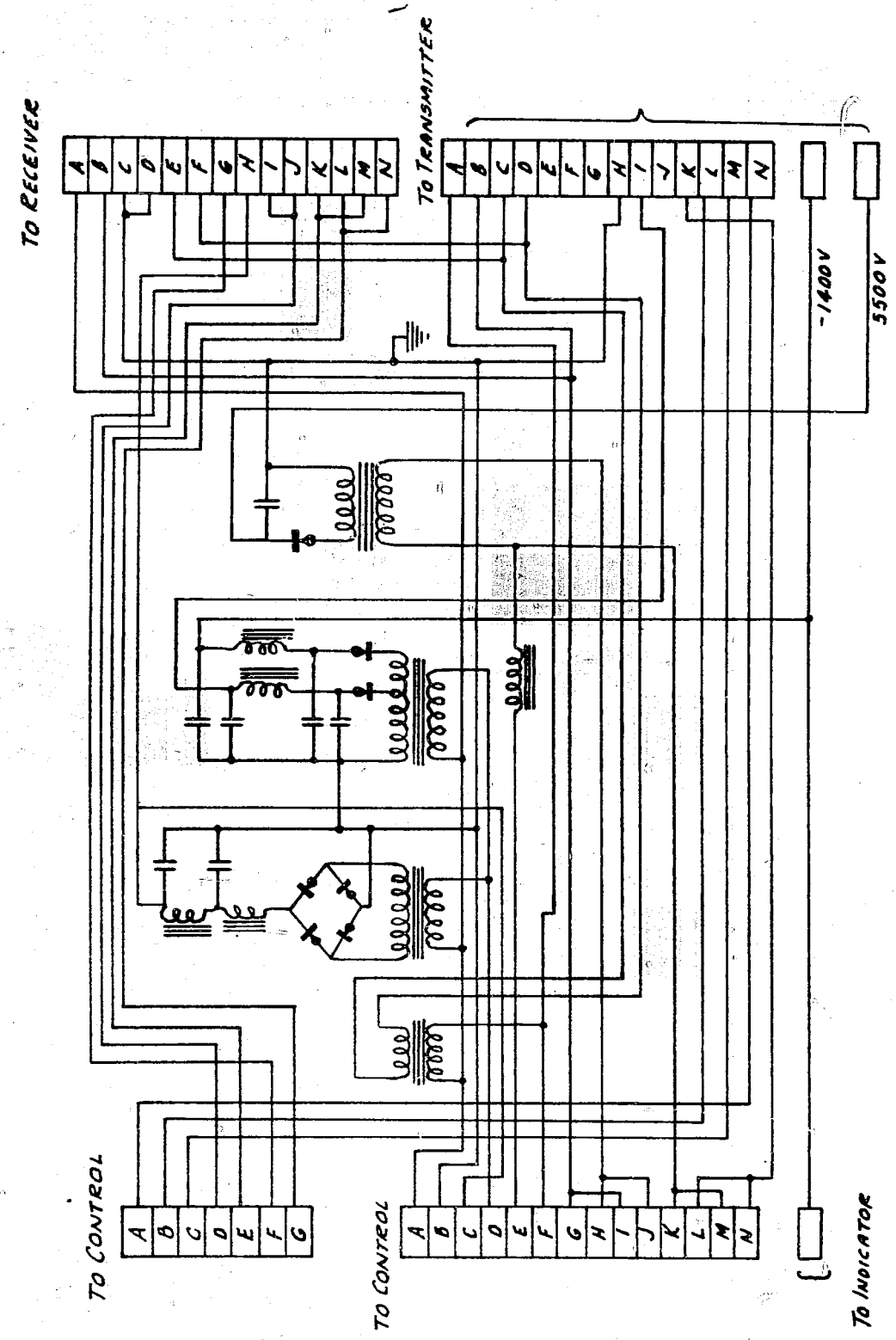


Figure 6(G)
POWER SUPPLY

ENCLOSURE (G), continued

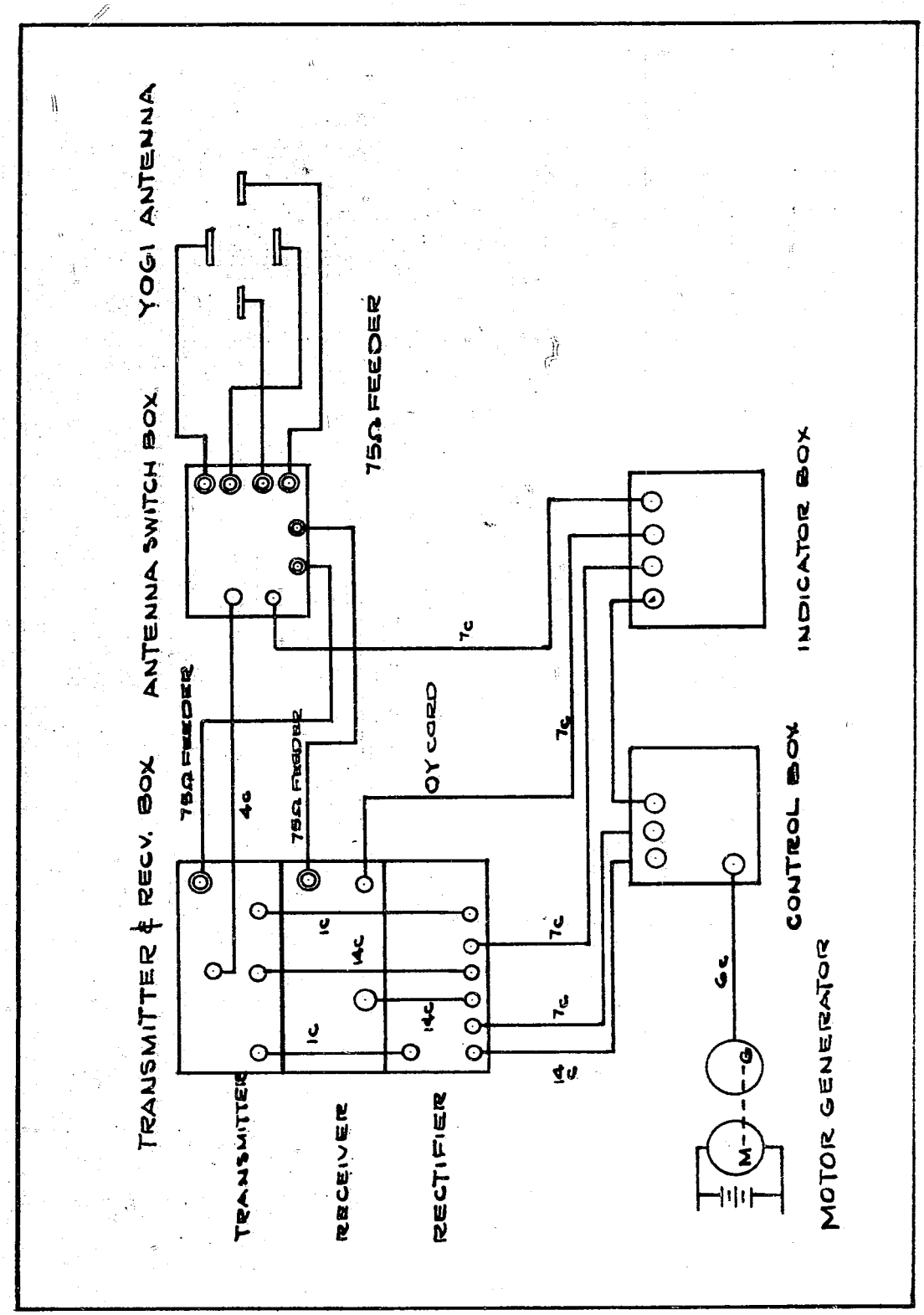


Figure 7(G)
CONTROL CIRCUIT BLOCK DIAGRAM

ENCLOSURE (G), continued

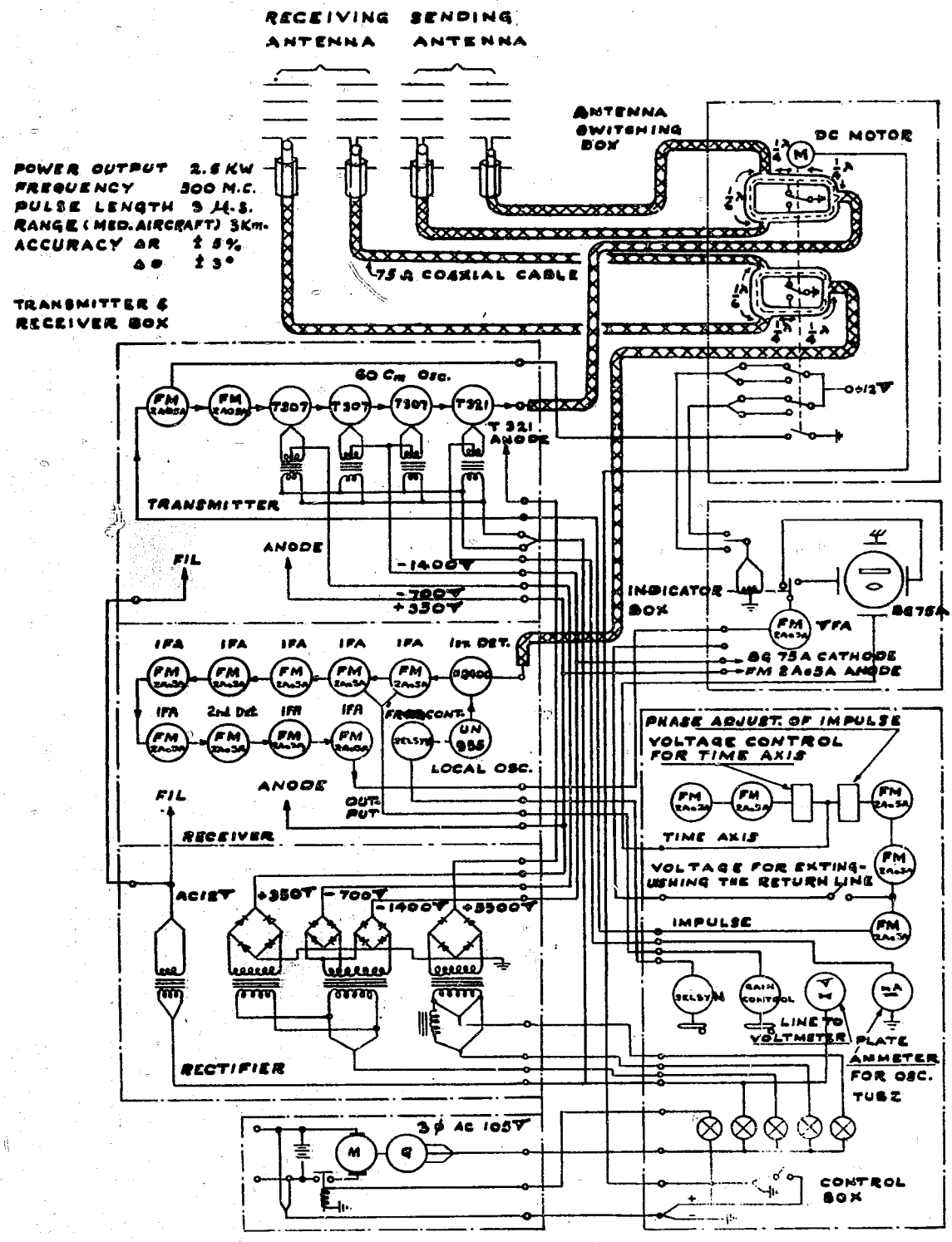
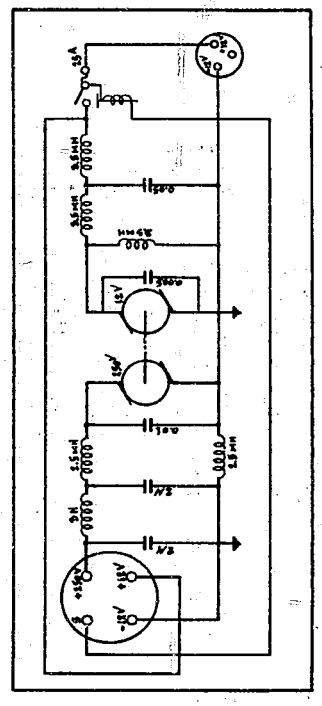


Figure 8(G)

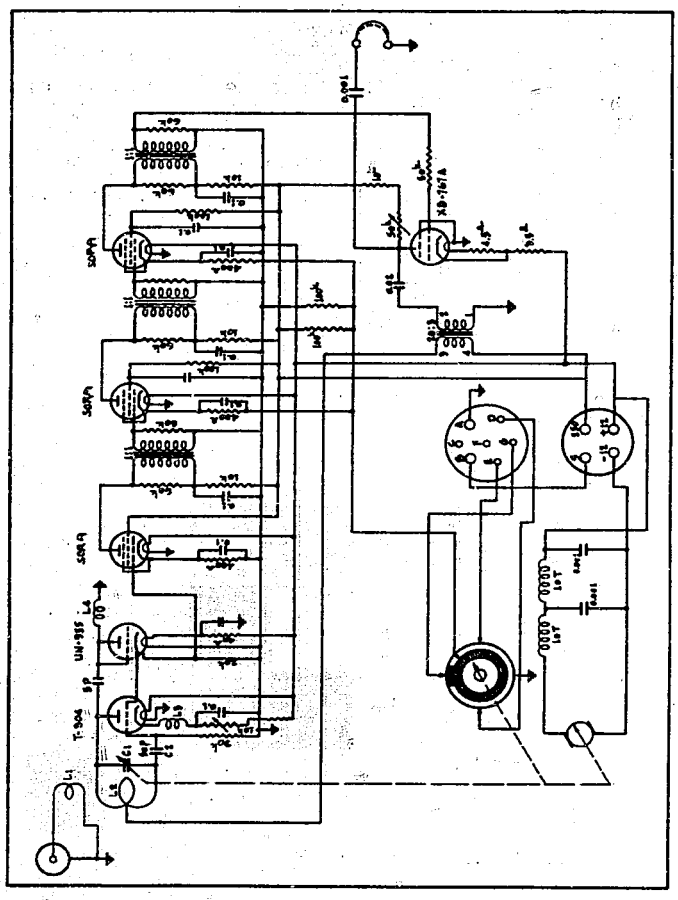
CONTROL CIRCUIT DETAIL BLOCK DIAGRAM

ENCLOSURE (H)

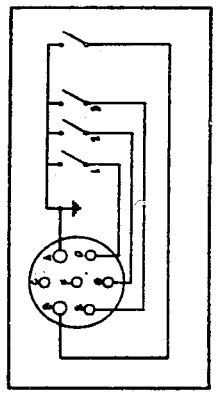
M-13 IFF



19 TEST GENERATOR



TRANSMITTER - RECEIVER

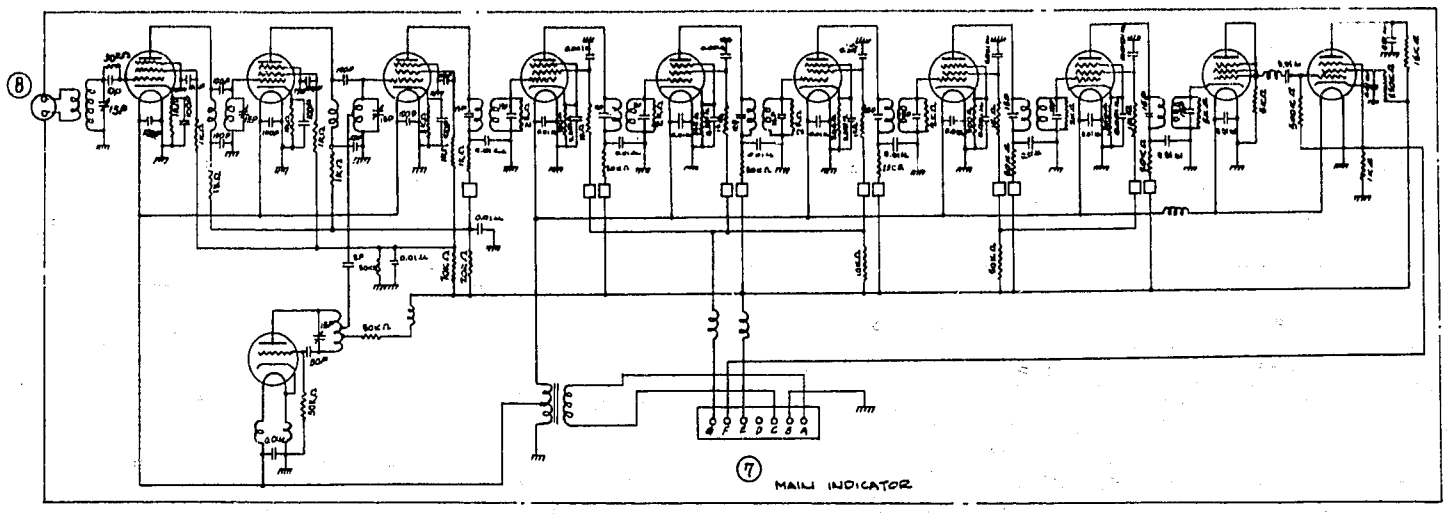


CONTROLLER

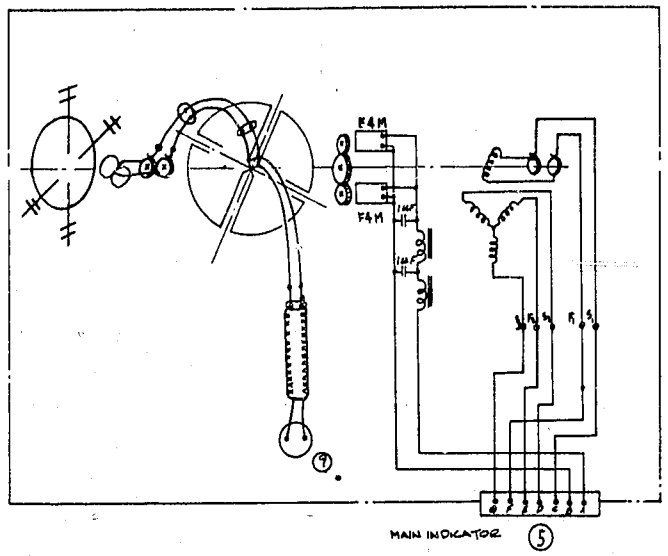
ENCLOSURE (1)

TYPE 19, EXP. MK 2 MOD 11 (TAMA 3) RADAR

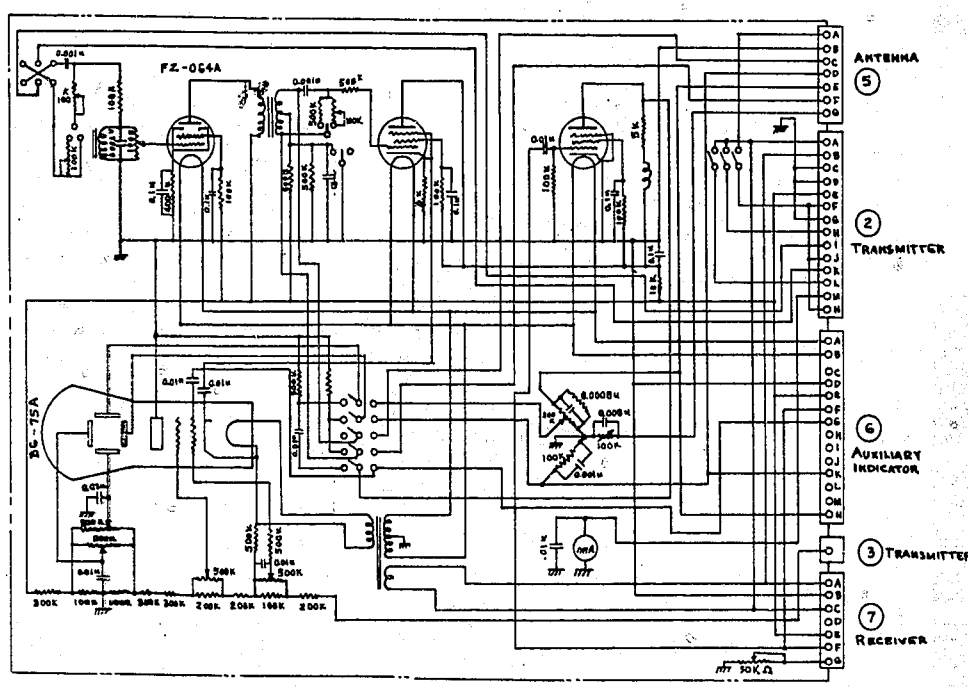
PLAN OF TAMA MARK 3 RECEIVER CIRCUIT

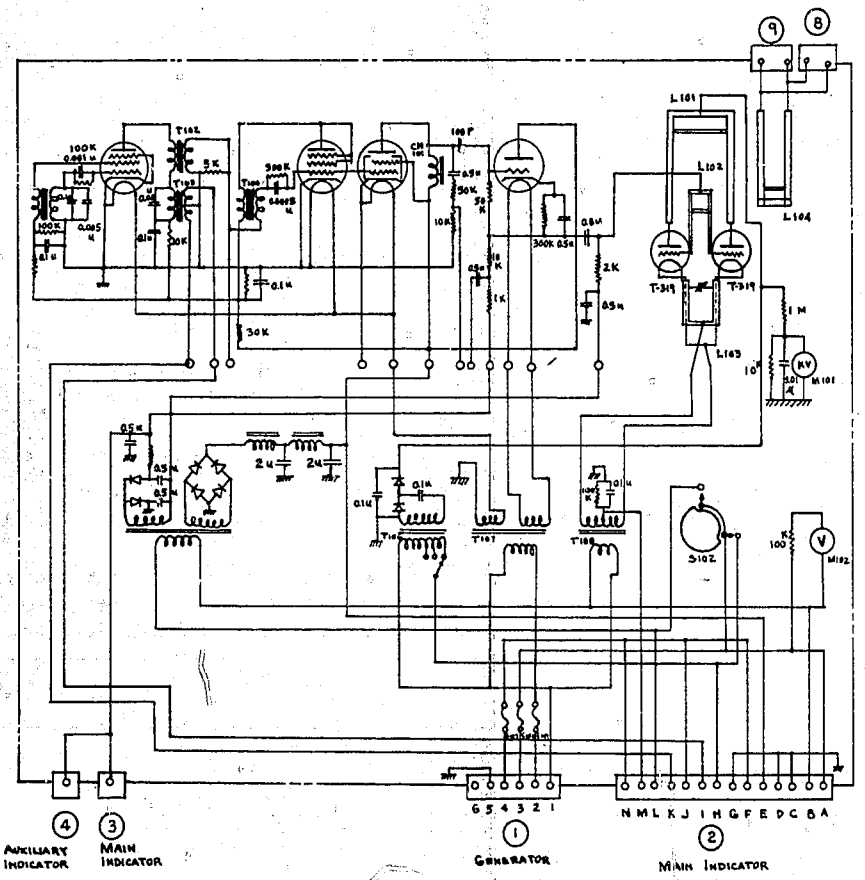


Plan of Tama Mark 3 Antenna Circuit

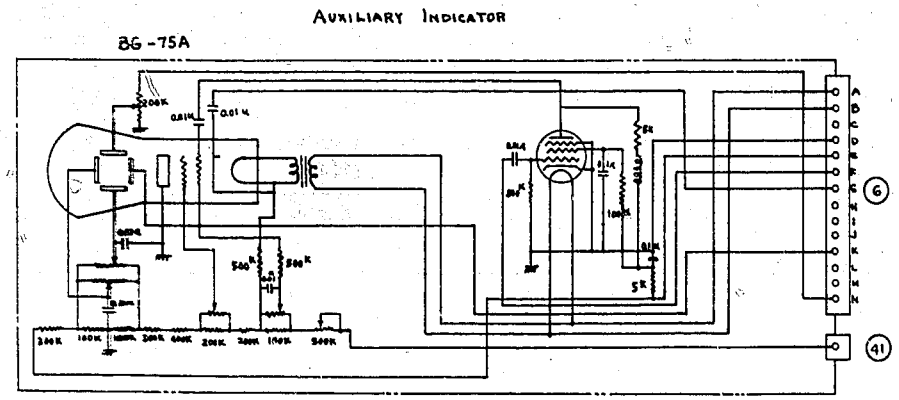


Plan of Tama Mark 3 Indicator Circuit





AUXILIARY INDICATOR



ENCLOSURE (I), continued

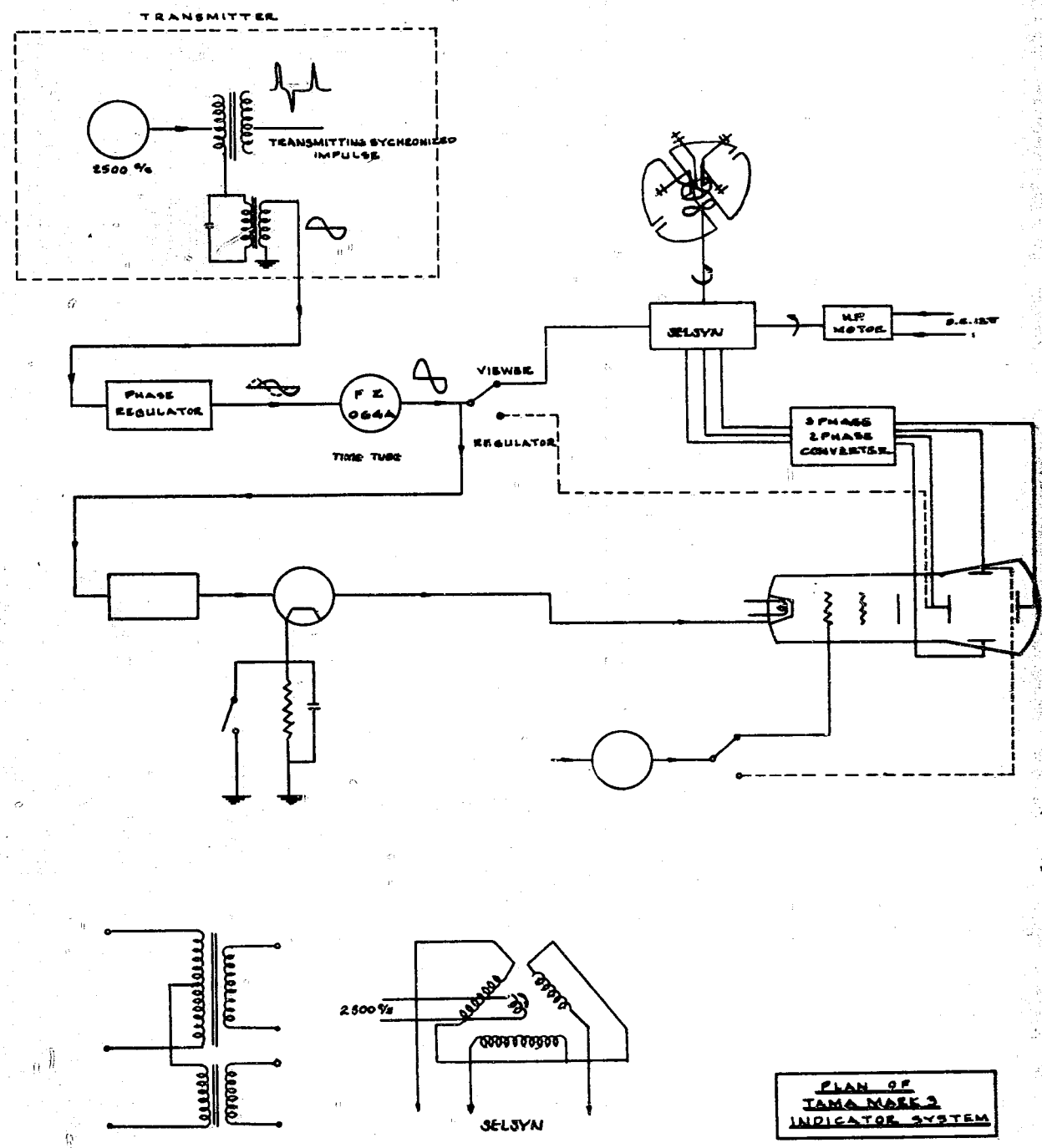


Figure 2(I)

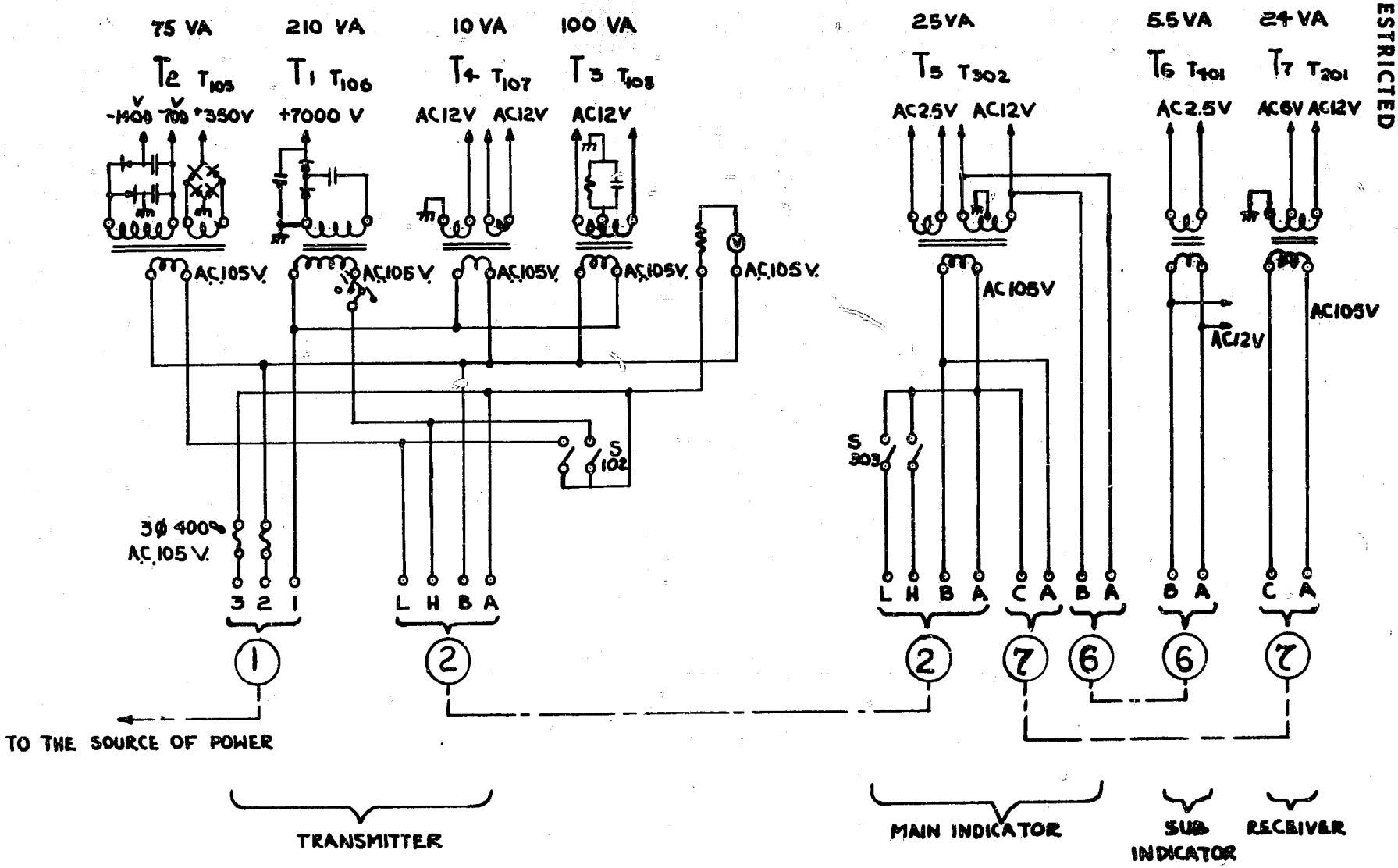
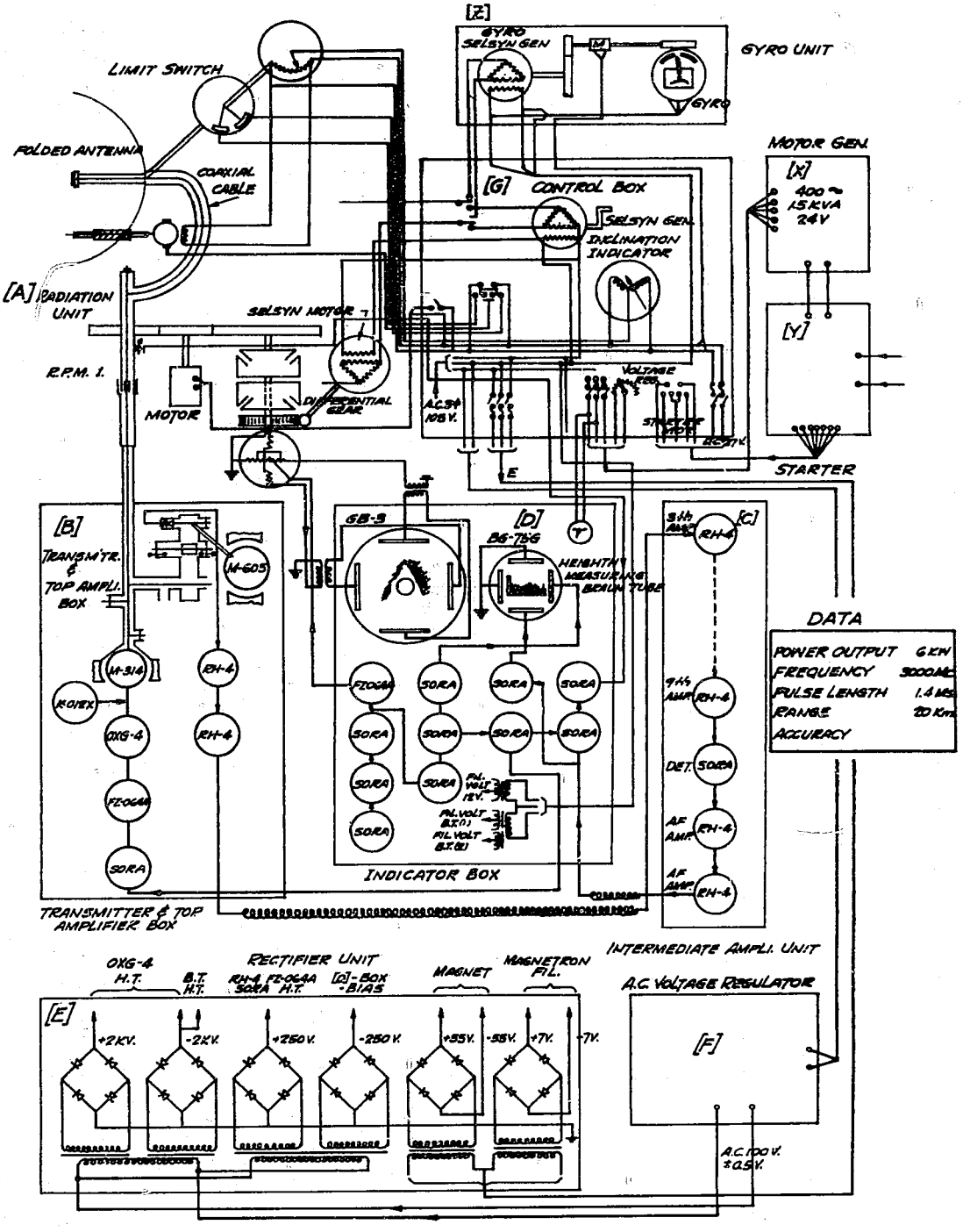


Figure 3(I)

PLAN OF TAMA MARK 3 A.C. ELECTRIC CIRCUIT SYSTEM

ENCLOSURE (J)

Type 51 Radar



ENCLOSURE (K)

CHART OF JAPANESE AIRBORNE RADAR CHARACTERISTICS.

No.	Name	Designation	Object	Research: Started	Research: Finished	Remark	Installation	Frequency: Wave Length	Power Output (Peak)	Pulse Length	Repetition Frequency	Transmitter: Oscillation Circuit	Transmitter: Oscillator Valve	Receiver: Intermed. Freq.	Receiver: Detector	Receiver: Local Oscil.	Scope Representation: Dis. (km)	Scanning Axis	Scale	Type	Gain	Beam Angle: Horiz.	Beam Angle: Vertical	Max. Range (Max. Effective Scale)	Minimum Distance	Accuracy of Range	Distance Discrimination	Accuracy of Bearing	Angle Discrimination	Spare Parts	No. of Operators	Degree of Operating Difficulty	Maintenance	No.
1	Type-3 Air Mark-6 Model-4 Radio	H-6	Patrol and search	11/41	8/42	In use	Large and Small Aircraft, Observer's Seat	2m	3kw	10μS	1000c/s	Blocking Oscillator	U-233 x2	10mc	1st UN-954 2nd FM-2405A	UN-955	120	Linear	Mechanical	Head: Yagi Sides: Folded Doublet	16db 6.5db	θ∥ = 30° θ⊥ = 28° θ∥ = 35° θ⊥ = 30°		150 (110 against a large Ship)	3km(H=1000m)	≃±5%	2~3 km	±3°	≃60°		Radar Technician by large Plane. Observer by small	None	Ordinary	1
2	Type-4 Air Mark-6 Model-3 Radio	FH-1	Patrol and search	2/44	9/44	Out of use	Small Aircraft, Observer's Seat	2m	4.2kw	15μS	250c/s	Modulated Oscillator	T-319 x2	10mc	1st UN-954 2nd SORA	UN-955	120	Sinusoidal	Mechanical	Head: Yagi Sides: Folded Doublet	16db 6.5db	θ∥ = 30° θ⊥ = 28° θ∥ = 35° θ⊥ = 30°		200 (110 against a large Ship)	5 km(H=1000m)	≃±5%	4 km	±3°	≃60°		Observer	None	Ordinary	2
3	Prototype 19 Air Mark-1 Model-12 Radio	FK-3	Patrol and search	10/44	6/45	Not yet used	Small Aircraft, Observer's Seat	2m	2kw	10μS	1000c/s	Blocking Oscillator	U-233 x2	10mc	1st UN-954 2nd FM-2405A	UN-955	75	Linear, Logarithmic	Mechanical	Head: Yagi Sides: Folded Doublet	16db 6.5db	θ∥ = 30° θ⊥ = 28° θ∥ = 35° θ⊥ = 30°		150 (60 against a large Ship)	3 km(H=1000m)	≃±5%	4~5 km	±3°	≃60°		Observer	None	Ordinary	3
4	Warning Radar for Large Aircraft	FK-4	Patrol and search	6/44	7/45 Stopped	Research stopped		2m	20kw	20μS	83c/s(500 c/s x 1/6)	Modulated Oscillator	K-3005 x2	10mc	1st UN-954 2nd SORA	UN-955	120	Linear	Mechanical	Head: Yagi Sides: Folded Doublet	16db 6.5db	θ∥ = 30° θ⊥ = 28° θ∥ = 35° θ⊥ = 30°		300 (150 against a large Ship)	5 km(H=1000m)	≃±5%	5 km	±3°	≃60°		Radar Technician	None		4
5	Prototype 19 Air Mark-1 Model-11 Radar	N-6	Patrol and search	3/43	10/44 Stopped	Not yet used	Small Aircraft, Observer's Seat	1.2m	2kw	5μS	1000c/s	Modulated Oscillator	T-319 x2	10mc	1st UN-954 2nd FM-2405A	UN-955	75	Logarithmic	Mechanical	Head: Yagi Sides: Folded Doublet	16db 6.5db	θ∥ = 30° θ⊥ = 28° θ∥ = 35° θ⊥ = 30°		150 (40 against a large Ship)	2.5 km(H=1000m)	≃±5%	1.5~2 km	±3°	≃60°	Number of Vacuum Tubes in Use x3	Observer	None	Ordinary	5
6	Prototype 18 Air Mark-6 Model-2 Radio	FD-1	Patrol and search	12/43	2/44 Stopped	Not yet used		60cm	2.5kw	3μS	1000c/s	Modulated Oscillator	T-321 x1	10mc	1st 2400 2nd FM-2405A	UN-955	75	Sinusoidal	None	Yagi Antenna	8db	≃30°	≃30°	75 (20 against a large Ship)	600m	≃±5%	≃500 m	±0.5°	≃60°	Number of Resistances in Use x1	Observer	None	Ordinary	6
7	Prototype 18 Air Mark-6 Model Radio	FD-2	Night fighter	4/44	8/44	Not yet used	Transmitter--Head, Indicator Observer's Seat	62m	2.5kw	3μS	1000c/s	Modulated Oscillator	T-321 x1	10mc	1st 2400 2nd FM-2405A	UN-955	75	Sinusoidal	None	Yagi Antenna	8db	≃30°	≃30°	75 (3 against a large Ship)	600m	≃±5%	≃500 m	±0.5°	≃60°	Number of Condensers in Use x1	Pilot	None	Ordinary	7
8	Prototype 19 Air Mark-2 Model-11 Radar	Gyoku-3	Night fighter	9/44	7/45	Not yet used		2m	3kw	2μS	2500c/s	Modulated Oscillator	T-319 x2	17.75mc	1st UN-954 2nd SORA	UN-955	75	Circular and Linear		Combination of Ant. and Doublet with Coniometer	2.5~3db	±70°	±7°	10 (4.5 against a large Ship)	400~600m	≃±5%	≃500 m	±5°	≃100°	Number of Fuses in Use x3	Pilot	None	Ordinary	8
9	Prototype 5 Model-1 IFF	M-13	IFF (Friend aircraft locating)	10/44	7/45	Not yet used	Bottom	2m	50w	0.6μS		Modulated by Thyratron	T-304		UN-955			(Earpiece)		L-Shaped Antenna	Nondirectional				10		About ±0.8km with radar 62			Number of transformers in use x1	Pilot	Slight	Ordinary	9
10	Prototype Model-1 Height Measuring Radar	FH-1	Height measure		2/45	In use	In the Wings	3x0mc±15mc	0.1w	Continuous		Self Oscillator	T-304-A		UN-955			D.C. Ammeter		Doublet	0db			0~600m (0or~450m)		≃±5%					Pilot Observer	None	Gave some trouble	10
11	Prototype 19 Air Mark-3 Model-30 Radar	51	Path Finder	9/44		On test		10cm	6kw	1.4μS	600c/s	Magnetron	M-314	14mc	1st Crystal 2nd	UN-955	120	Circular		Doublet with Parabolic Mirror	18db	±7°	±12°	100 (20)	≃1500m	Research Incomplete	Research Incomplete	Research Incomplete	Research Incomplete		Radar Technician	Slight	Ordinary	11
12	Prototype 2 Air Mark-7 Model-2 Radio	FT-8	Radar counter measure	11/43	5/44	Not yet used	Large Aircraft, Observer's Seat	3.7m~0.45m						25mc	1st UN-955x2 2nd FM-2405A	UN-955		(Earpiece)		Racket Ant. and θ Ant.	-5~15db	±30°		Over 250				±5°	2~3°		Radar Technician	None		12
13	Prototype 2 Air Mark-7 Model-3 Radio	FTC	Radar counter measure				Large Aircraft, Observer's Seat	3.7m~0.45m						0~1mc	1st UN-955x2 2nd SORA	UN-955		(Earpiece and Meter)		Racket Ant. and θ Ant.	-5~15db	±30°		Over 250				±5°	2~3°		Radar Technician			13