UCRL 2887
abstract

UNIVERSITY OF CALIFORNIA

Radiation Laboratory

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UCRL-2887
Abstract

DEVELOPMENT OF A 500 kw, 50 mc RF SYSTEM FOR PARTICLE ACCELERATION

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ABSTRACT

Circuitry has been developed which produces 500 kw of radiofrequency power at 50 megacyles. This equipment was developed to power a linear accelerator. A detailed discussion of the schematic diagram is presented. Reasons are also given for the selection of critical components used.

Given orally March 8, 1955 at the meeting of American Institute of Electrical Engineers at Palo Alto, California.

Talk - March 8, 1955 to American Institute of Electrical Engineers, Palo Alto, California

SUBJECT: Development of a 500 kw, 50 mc RF System for Particle Acceleration

I The Linear Accelerator

A. History of development

B. Problems associated with rf power source

1. Multipactoring and pre-excitation
2. High standing wave ratio lines
3. Multiple resonances in output circuit - long transmission lines because of shielding

II The RF System

(slide 1, 2) A. General description

(slide 3) B. Low level stages

1. Crystal input

a. Transient response of load to incorrect frequency.

2. Limiter input, termination, phasing, and gate

3. 2E26 Mixer

a. Common bias to effect amplitude selection

4. 4 - 250A output stage

a. Neutralization
b. Grid current protection
c. Pi network output circuit
d. Output monitor

(slides 4, 5, 6)
(slides 7, 8) C. A 2519A Driver

1. Development of A2519A from 6166
(slide 9) 2. Input circuit
3. Neutralization
4. Output Circuit
5. Protective bias

(slide 8)

II The RF System (con't)

(slide 7) D. Final Amplifier

1. Development of A2332C from 5831

(slide 10)
(slides 9, 12) 2. Input circuit

3. Neutralization

4. Output Circuit

a. Tuning
b. Water supply
c. Voltage supply
d. Output coupling capacitor and cooling

5. Protective Circuit

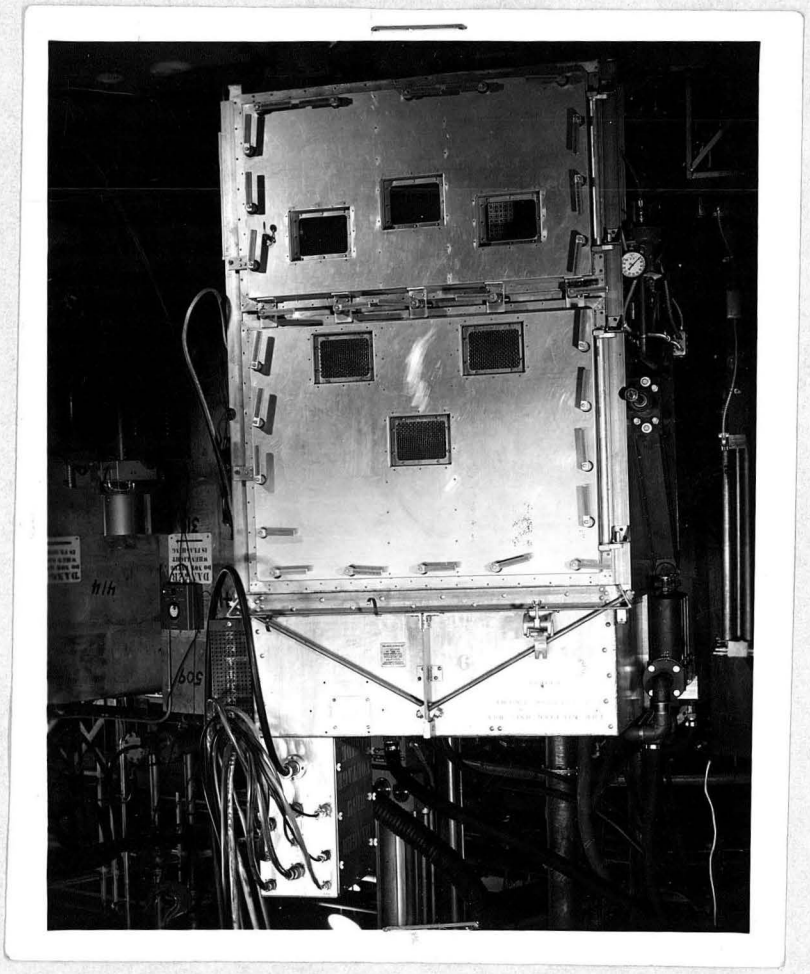
a. Overcurrent
b. Grid bias interlock
c. RF interlock

E. Output Power Monitor

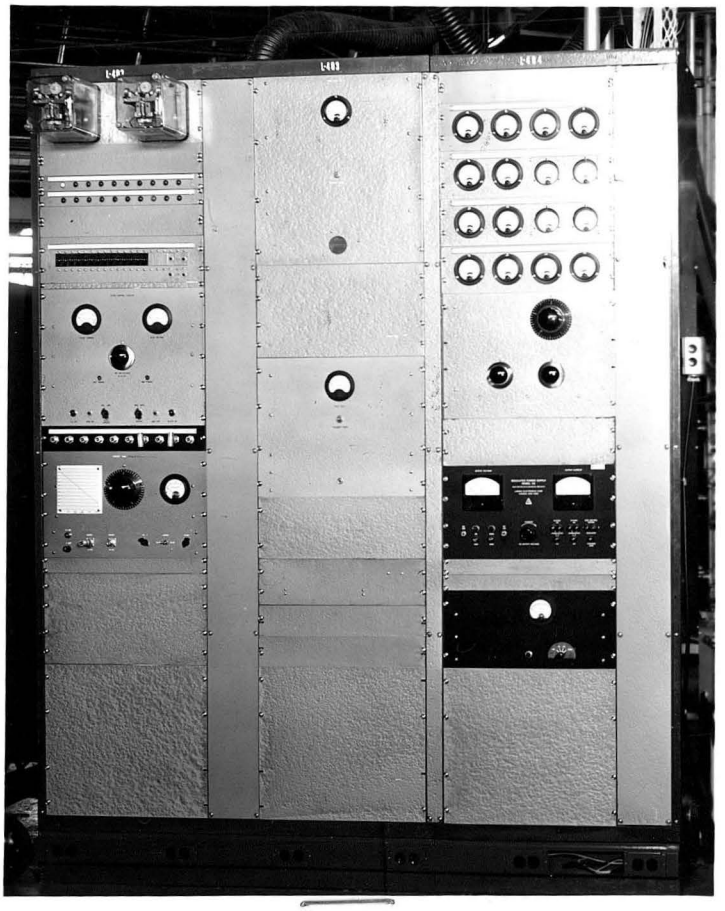
1. The directional coupler

(slide 14) 2. Power sampler

(slide 15) 3. Power meter chassis

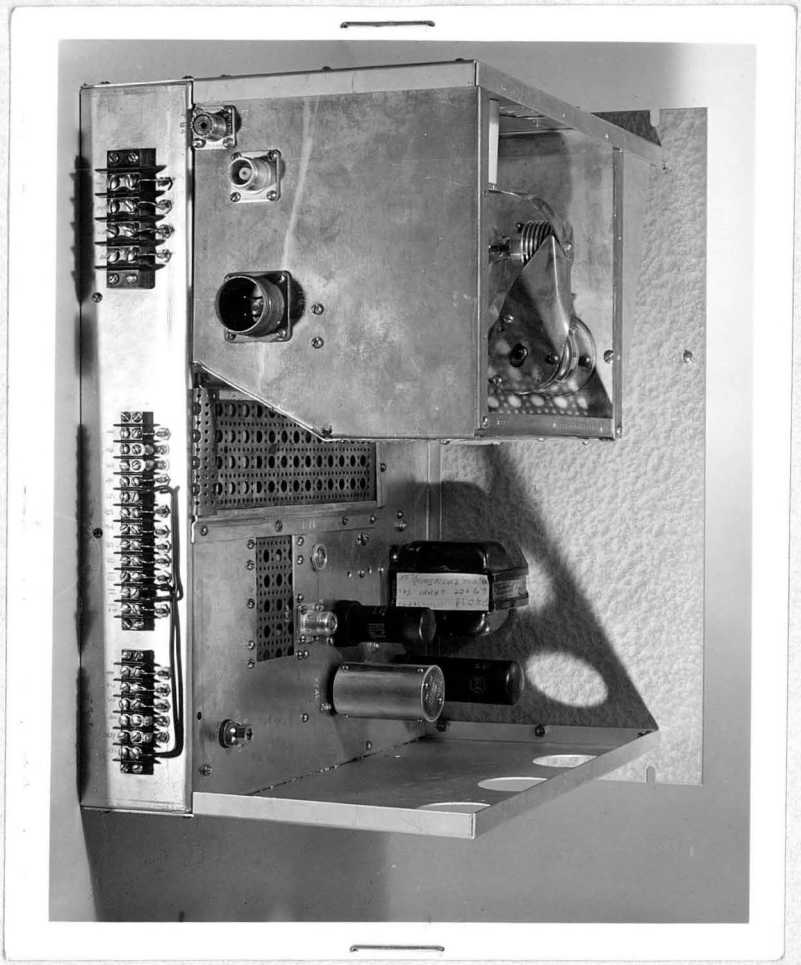


SLIDE 1



SLIDE 2

For Slide 3 see last page.



SLIDE 4

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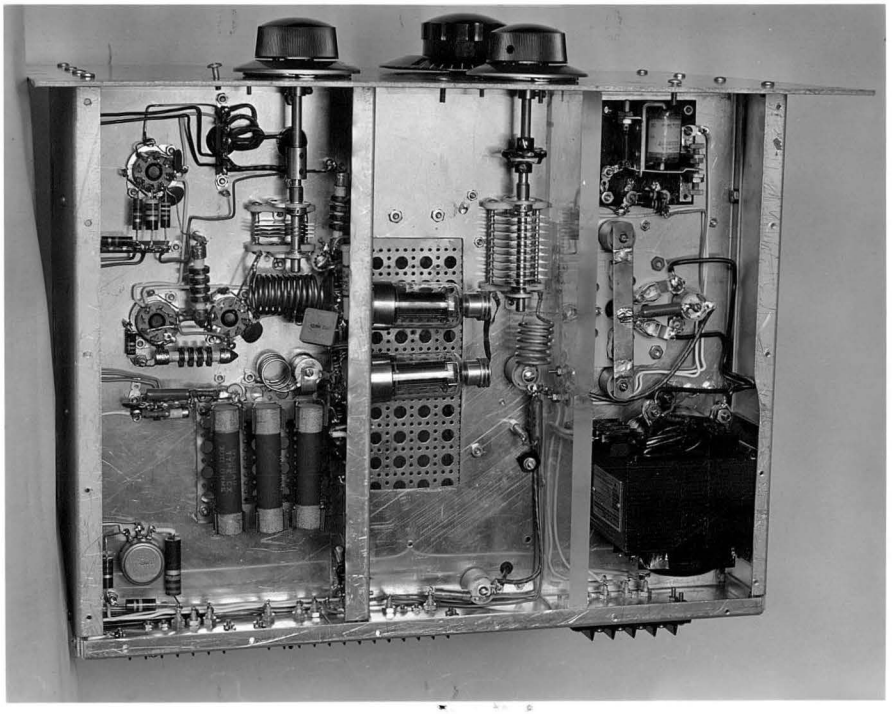
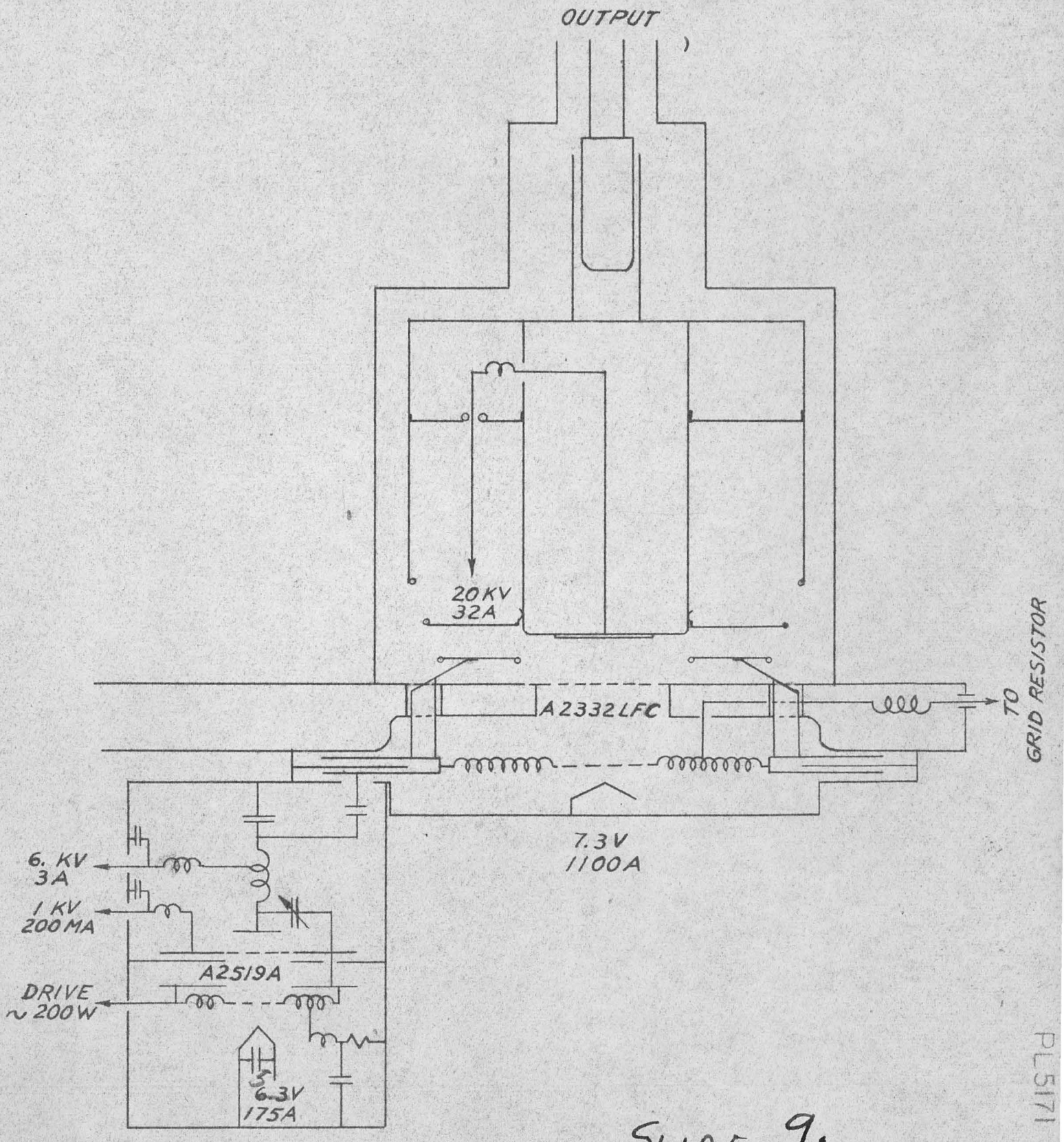


SLIDE 6

SLIDE 7

SLIDE 8

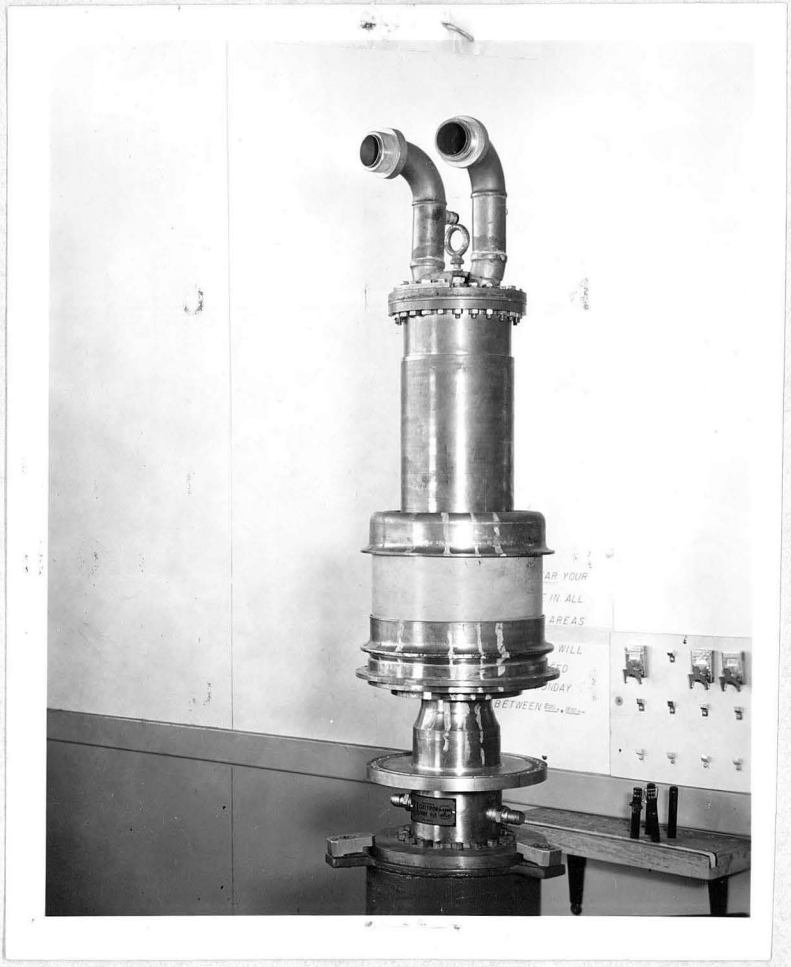
SIMPLIFIED SCHEMATIC
50 MC - 500 KW POWER UNIT
(PL 5171)



PL 5171

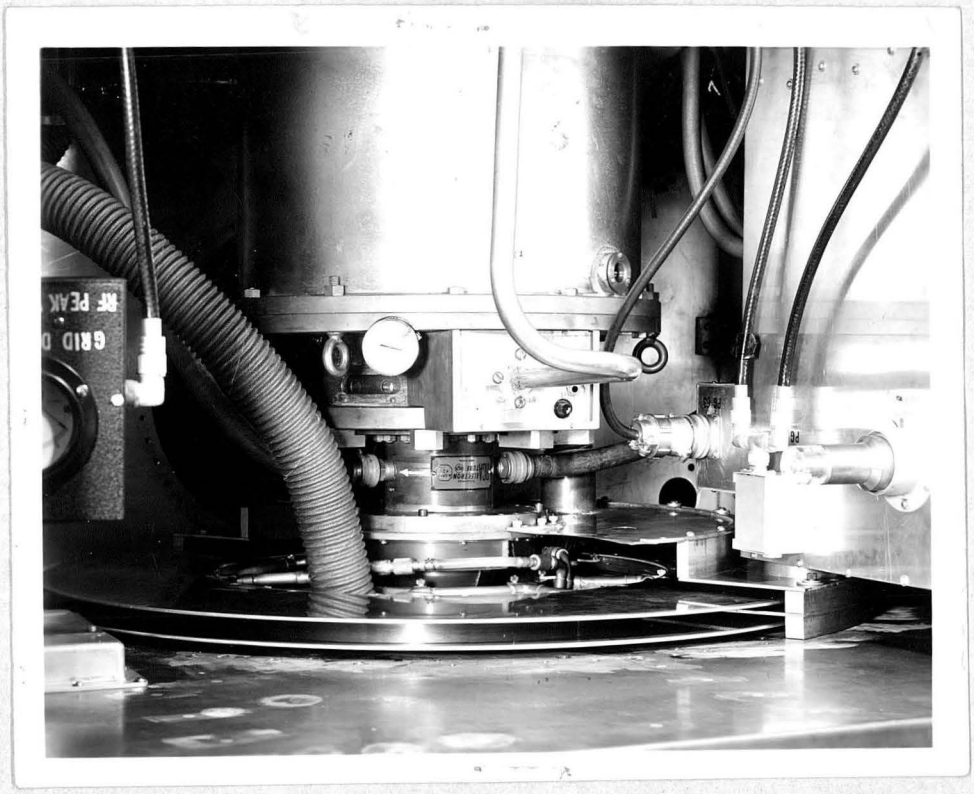
PL 5171

SLIDE 9.

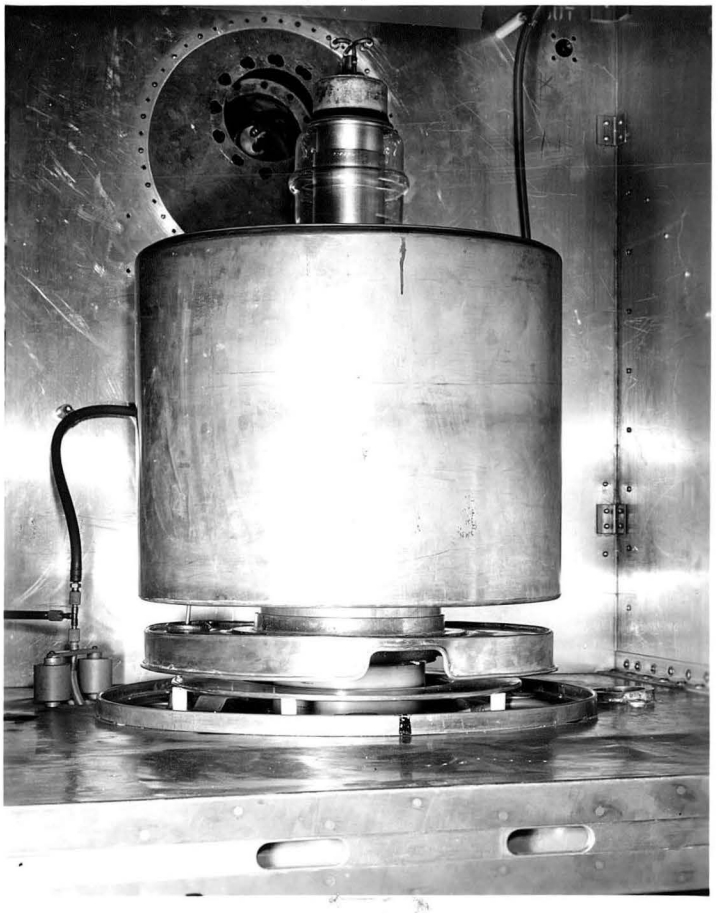


SLIDE 10

SLIDE 11 deleted by author
not used in talk.



SLIDE 12



SLIDE 13

SLIDE 14

SLIDE 15

LIST OF MATERIAL		
ITEM OR PART NUMBER	DESCRIPTION	

8-PIN OCTAL SOCKET

V-1 6AG7

XTAL-1 MONITOR CRYSTAL 12.1375 MC MILITARY TYPE CR-18/U

C-6 .001MF 500V CERAMICON

C-3 0-50MMF HAMMARLUND MC50-S

C-4 .001MF STAND-OFF CERAMICON 500V

L-1 2.5MHY 250MA MILLEN

L-2 2.5MHY 250MA MILLEN

L-4 2.5MHY 250MA MILLEN

L-3 3/4" DIA AIR CORE 10TURNS #10 WIRE

C-1 .001MF 600V DISC

C-2 .001MF 600V DISC

C-5 .001MF STAND-OFF CERAMICON 500V

R-1 47K 1W

R-2 80K 1W

C-7 .001MF 500V CERAMICON

ADJ FOR 3.5 GRID MA.

V-2 2E26

R-4 47Ω 2W

R-14 47Ω 2W

L-5 10 OHMITE Z-6

C-10 .001MF 600V DISC

C-8 .001MF 500V STAND-OFF CERAMICON

C-12 .001MF STAND-OFF CERAMICON 500V

R-3 10K 2W

C-7.1 .001MF 500V FEED THRU

TO TS2-8

C-9 .001MF STAND-OFF CERAMICON 500V

C-13 .001MF STAND-OFF CERAMICON 500V

R-8 20K 10 WATT WIRE WOUND

L-6 10 OHMITE Z-50

C-11 .001MF 500V DISC

R-5 47Ω 2W

R-7 47Ω 2W

C-46 .001MF 500V CERAMICON

C-16 .001MF 500V FEED THRU

C-17 .001MF 500V FEED THRU

C-18 .001MF 500V CERAMICON

C-22 .001MF 500V FEED THRU

TO TS2-6

TO TS2-4

PG-1 INPUT FROM LIMITER AMP AMPHENOL 83-1R

C-38 .001MF 500V STAND-OFF CERAMICON

R-11 47K 2W

V-6 6L6

R-15 100K 1W

C-41 .001MF 500V CERAMICON

R-16 100K 1W

C-40 .001MF 500V DISC

C-47 C-48

R-17 25K 2W POT

C-42 .001MF 500V STAND-OFF CERAMICON

.001MF 500V FEED THRU TO TS2-10

TO TS2-9

R-18 22K 2W

XTAL-2 IN39

C-44 .001MF 500V CERAMICON

L-15 1 OHMITE Z-50

½" WIDE COPPER STRAP

R-19 200Ω TYPE CX GLOBAR

R-20 200Ω TYPE CX GLOBAR

R-21 200Ω TYPE CX GLOBAR

C-45 JOHNSON 503-1 10-35MMF

L-14 4 TURNS #16 WIRE 3/4" DIA AIR CORE

½" WIDE COPPER STRAP

V-3 2E26

SHIELD UNDER CHASSIS

T-1 THORDARSON T21-F11

C-54 .001MF 500V FEED THRU

TO TS1-1

TO TS1-2

6.3V, 6A

C-43 .001MF 500V FEED THRU

TS-1

115V. AC.

105V DR.

300V DR.

C-50 .001MF 500V FEED THRU

TS-2

4-250A Eg

4-250A Ig

2E26 Ip

2E26 Ig

LIMITER OUTPUT

6AG7 Ip

C-51 .001MF 500V FEED THRU

R-22 5M 1W W.W. PREC.

C-49 100MMF CENTRALAB 7505-100N-N750 5KV

R-23 10K 2W

R-24 2K 1W

TS-3

115V A.C.

INTERLOCK TO DRV. CHAIN

6 RELAY

3/4" DIA AIR CORE 3 TURNS #10 WIRE L-7

NEUTRALIZING CAPACITOR 1/4" BRASS ROD 5" LONG 3/8" FROM 4-250A ENVELOPE ELEVATION ABOVE CHASSIS ADJUSTABLE

V-4 4-250A

TIE PINS 2 & 4 TOGETHER WITH 1/4" COPPER STRAP

CENTRALAB 7505-100N N750

C-14 0-50MMF HAMMARLUND MC50-S

C-15 2.5KV STANT CERAMICON CENTRALAB 8505-50N, N750

L-9 10 OHMITE Z-50

L-8 10 OHMITE Z-50

C-19 .001MF 500V CERAMICON

C-20

L-11 3 TURNS OF 1/2" x 1/2" Cu. STRAP 1" CENTER TO CENTER BETWEEN TRANS & AIR GAP AIR CORE

C-23 100MMF 5KV CERAMIC CENTRALAB 7505-100N N750

C-26 100MMF 5KV CERAMIC

L-10 10 OHMITE Z-50

C-24 .001MF 600V DISC

C-25 .001MF 600V DISC

C-27 100MMF 5KV CERAMIC CENTRALAB 7505-100N N750

R-9 10K 2W

C-21 .001MF 500V STAND-OFF CERAMICON

WARD LEONARD KL-1 250-44

R-10 15K 1W

R-11 20K 1W

.001MF 500V FEED THRU

T-2 E.S. #E4905A

C-28

C-29

TO TS3

TO TS2-2

C-35 100MMF 5KV CENTRALAB 7505-101N N750

L-12 16 TURNS #10 WIRE ON 1" DIA FORM

PG-2 AMPHENOL 82-805 6166 GRID OUTPUT

PG-3 AMPHENOL AN3102-22-1P 4-250A METERING

C-30 4-250 MMF MINICA CCB-L

C-31 50 MMF 7.5KV CERAMIC CENTRALAB 850S-50N, N750

C-32 100MMF 15KV CERAMIC CENTRALAB 851-100N N750

C-33 75MMF 7.5KV CERAMIC CENTRALAB 850S-75N N750

C-34 500MMF 10KV CERAMIC CENTRALAB TV3-501

CALCANE BOX ON TOP OF CHASSIS

V-5 1/2 6AL5

L-13 10 OHMITE Z-50

C-36.1 .001MF 500V FEED THRU

C-37 .001MF 500V STAND-OFF CERAMICON

R-12 1M 1/2W

R-13 110K 1/2W

C-38 .001MF 500V STAND-OFF CERAMICON

PG-4 83-1R 6166 GRID DRIVE

BELDEN 8689 WIRE OR EQUIV. (10KV TEST)

4

EM (157) DRAFT WOODSIDE EM (124) MORENO

Change Letter	Drawn By	Check By	Date	CHANGES

FINISHES: SAW CUT, FLAME CUT, SHEAR; ROUGH MACHINE; AVERAGE MACHINE; SMOOTH MACHINE

SHOP NOTES: UNLESS OTHERWISE SPECIFIED 1. TOLERANCES + ON DIMENSIONS — 2. BREAK EDGES 1/64 MAX. 3. 20° CHAMFER ENDS OF ALL SCREW THREADS 4. 11½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

SHOP ORDERS: ACCT NO. 4114-02; SERIAL NO. SHOWN ON; DATE ISSUED 3PL4371/54; DATE REQD.; NO. REQD.; DELIVER TO

DESIGN ACC'T No. 4114-02

A-4B DRIVER CHASSIS

4-250A

SCHEMATIC

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