N.W. set #2 description

National Research Council Canada. Radio Section

PRA; no. PRA-11, 1941-10

ELEC. ENG.

SECRET

PRA-11

Copy No. 22

NATIONAL RESEARCH COUNCIL OF CANADA

RADIO SECTION

OTTAWA

OCTOBER, 1941

SECRET

PRA-11

ANALYZED

Copy No. 22

Revision of Previous
Pamphlet entitled
"N.W. Set #2"
May, 1941.

NATIONAL RESEARCH COUNCIL OF CANADA

RADIO SECTION

N.W. SET #2
DESCRIPTION

OTTAWA

OCTOBER, 1941

N.W. SET #2
DESCRIPTION

GENERAL

N.W. #2 operates on a wavelength of 140 cm. It requires a 110-120 volt, 60 cycle supply and draws a total of about 4 amperes.

The two units (receiver and transmitter) can be readily assembled with the aid of Drawings 26 and 27, filed at the back of these instructions, and by following the code markings on the several cables found within the cabinets. The proper locations for the various electron tubes can be found in Drawings 28 to 34. The inter-cabinet cables are indicated in Drawing 8.

RECEIVER UNIT

1. Line Voltage Control The variac on the receiver unit (Dwgs. 8 & 26) controls the supply voltage to both receiver and transmitter units. This voltage is indicated on both units by A.C. voltmeters (Dwgs. 26 & 27). From the variac the current passes through plug fuses and door interlock switches on each unit, thence to the power switches.

2. Receiver Power Supply Chassis (Dwg. 30) The receiver power switch is located at the bottom of the meter panel (Dwg. 26) and an auxiliary power switch is situated behind the power chassis (Dwg. 30). These switches control the filament supplies, the 300 volt regulated plate supply (Dwg.16), the -150 volt bias supply (Dwg.15) and the 3600 volt scanning supply (Dwg.9). There is a switch for the latter on the back of the chassis.

SECRET

The output potential of the regulated supply may be adjusted by means of a rheostat (screwdriver control) on the top of the chassis.

3. Receiver Chassis (Dwgs. 11, 23, 24 & 28) The receiver for N.W. #2 has one R.F. stage whereas N.W. #1, which was demonstrated at Halifax, had none. Receivers with two and three R.F. stages are now being prepared for production. The model with one R.F. stage gives satisfactory results, but the later models considerably improve the signal-to-noise ratio.

The R.F. and first detector stages are tuned by screwdriver adjustment from the front of the panel (Dwg. 26). The local oscillator frequency is adjusted by the knob on the same panel. The gain control (screen voltage on I.F. stages) is situated in the center of the meter panel.

4. Scanning Chassis (Dwgs. 18, 25, 26 & 29) The centering, focus and intensity controls are on the front of the panel. The recurrence frequency control (Dwg. 29) is normally adjusted to 1000 c.p.s. The sweep balancing control is adjusted, if necessary, to give a 45° line on the C.R. tube when the sweep voltage from the 6AC7 tube is applied to one pair of deflecting plates, and that from the 884 to the other pair. The range in miles represented by the length of the scanning line may be altered by changing the position of the plug in the four red plug sockets above the C.R. tube socket. The ranges provided are roughly 3-1/2, 7, 10 and 14 miles.

SECRET
PRA-11

TRANSMITTER UNIT

1. Oscillator Power Supply and Modulator Chassis (Dwgs. 13, 17 & 32)

The control switches are found on the meter panel (Dwg. 27). The variac on the bottom panel controls the oscillator plate supply voltage. The pulse duration control is situated on the back of the power pack chassis (Dwg. 32).

2. Oscillator Chassis (Dwgs. 19 & 31) The controls on the front of the panel (Dwg. 27) are the aerial coupling condenser, the plate tuning condenser and the grid leak control. The latter is not critical.

3. Monitor Chassis (Dwgs. 20, 21 & 33) The monitor indicates the form of output pulse being transmitted. The signal is picked up on a short aerial behind the panel, and applied to the monitor C.R. tube. A toggle switch on the front of the panel (Dwg. 27) changes the pulse control from receiver to transmitter. In the latter case the pulse is generated in the monitor chassis, allowing the transmitter to be tested in the absence of the receiver. Ganged with this switch is another which takes the triggering pulse to the modulator unit from the scanning chassis or the monitor chassis, respectively. A screwdriver control on the chassis (Dwg. 33) controls the recurrence frequency of this monitor pulse generator. Another screwdriver control at the rear of the chassis controls the sweep delay.

AERIALS (Dwgs. 35 & 36)

Two billboards covered with 1/4" mesh wire cloth are required to mount the two 20-element arrays. Only the arrays proper are being sent. Details are given in Drawings 35 and 36.

Each array is centre fed and has an impedance of about 150 ohms. Open wire or concentric line may be used, but in either case provision must be made for matching the line to the array. This may most easily be done with a stub on the open wire feeder at the array. The length and position of this stub can only be found by experiment.

Using the transmitter as a test oscillator, with 600-800 volts on the plates, it should be possible to reduce the standing wave ratio to 1.3 or better. Trombones are provided in case it is desirable to use concentric line. These have an impedance of 280 ohms when connected to 70 ohms concentric. Soft copper coaxial cable, type 22, supplied by Victor J. Andrew of Chicago, Ill., is recommended. A trombone is provided to bring the balanced transmitter output to the unbalanced coaxial cable. This may be mounted inside the transmitter with flexible leads to adjustable clips on the coupling loop.

If open wire line is used to the receiver, this trombone may be used to bring the line into concentric for the receiver input. The tap on the grid coil of the R.F. stage may have to be adjusted together with the tuning condenser, in order to obtain the best match to the feeder.

PRA-11

OPERATING INSTRUCTIONS

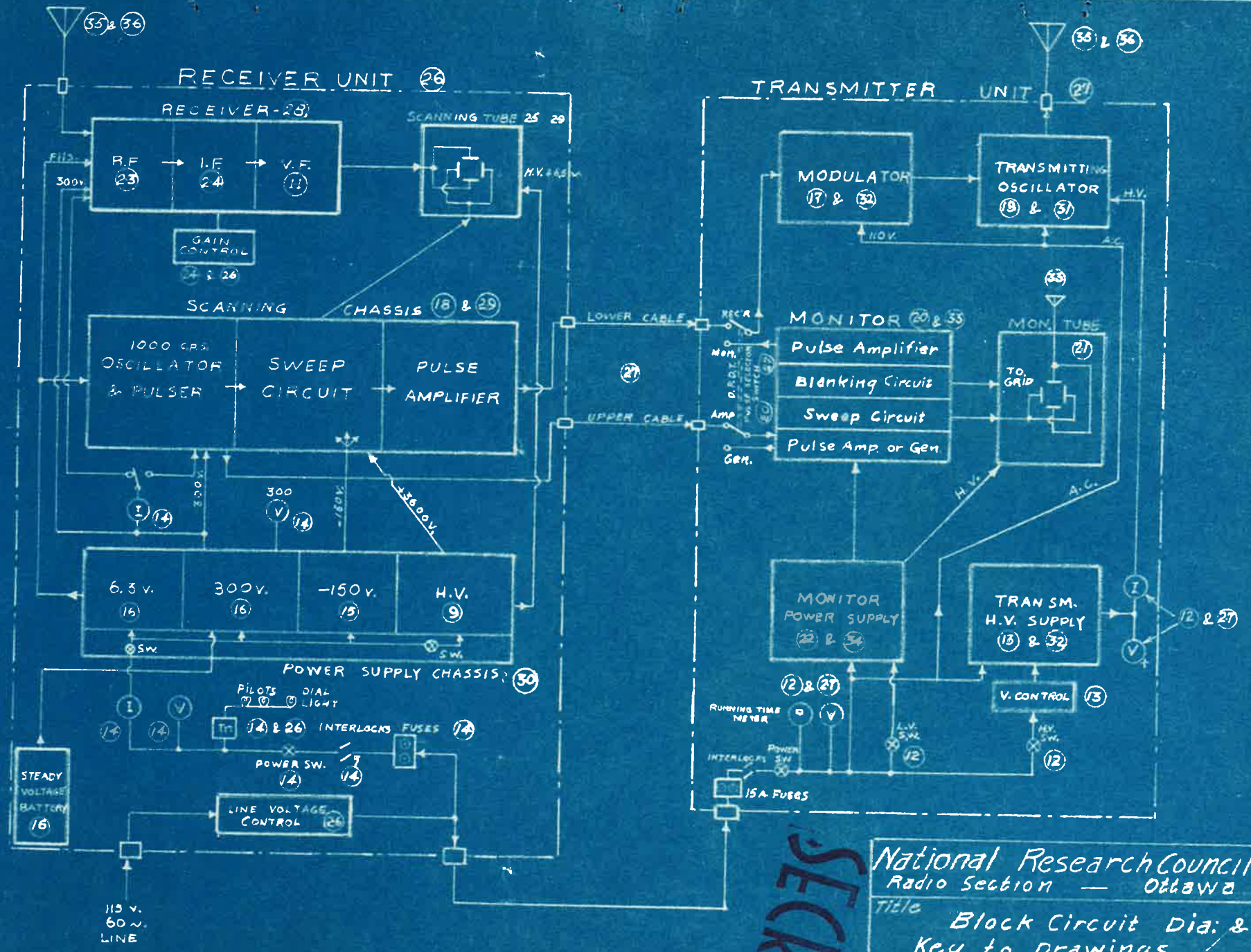
Turn on the receiver and transmitter power switches and adjust the variac on the receiver to 120 volts. When the sweep on the scanning tube is working, switch on the high voltage on the transmitter and turn up its variac to 110-130. Tune the oscillator; if necessary, also the receiver. Observe the 'pips' on the scanning sweep line produced by reflected signals.

CAUTION 1. Never turn off the receiver with high voltage on the oscillator plates, as they are likely to flash over.

2. If making adjustments on the transmitting chassis with power on, avoid contact with the plate circuit, which carries 9000 volts; similarly on the scanning chassis where 3600 volts are present.

SECRET

LIST OF DRAWINGS

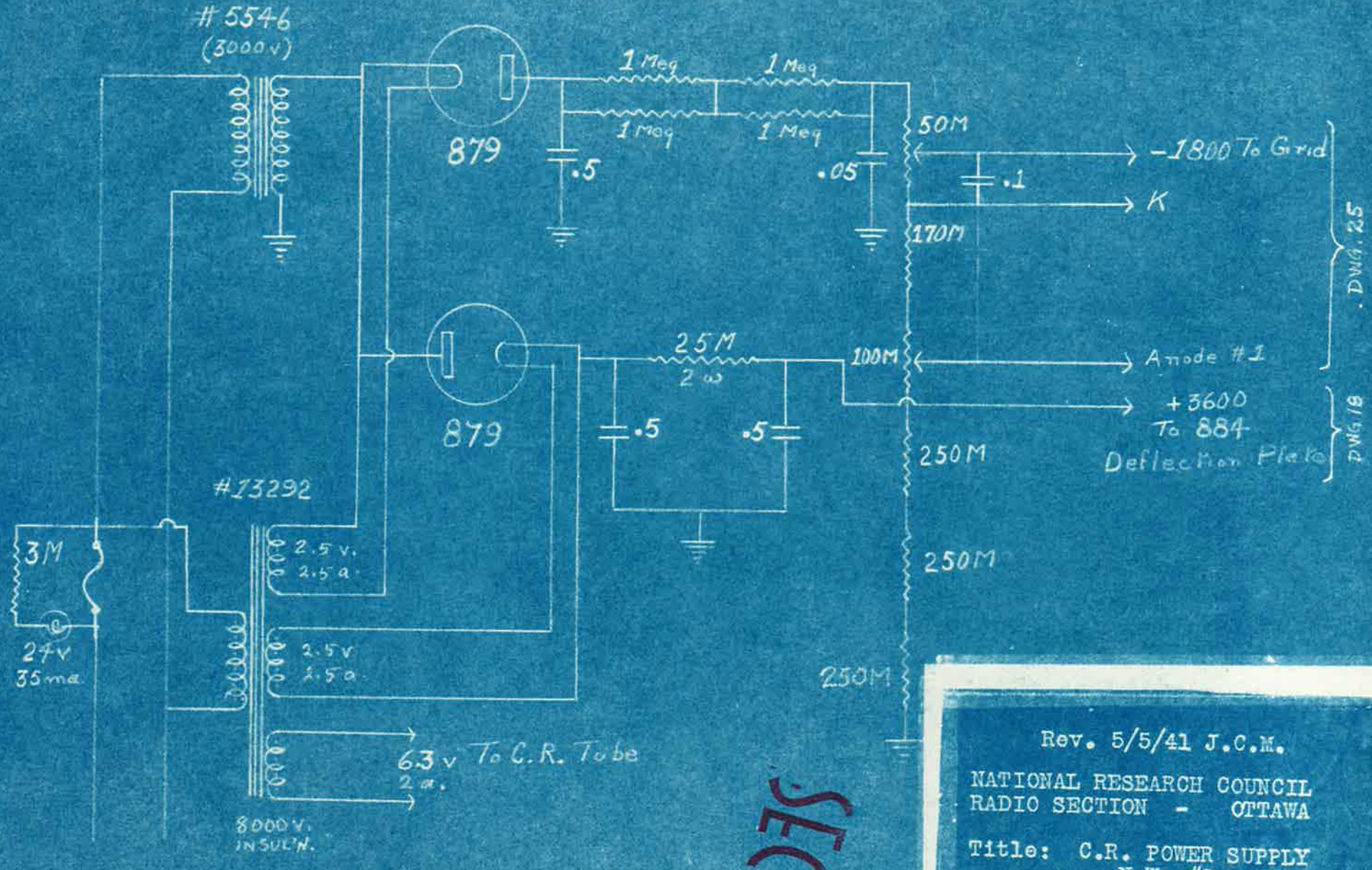


No. Numbers in Circles Refer to Drawings.

National Research Council
Radio Section — Ottawa

Title: Block Circuit Dia: & Key to Drawings N.W. #2

Orig. by J.C.M.	Retraced by J.L.C. Oct 21/41
Dr'n by J.C.M.	Ch'k by J.C.M.
Date Aug. 5/41	Ref No. 8



SECRET

Rev. 5/5/41 J.C.M.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

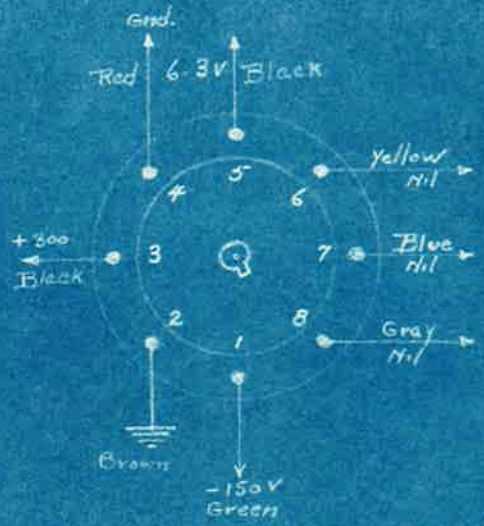
Title: C.R. POWER SUPPLY
N.W. #2

Orig. by J.C.M.
Drawn by J.E.L.
Ck'd by H.R.S.
Date Feb.24/41 REF. #9

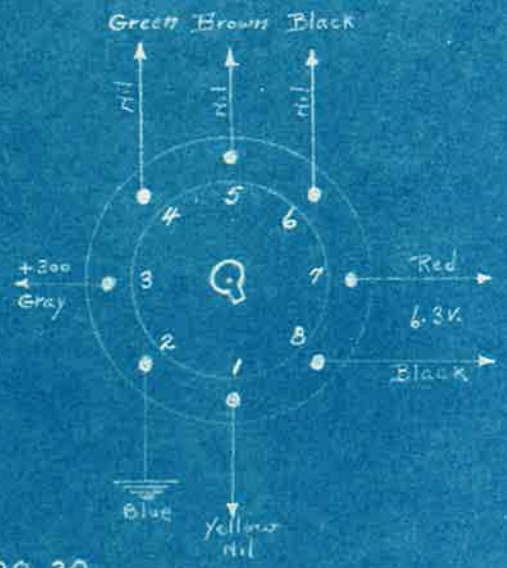
5AP4

(Cf DWG 25)

Scanner Connector



Receiver Connector

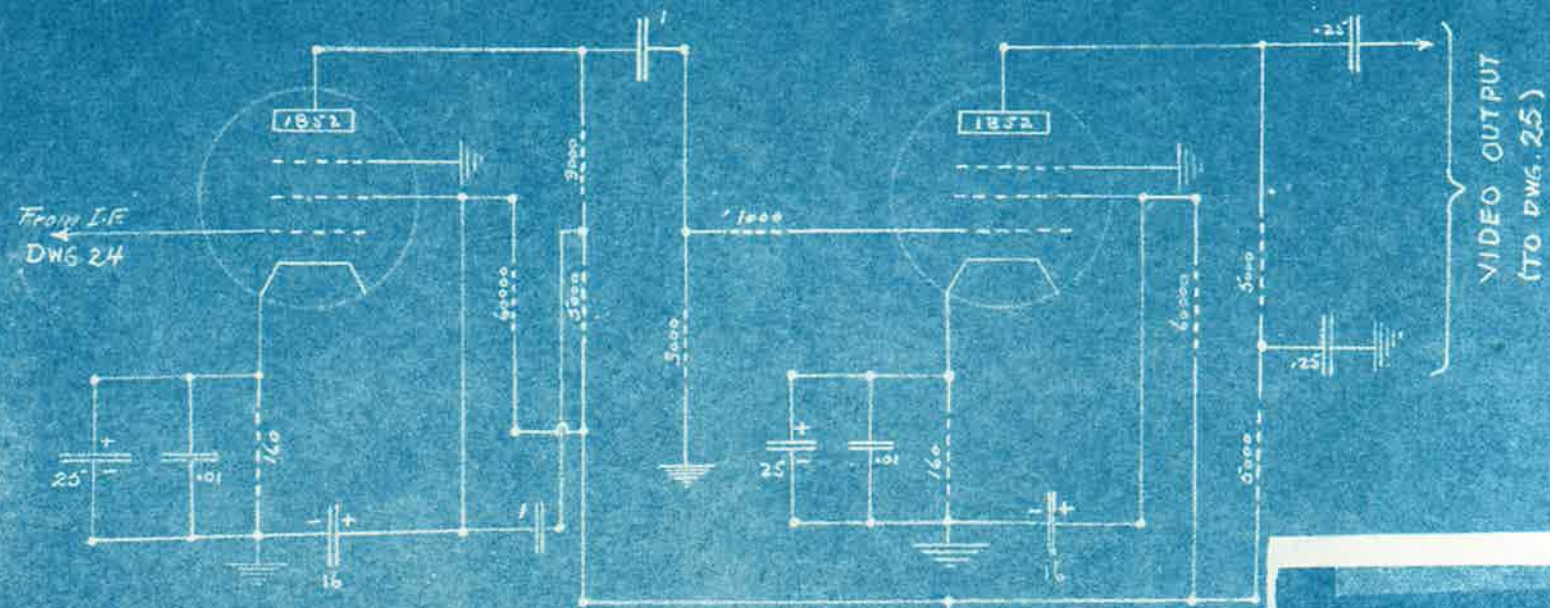


Cf. DWGS. 28-30

SECRET

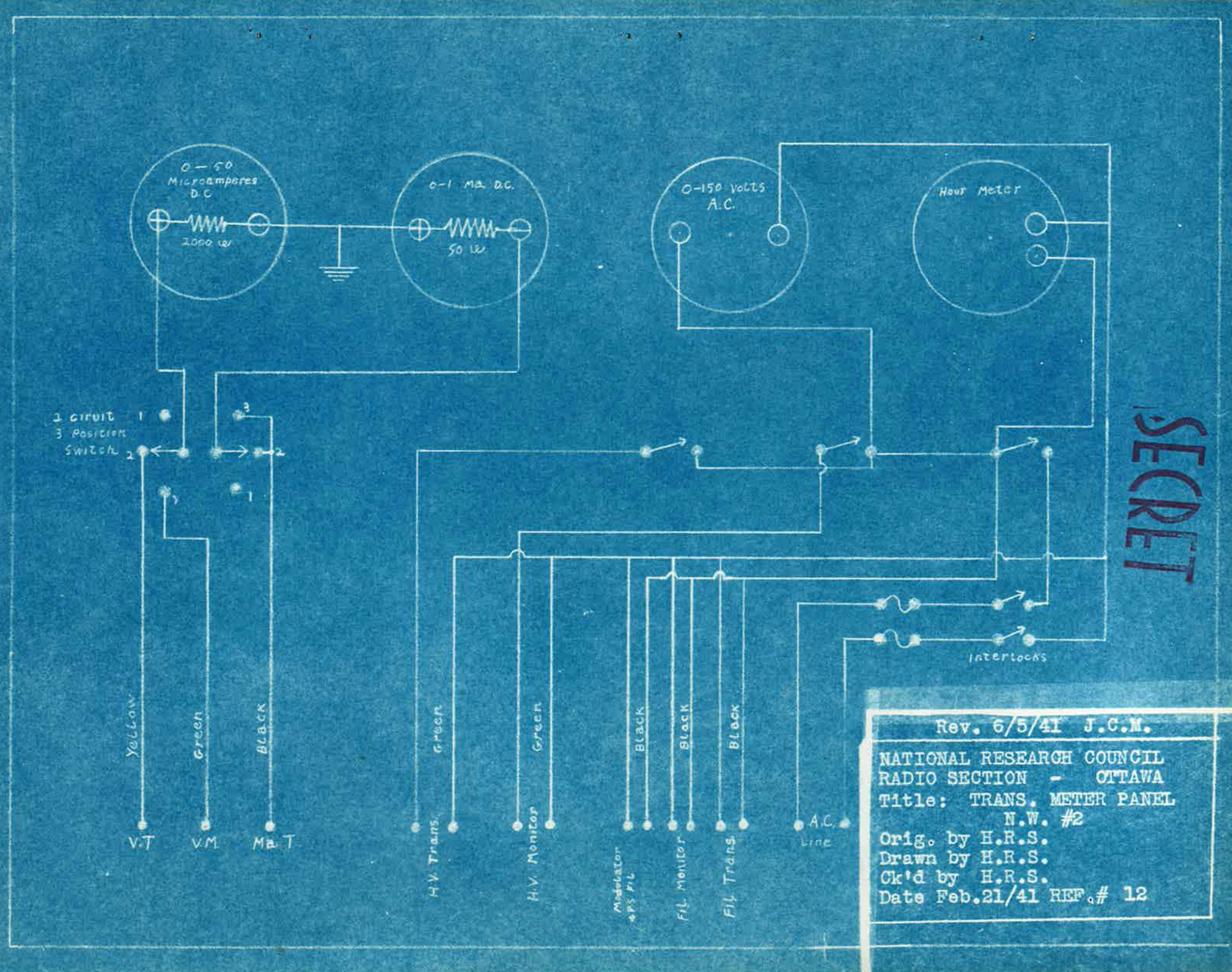
Rev. 6/5/41 J.C.M.
NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

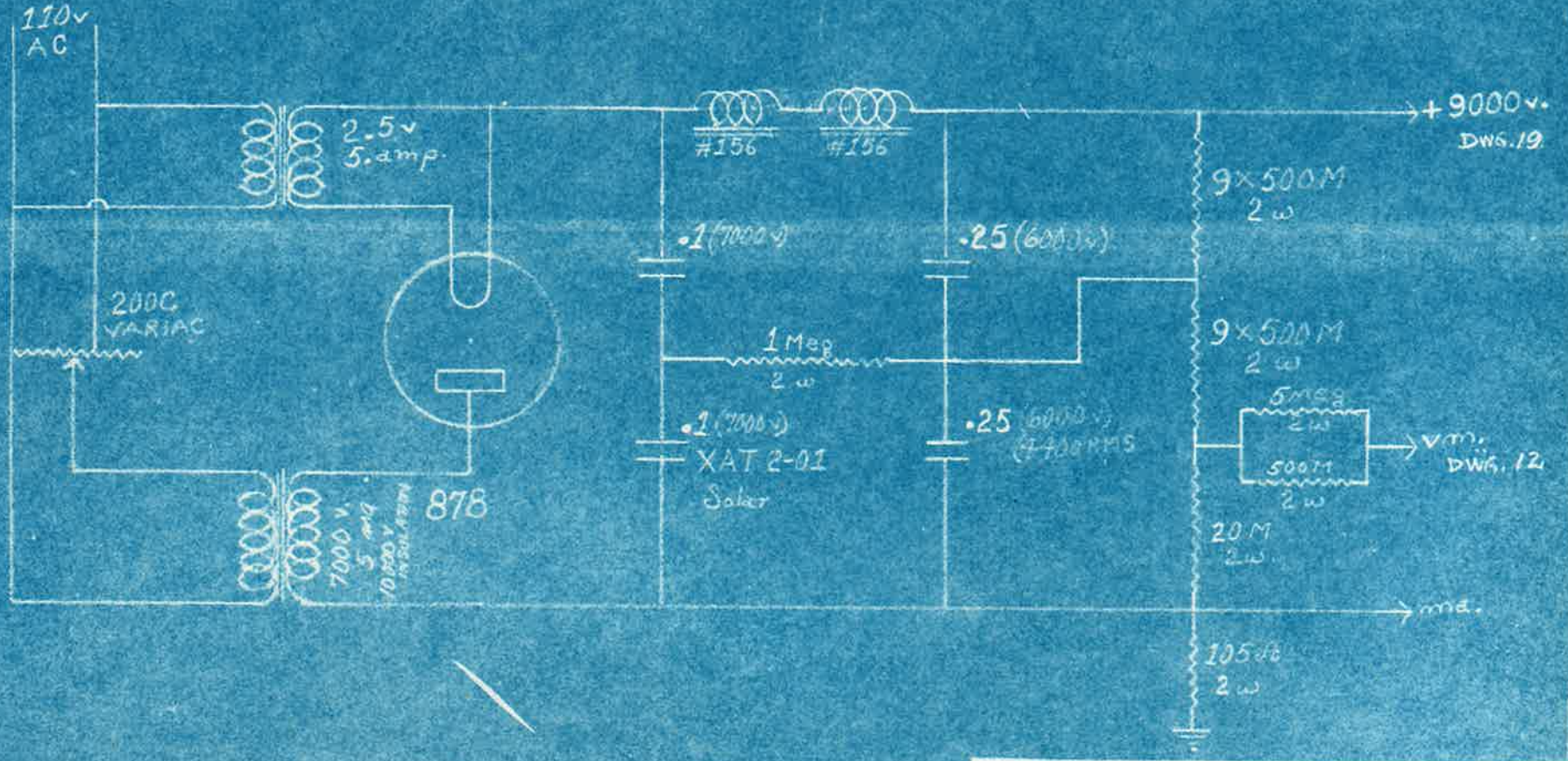
Title: SOCKET CONNECTIONS
N.W.#2 140 CM
Orig. by H.R.S.
Drawn by H.R.S.
Ck'd by H.R.S.
Date Feb./41 REF. #10



Rev. 6/5/41 J.C.M.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA
Title: VIDEO AMPLIFIER
N.W. #2 140 CM
Orig. by H.R.S.
Drawn by H.R.S.
Ck'd by H.R.S.
Date Feb./41 REF. #11


0 – 50 Microamperes D.C
2000 Ω
0-1 Ma. D.C.
50 Ω
0-150 Volts A.C.
Hour Meter
1 Circuit 3 Position Switch
Yellow
Green
Black
V.T
V.M
Ma.T
H.V. Trans.
Green
H.V. Monitor
Green
Modulator & PS Fil.
Black
Fil. Monitor
Black
Fil. Trans.
Black
A.C. Line
Interlocks
SECRET
Rev. 6/5/41 J.C.M.
NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA
Title: TRANS. METER PANEL
N.W. #2
Orig. by H.R.S.
Drawn by H.R.S.
Ck'd by H.R.S.
Date Feb.21/41 REF.# 12

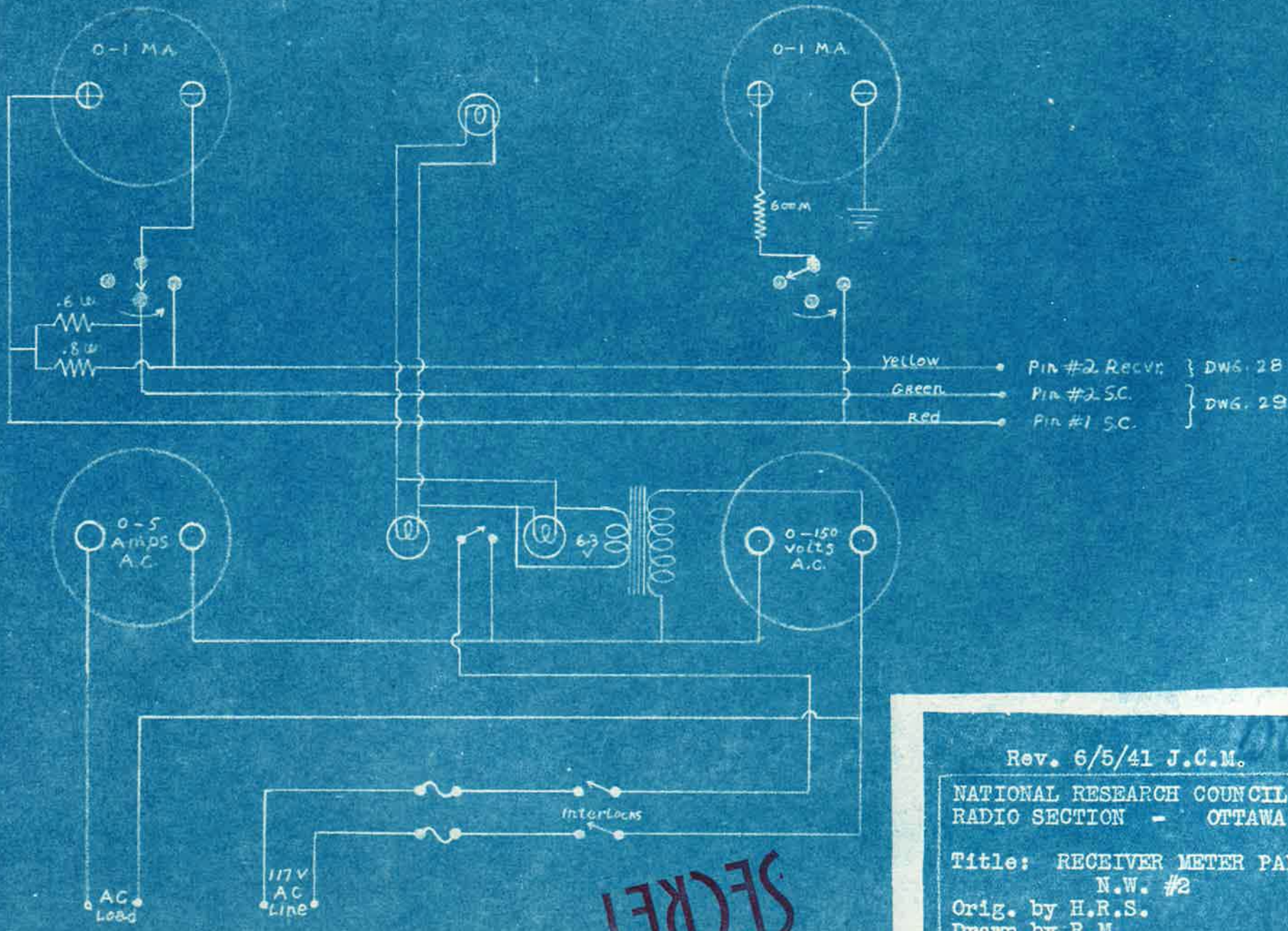


Rev. 6/5/41 J.C.M.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: OSCILLATOR POWER SUPPLY - N.W. #2

Orig. by H.R.S.
Drawn by J.E.L.
Ck'd by H.R.S.
Date Feb.20/41 REF. #13



SECRET

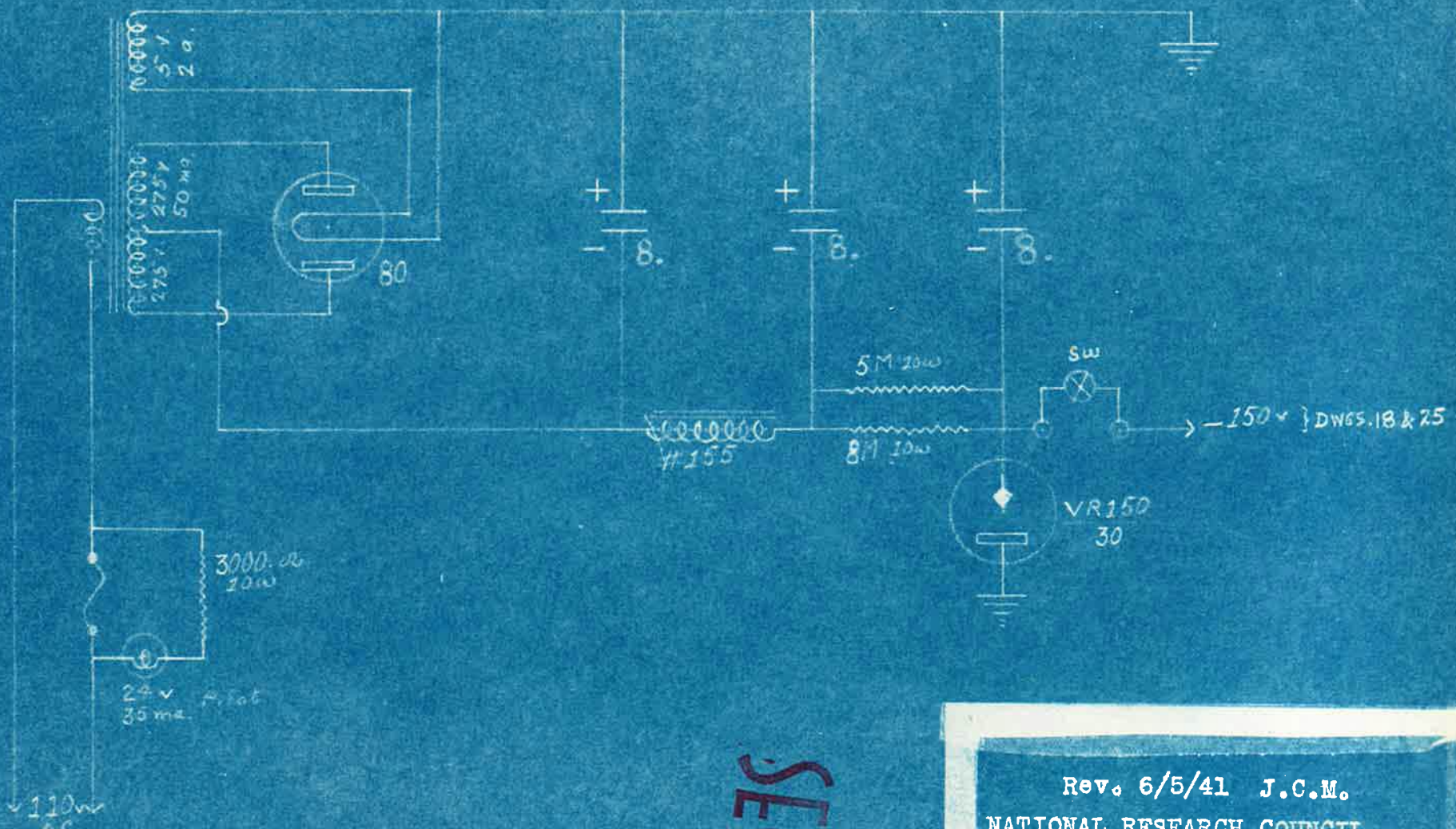
Rev. 6/5/41 J.C.M.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: RECEIVER METER PANEL
N.W. #2

Orig. by H.R.S.
Drawn by R.M.
Ck'd by H.R.S.
Date Feb.20/41 REF. #14

#271



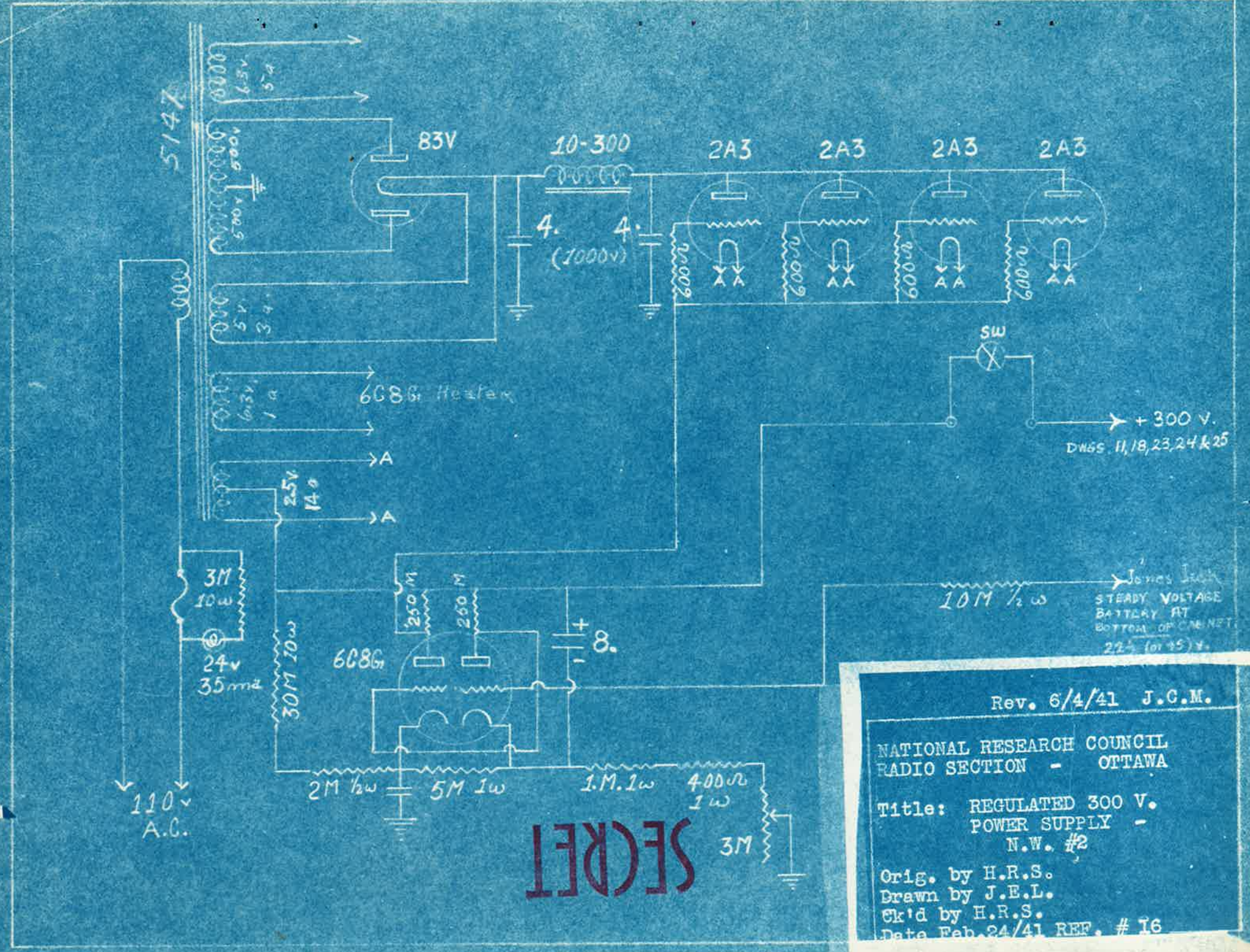
SECRET

Rev. 6/5/41 J.C.M.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: BIAS SUPPLY
N.W. #2

Orig. by H.R.S.
Drawn by J.E.L.
Ck'd by H.R.S.
Date Feb.22/41 REF. #15

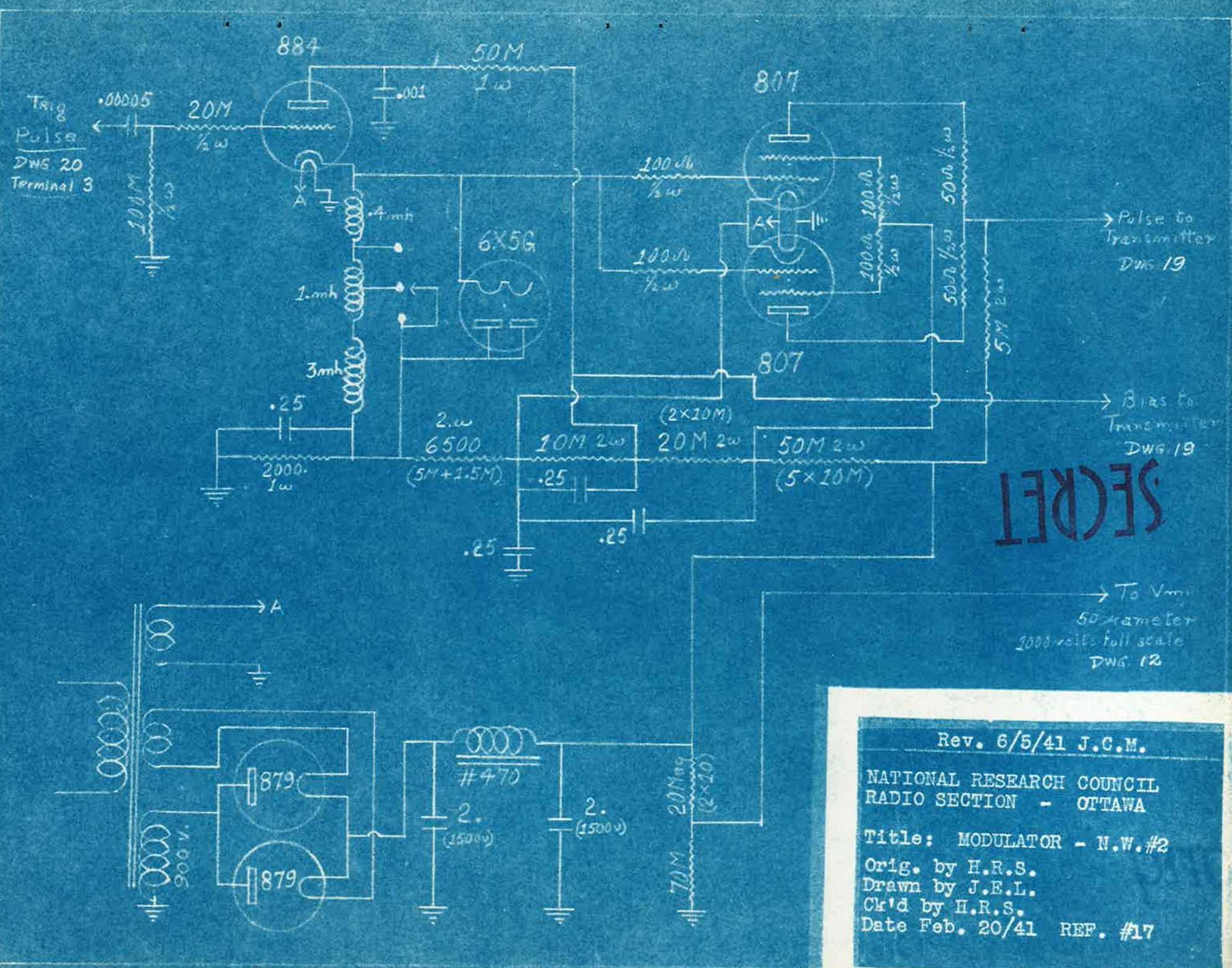


Rev. 6/4/41 J.C.M.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: REGULATED 300 V. POWER SUPPLY - N.W. #2

Orig. by H.R.S.
Drawn by J.E.L.
Ck'd by H.R.S.
Date Feb. 24/41 REF. # I6

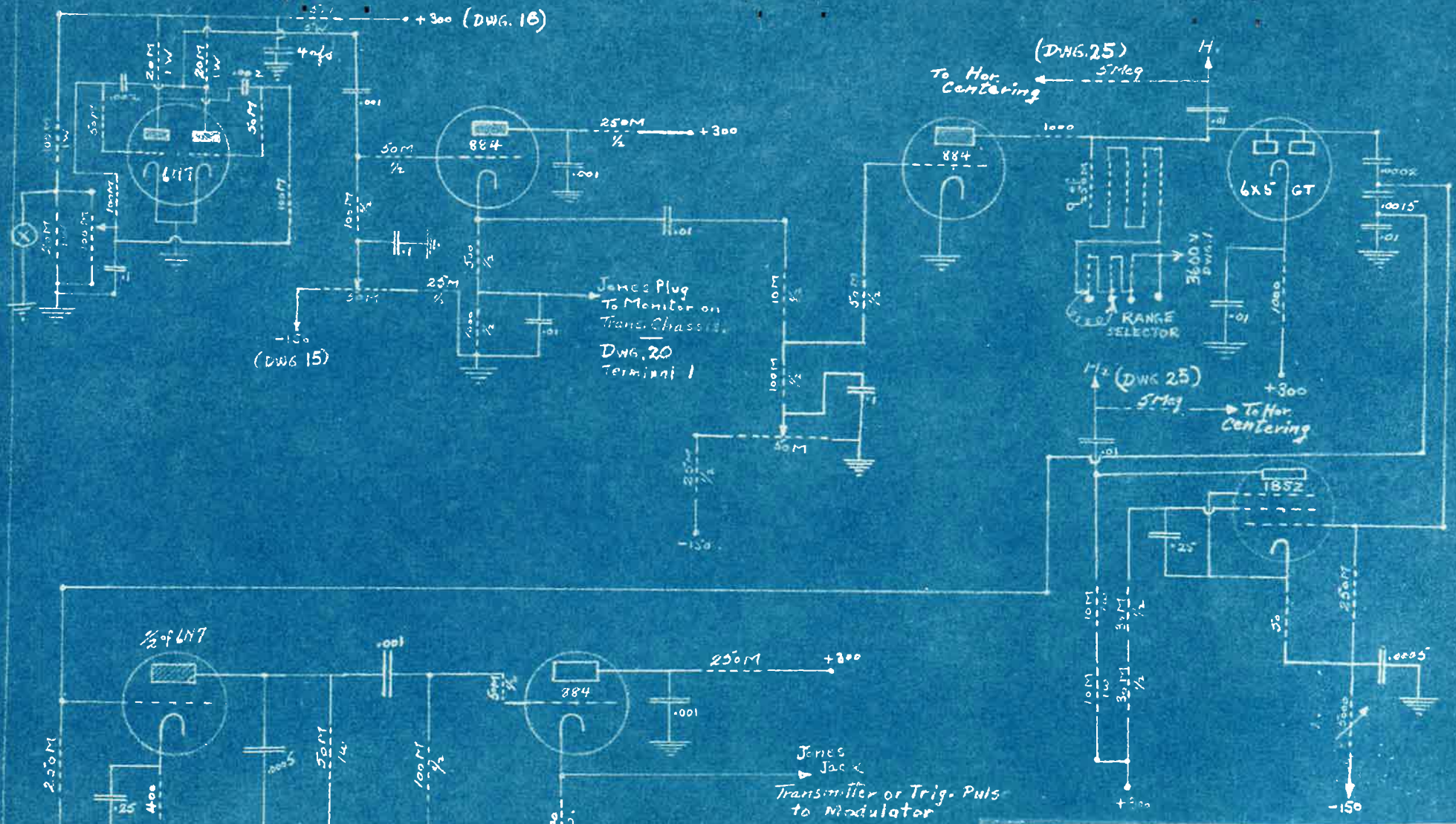


Rev. 6/5/41 J.C.M.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: MODULATOR - N.W.#2

Orig. by H.R.S.
Drawn by J.E.L.
Ck'd by H.R.S.
Date Feb. 20/41 REF. #17



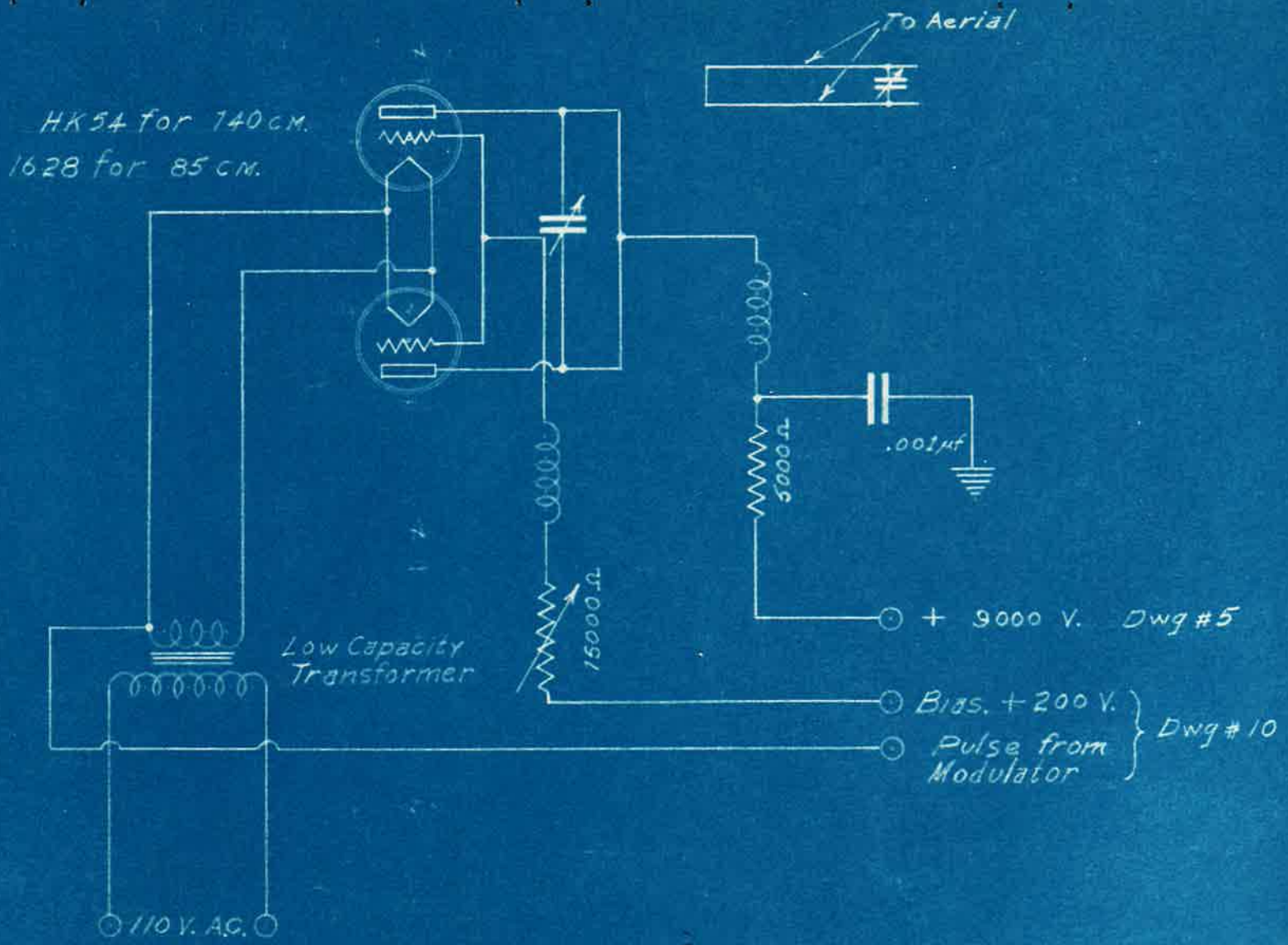
SECRET

Rev. 6/5/41 J.C.M.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: SCANNING CHASSIS
N.W. #2

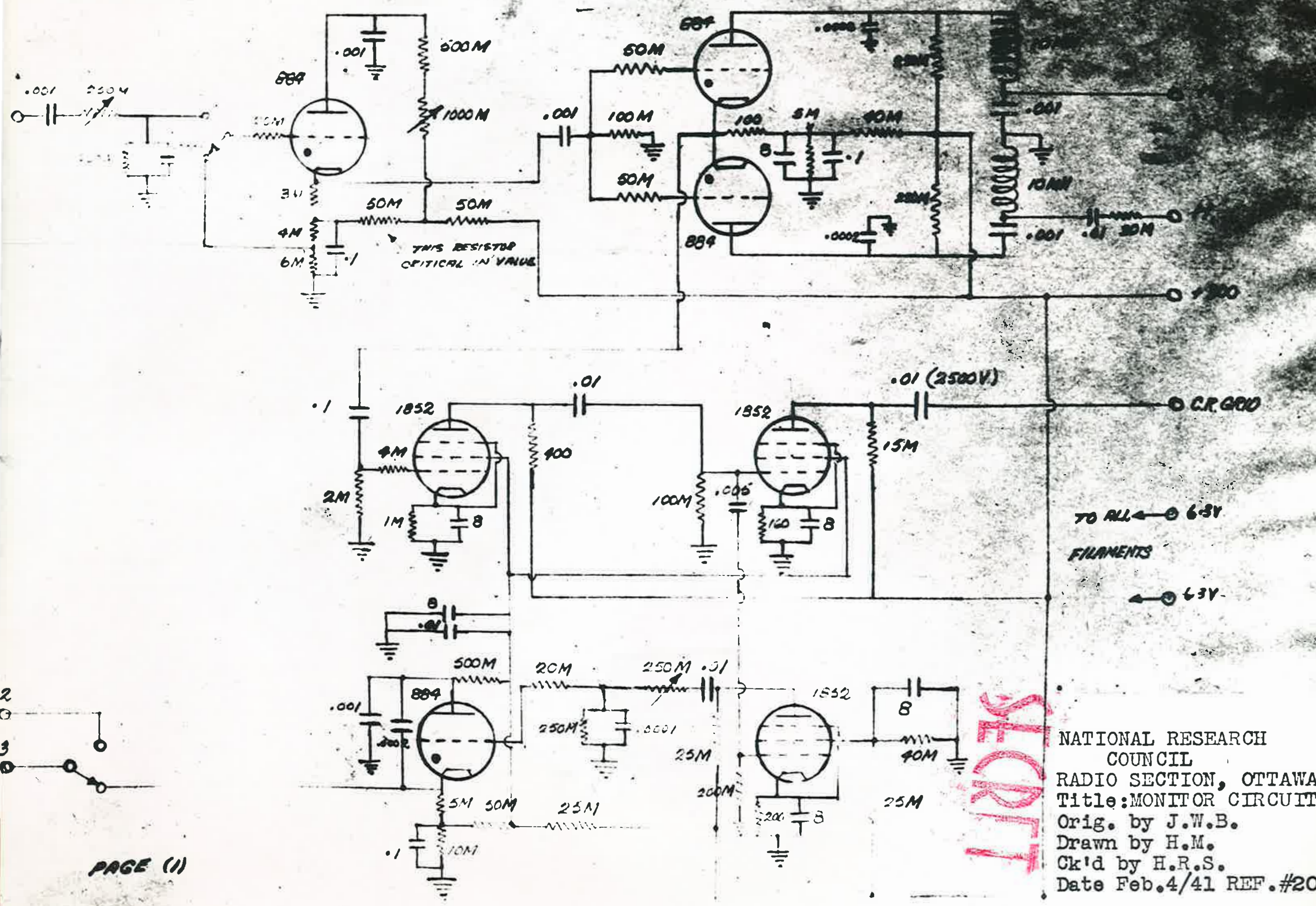
Orig. by H.R.S.
Drawn by H.R.S.
Ck'd by H.R.S.
Date Feb./41 REF. #18



SECRET

National Research Council	
Radio Section - Ottawa	
Title: Transmitter Oscillator Circuit N.W. #2	
Orig. by H.R.S.	Retraced by J.L.C. Oct 27/41
Dr'n. by J.L.C.	CH'K. by.
Date, Mar. 11/41	Ref. No. 19

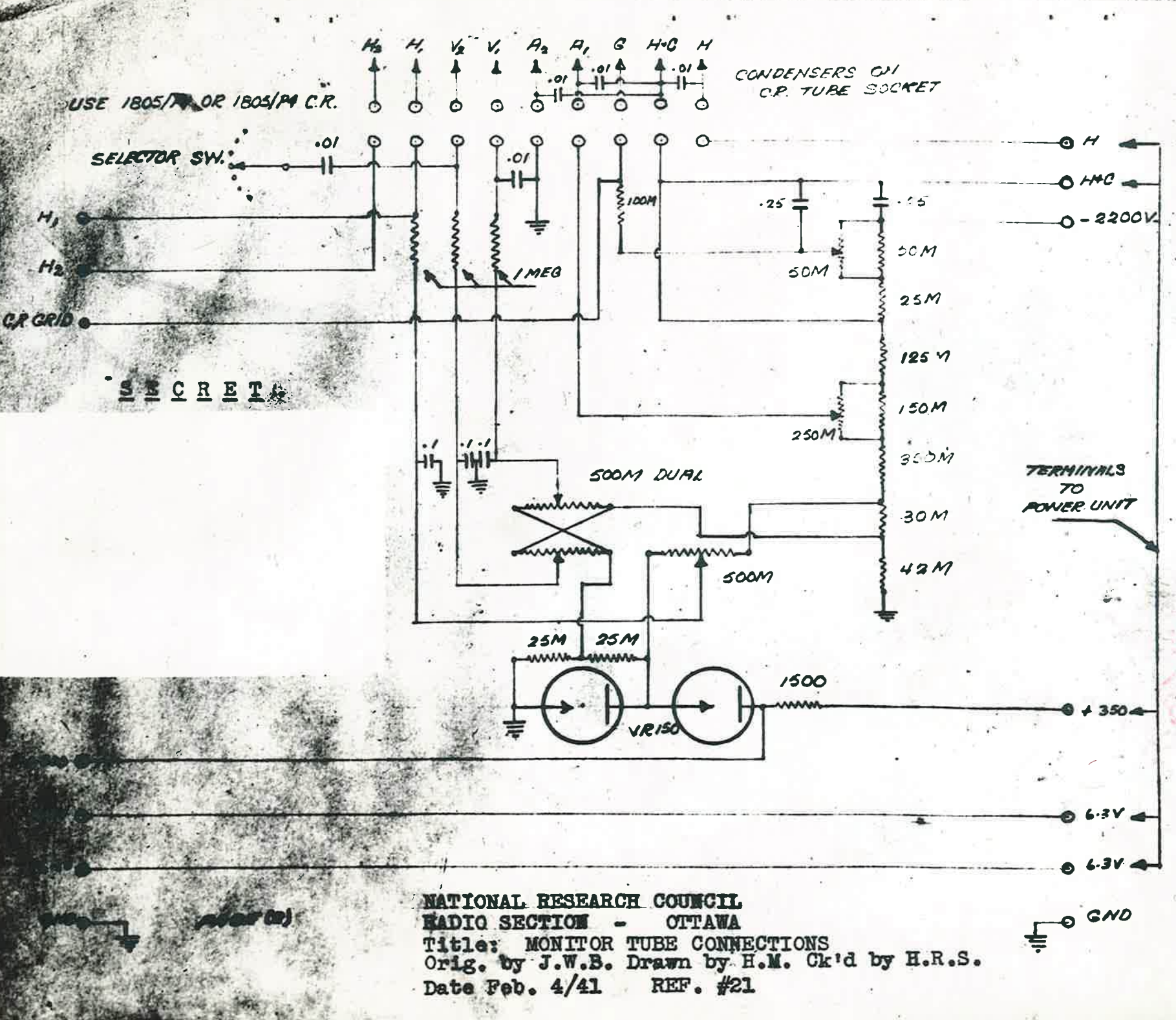
S E C R E T



PAGE (1)

SECRET

NATIONAL RESEARCH COUNCIL
RADIO SECTION, OTTAWA
Title: MONITOR CIRCUIT
Orig. by J.W.B.
Drawn by H.M.
Ck'd by H.R.S.
Date Feb.4/41 REF.#20

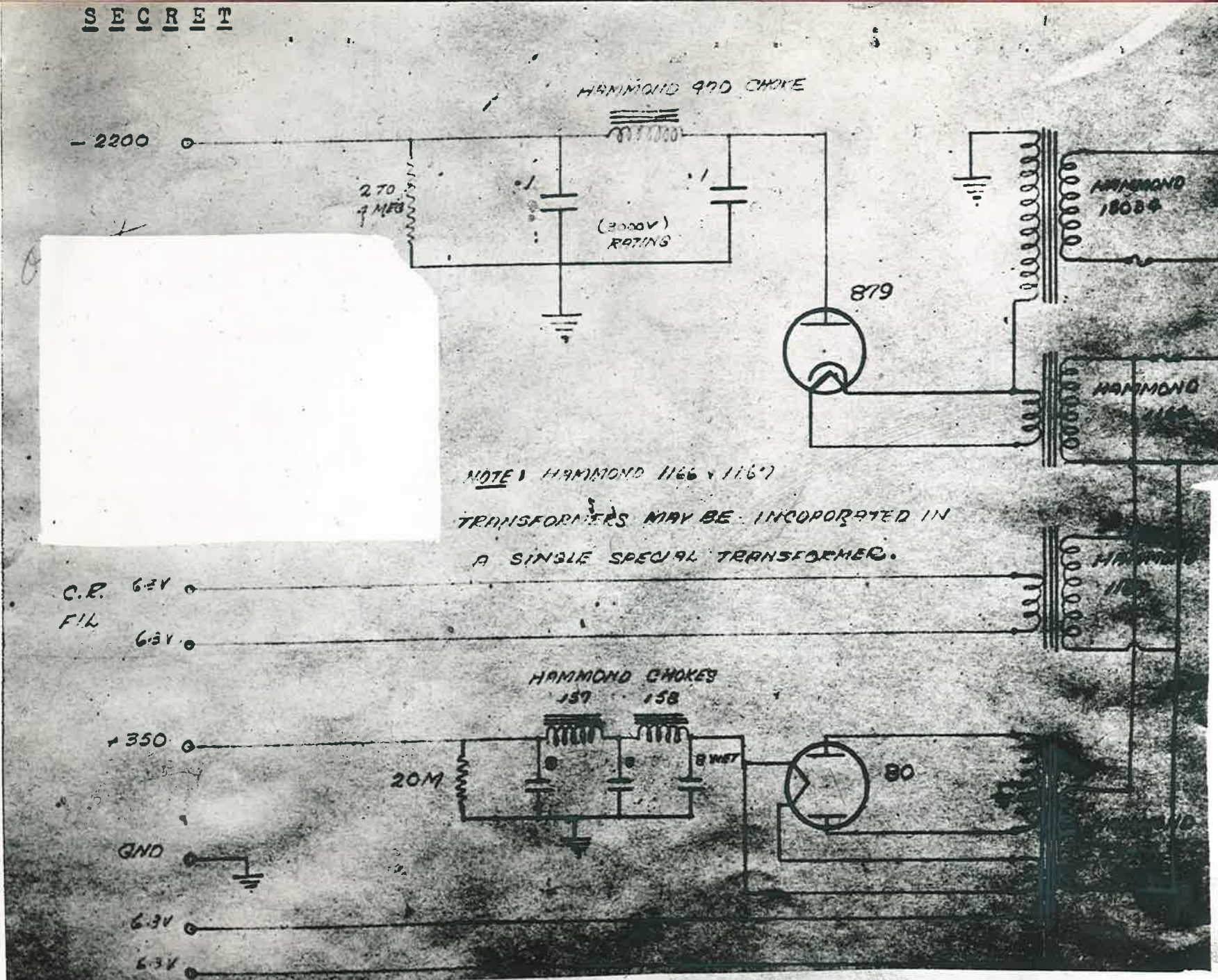


SECRET

SECRET

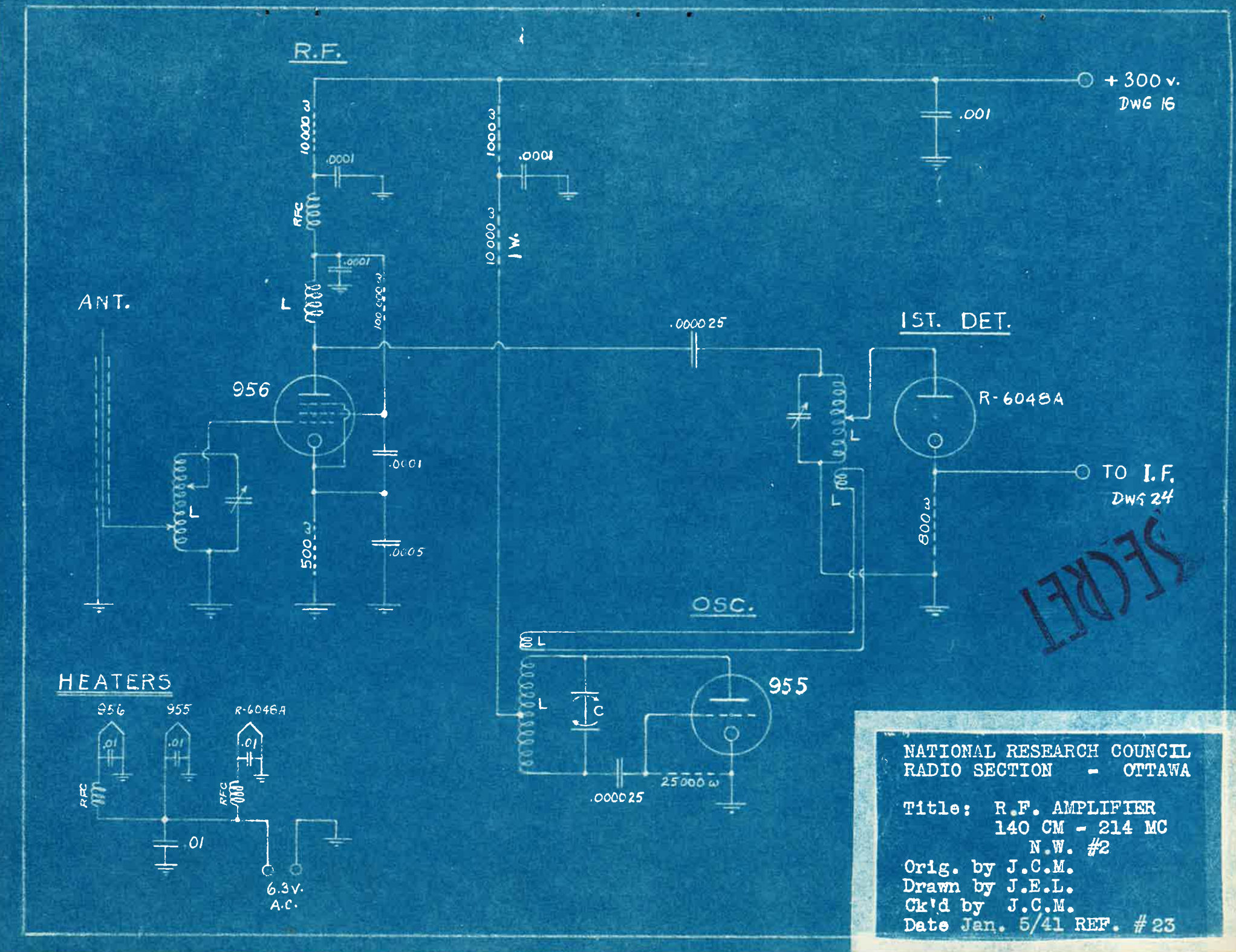
NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA
Title: MONITOR TUBE CONNECTIONS
Orig. by J.W.B. Drawn by H.M. Ck'd by H.R.S.
Date Feb. 4/41 REF. #21

SECRET



SECRET

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA
Title: MONITOR POWER SUPPLY CIRCUIT
Orig. by J.W.B. Drawn by H.M. Ck'd by H.R.S.
Date Feb. 4/41 REF. #22

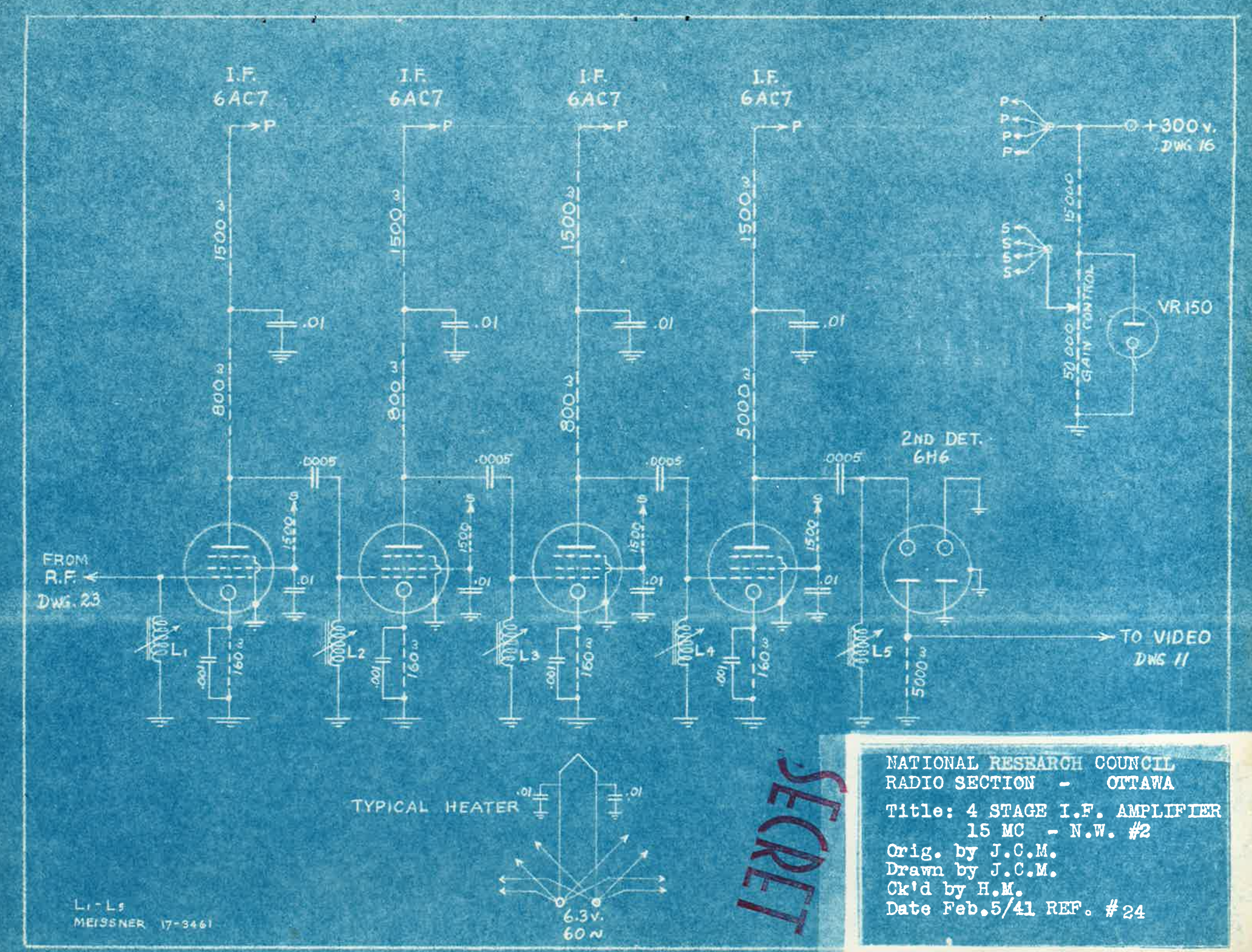


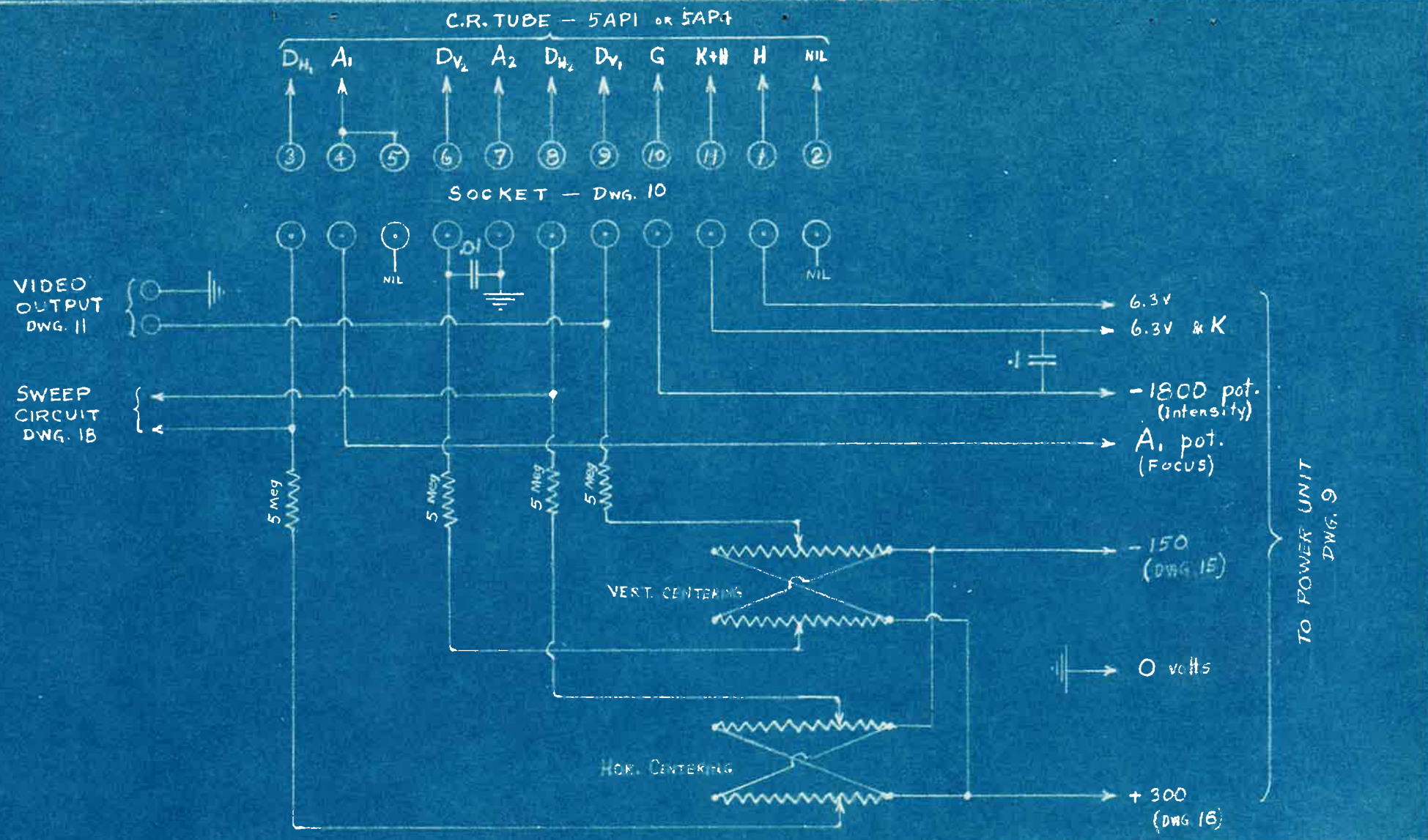
SECRET

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: R.F. AMPLIFIER
140 CM - 214 MC
N.W. #2

Orig. by J.C.M.
Drawn by J.E.L.
Ck'd by J.C.M.
Date Jan. 5/41 REF. # 23


I.F. 6AC7
I.F. 6AC7
I.F. 6AC7
I.F. 6AC7
P
1500 Ω
800 Ω
5000 Ω
.01
.0005
1500 Ω
160 Ω
.001
5000 Ω
+300 v.
DWG 16
15000
50,000
GAIN CONTROL
VR 150
2ND DET. 6H6
FROM R.F. DWG. 23
L1
L2
L3
L4
L5
TO VIDEO DWG 11
TYPICAL HEATER
6.3 v.
60 Ω
L1 - L5
MEISSNER 17-3461
SECRET
NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA
Title: 4 STAGE I.F. AMPLIFIER
15 MC - N.W. #2
Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by H.M.
Date Feb.5/41 REF. #24



SECRET

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: SCANNING TUBE CONNECTIONS - N.W. #2
Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by J.C.M.
Date May 5/41 REF.# 25

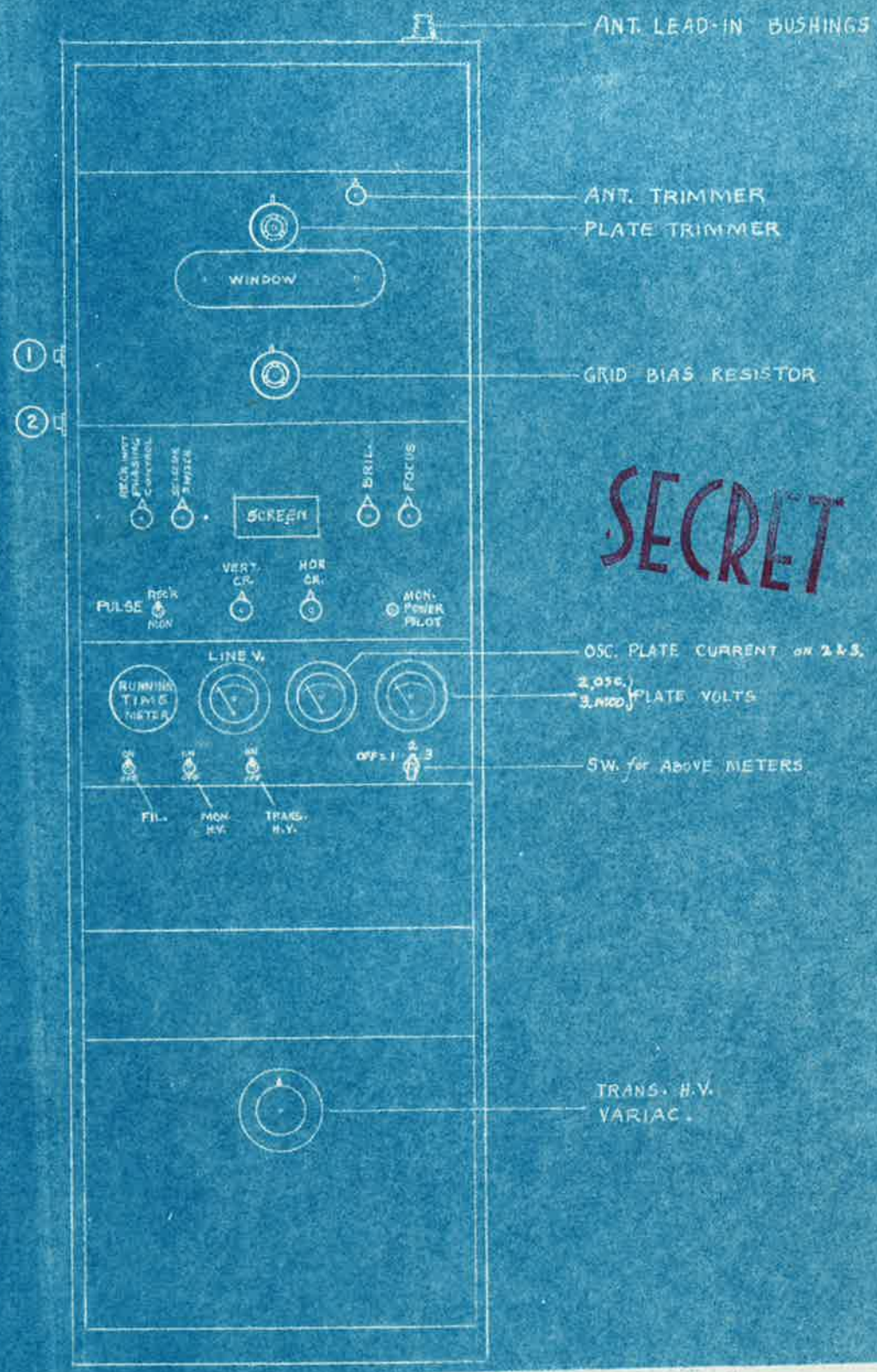
SECRET

UPPER RIGHT METER

SW. AT 1 — MEASURES SCANNING PLATE CURRENT
SW. AT 2 — " " RECEIVER " "

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: FRONT VIEW OF RECEIVER UNIT - N.W. #2
Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by J.C.M.
Date Apr.30/41 REF.#26



BLANK PANEL

TRANSMITTER OSCILLATOR CHASSIS

MONITOR CHASSIS

METERS & CONTROL PANEL

MON. POWER SUPPLY CHASSIS

BLANK

TRANS. H.V. SUPPLY AND MODULATOR CHASSIS

SECRET

CONNECTIONS FOR CABLES TO REC'R CABINET :-

(1) LEADING PULSE TO MONITOR.

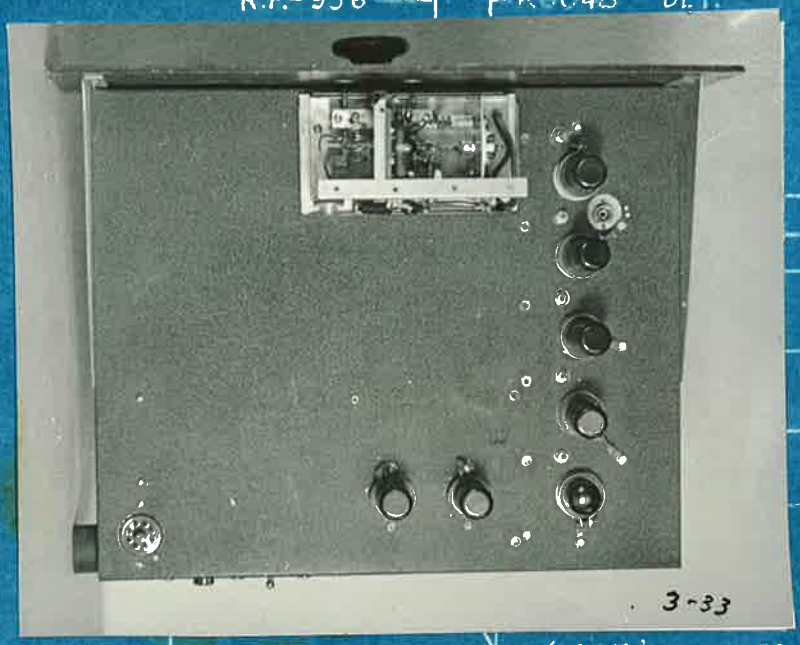
(2) TRIGGERING PULSE TO MODULATOR.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: FRONT VIEW OF TRANSMITTER CABINET N.W. #2

Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by J.C.M.
Date Apr.30/41 REF. #27

R.F.-956 — R-1048 - DET.



6AC7
6AC7
6AC7
6AC7
I.F.

CONNECTION FOR GAIN CONTROL ON METER PANEL

6H6 — DET.

SECRET

3-33

TO POWER PACK

PLAN

6AC7's - VIDEO

AERIAL

PILOT FUSE SW. OPEN CLOSED

1b METER DWG 14

BACK VIEW

NOTE

PILOT LIT WHEN FUSE BLOWN.

SW. UP ENABLES EXTERNAL METER TO BE USED BETWEEN THE TWO JACKS.

VIDEO OUTPUT JONES PLUG

955 - OSCILLATOR

3-36

BOTTOM VIEW

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: LAYOUT OF RECEIVER CHASSIS - N.W. #2

Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by J.C.M.
Date Apr.23/41 REF. #28

6N7 - 1000 c.p.s. OSC.

FREQUENCY ADJUSTMENT

SW. TO 'SHORT' SAME

884 - PULSE GEN.

BIAS CONTROL FOR SAME

JONES JACK - PULSE TO MON.

884 & BIAS CONTROL — SWEEP CCT. —

JONES JACK - PULSE TO TRANS.

TRANS. PULSE { 884 & BIAS / (½ OF) 6N7

POWER CABLE

INPUT CABLE FROM REC'R

6X5 GT - DIODE SWEEP LIMITER

5API / 1805-P1

SWEEP BALANCING AND LENGTH CONTROL.

6AC7/1852 - SWEEP CCT. -

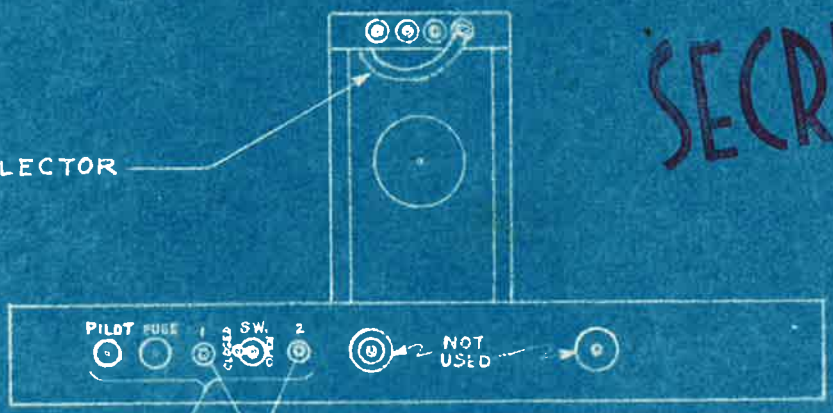
Photo

P.O. 2-13

PLAN

SECRET

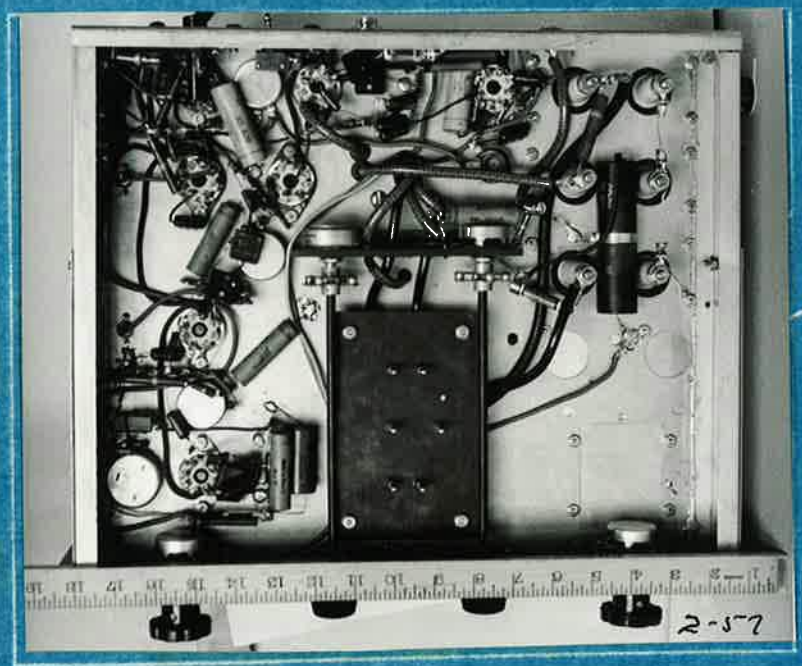
4 POSITION RANGE SELECTOR



FUSE & TAP FOR EXT. METER IN B+ LINE

TO METER PANEL DWG. 14

BACK VIEW



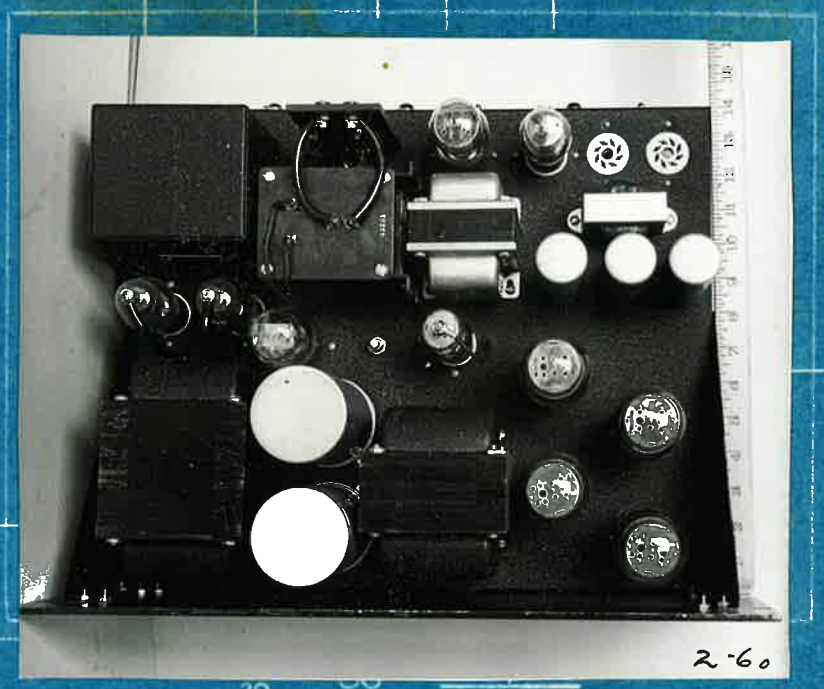
BOTTOM VIEW

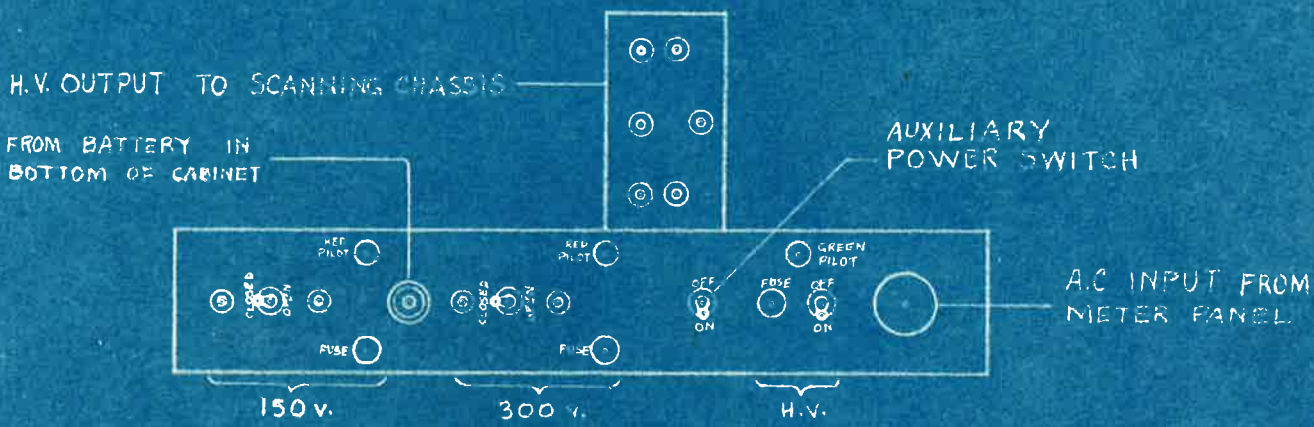
CONNECTION FOR H.V. CABLE FROM POWER PACK

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: LAYOUT OF SCANNING CHASSIS - N.W. #2

Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by J.C.M.
Date Apr. 28/41 REF.# 29





BACK VIEW

N.B. GREEN PILOT IS LIT WHEN A.C. IS ON.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: LAYOUT OF RECEIVER POWER SUPPLY CHASSIS N.W. #2

Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by J.C.M.
Date Apr.29/41 REF.# 30

SECRET

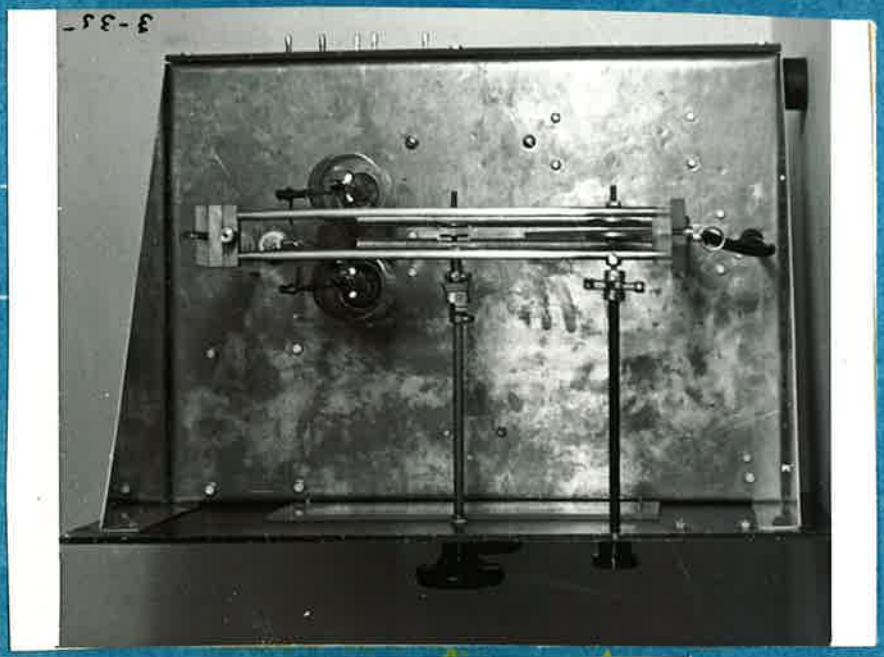
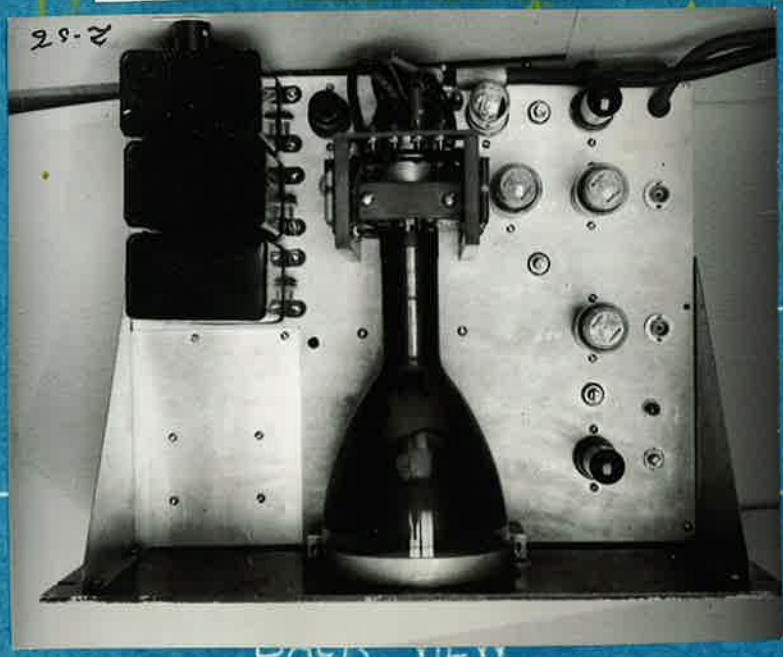


PLATE TUNING CONTROL

AERIAL COUPLING CONDENSER CONTROL

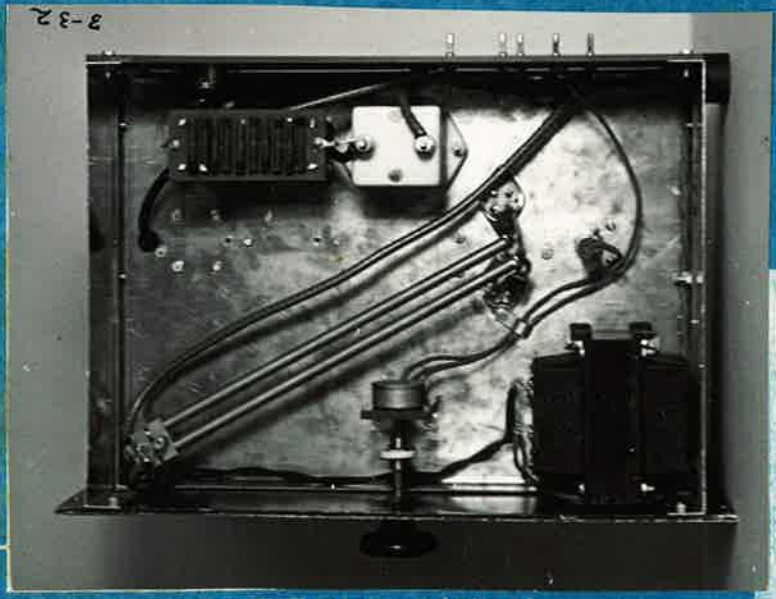


H. & K. TYPE 54 GAMMATRONS

A.C. FROM METER PANEL

FROM H.V. CHASSIS

BACK VIEW



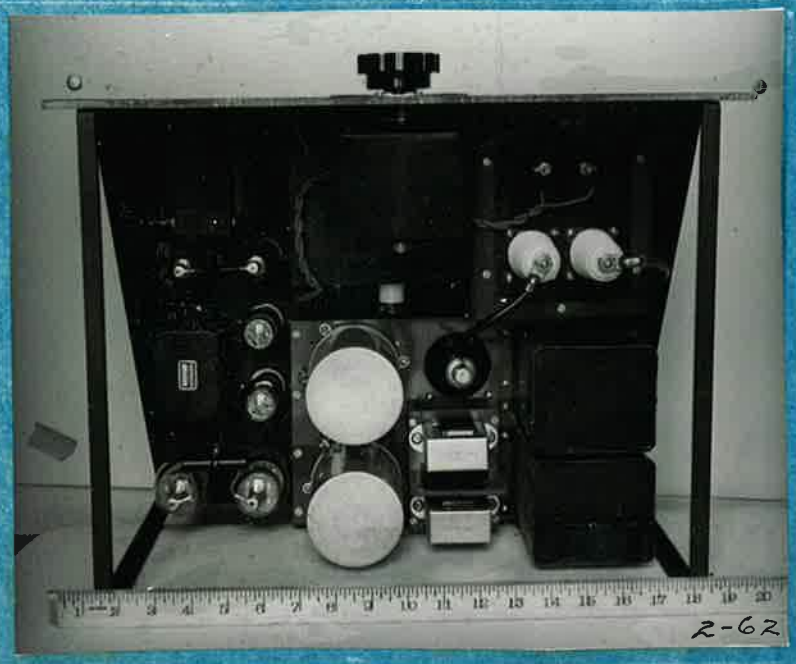
GRID LEAK CONTROL

BOTTOM VIEW

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: LAYOUT OF OSCILLATOR CHASSIS - N.W. #2
Orig. by J.C.M.
Drawn by J.C.M.
Ch'd by J.C.M.
Date Apr.26/41 REF. #31

VARIAC



SECRET

2X2's

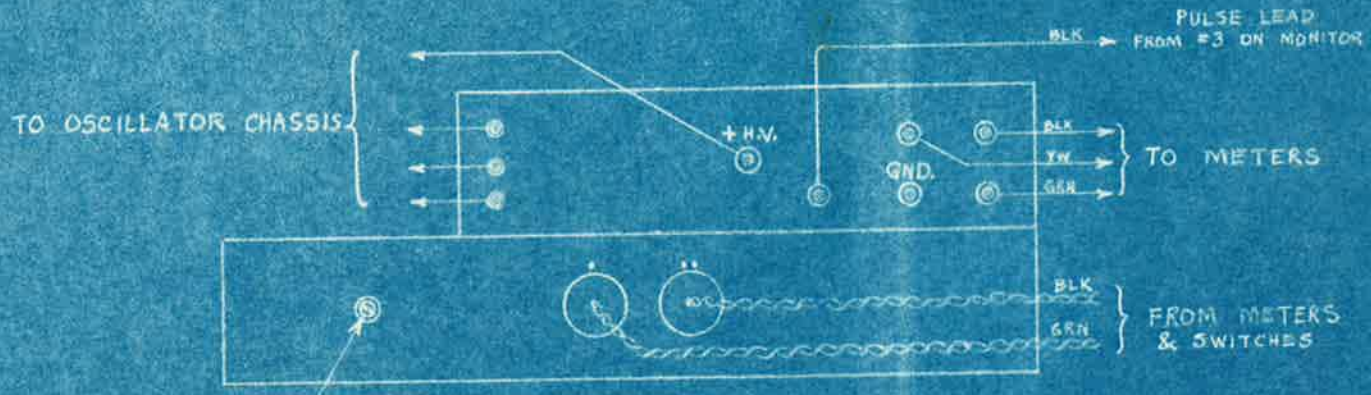
884

6X5G

807's

878

TOP VIEW



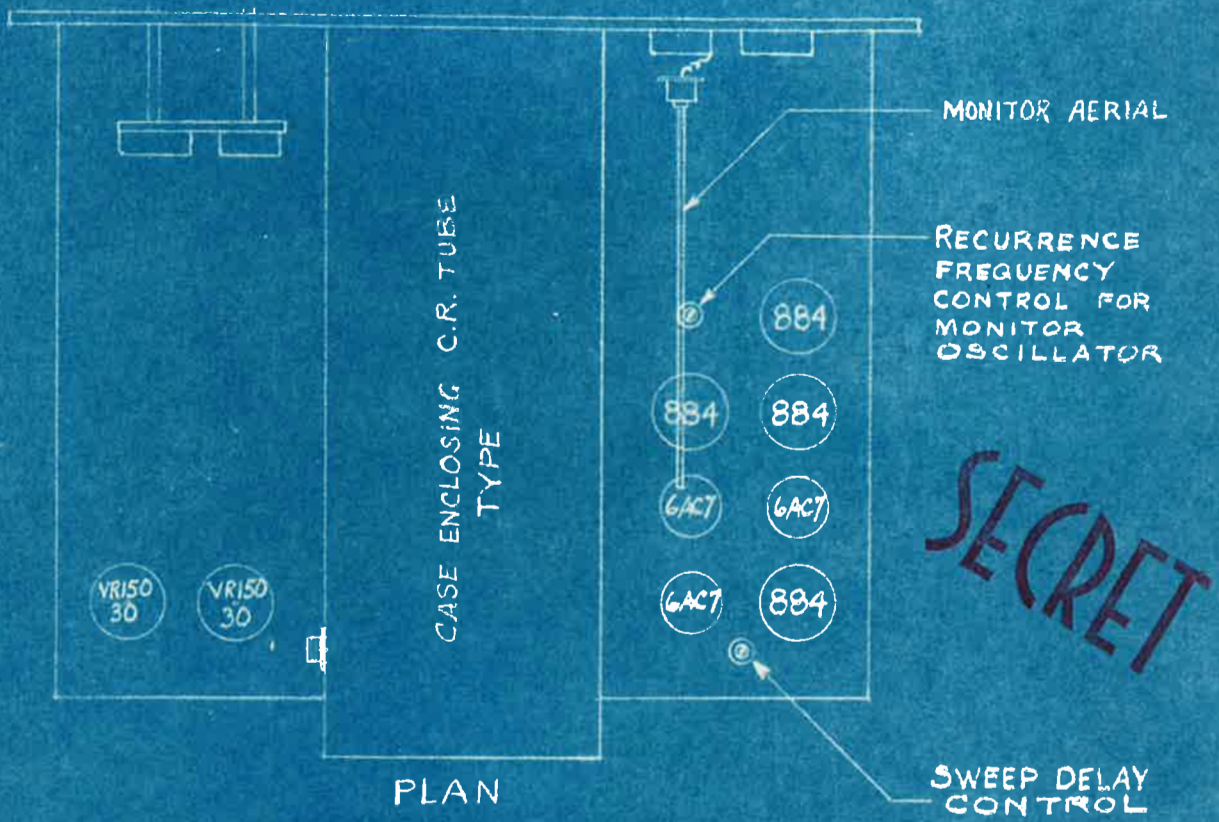
BACK VIEW

PULSE DURATION
CONTROL
(3 POSITION SWITCH)

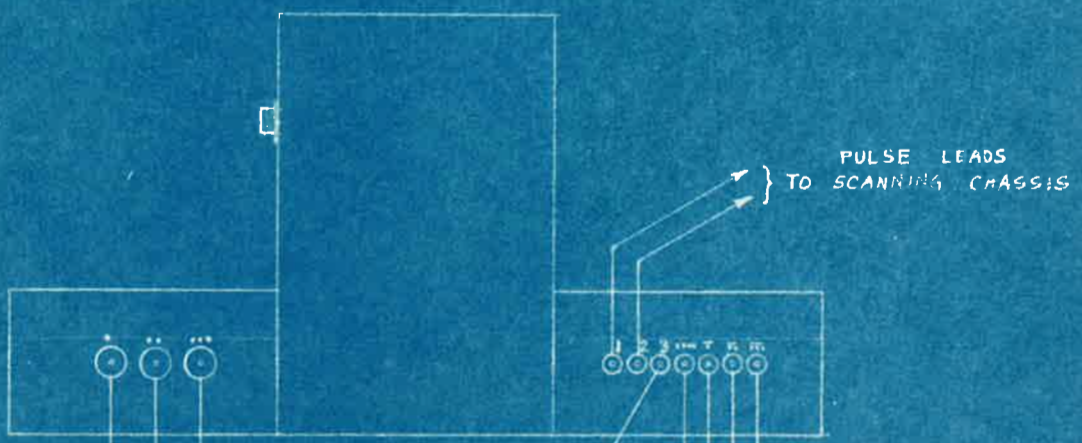
NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: LAYOUT OF H.V. POWER PACK AND MODULATOR N.W. #2

Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by J.C.M.
Date Apr.24/41 REF. # 32



PLAN



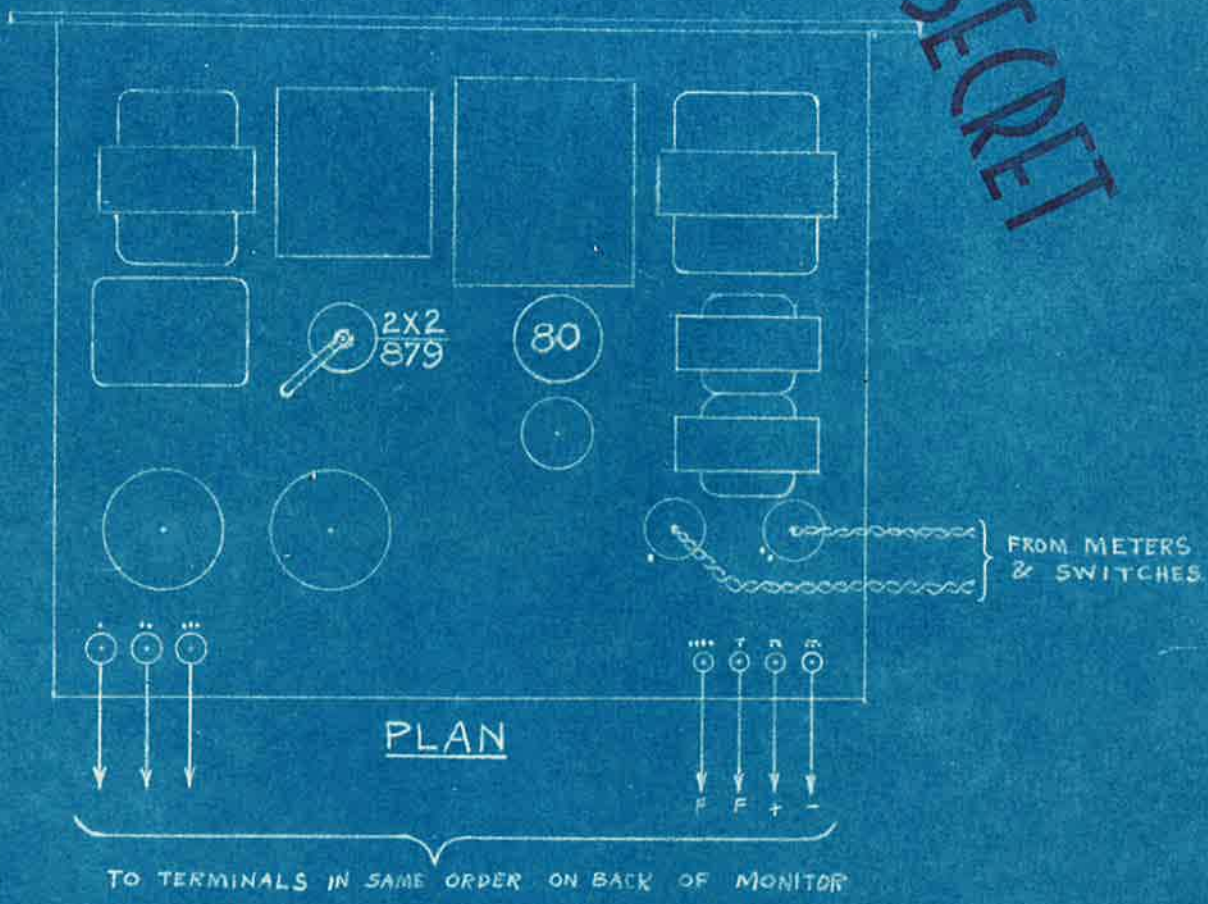
BACK VIEW

SECRET

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: LAYOUT OF MONITOR CHASSIS - N.W. #2
Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by J.C.M.
Date Apr.23/41 REF. #33

SECRET

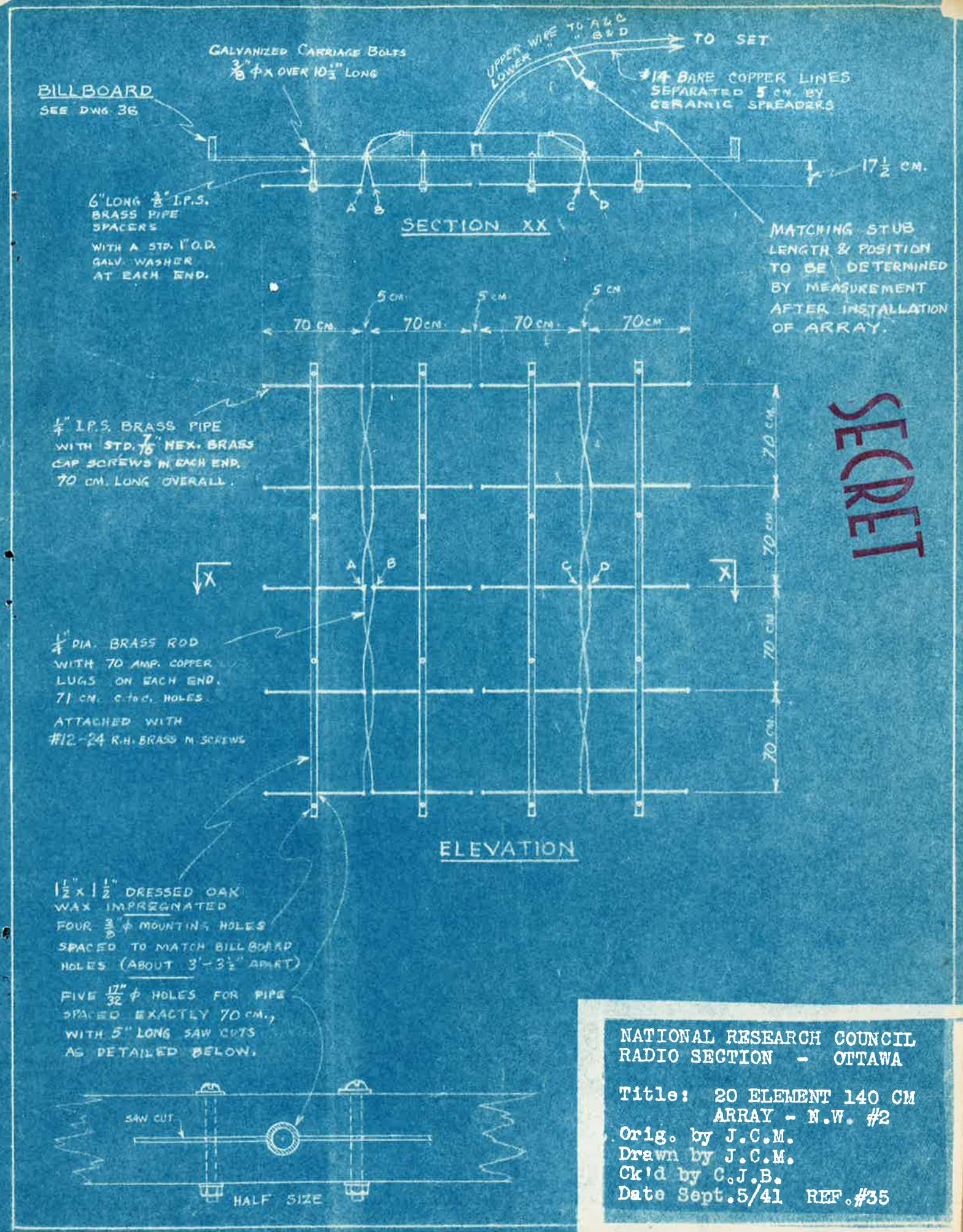


BACK VIEW

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: LAYOUT OF MONITOR POWER PACK - N.W.#2

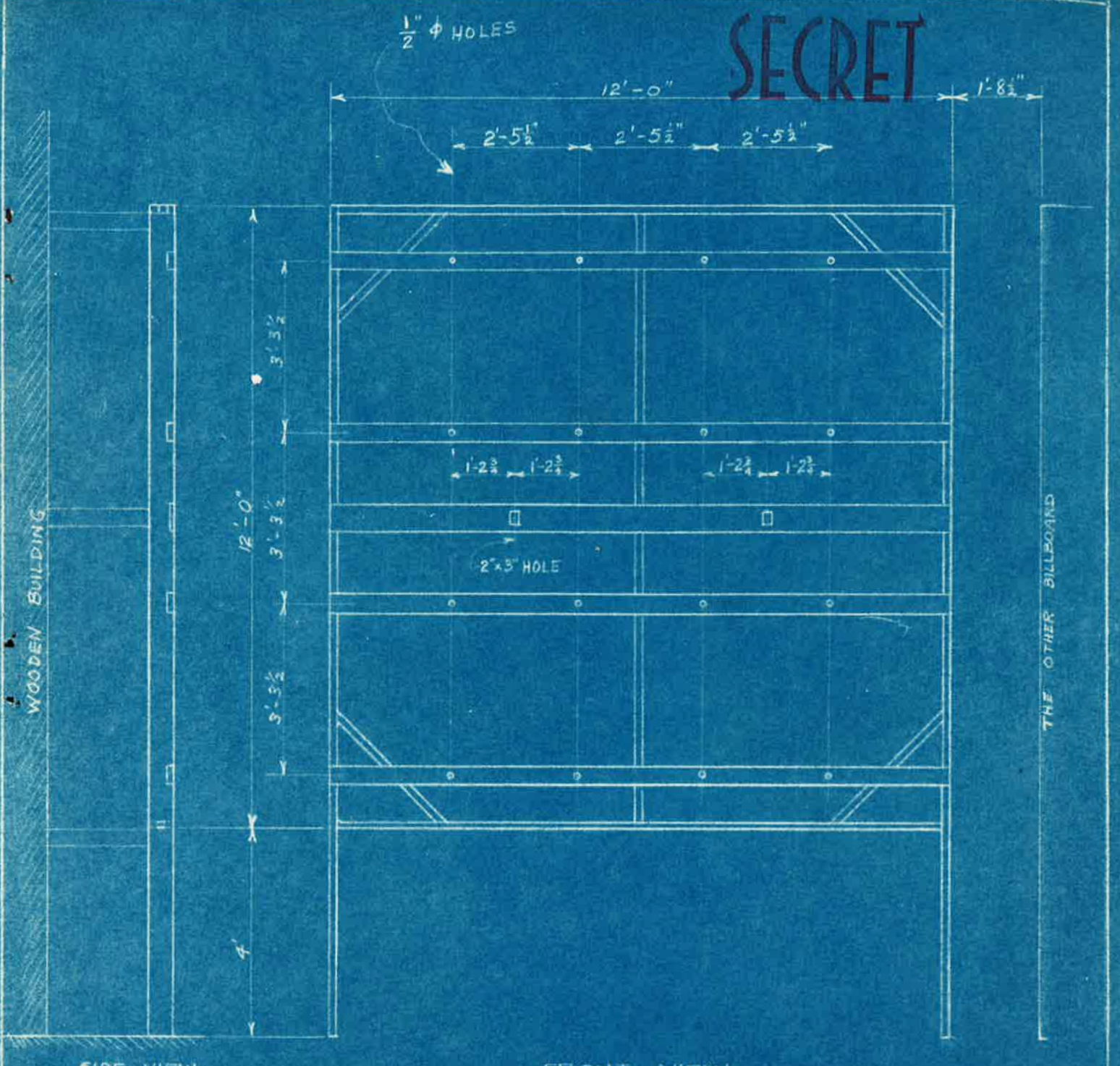
Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by J.C.M.
Date Apr.25/41 REF.#34



NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: 20 ELEMENT 140 CM
ARRAY - N.W. #2
Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by C.J.B.
Date Sept.5/41 REF.#35

SECRET



COVER THE 12'×12' AREA
WITH ¼" MESH GALVANIZED SCREEN
(4 VERTICAL STRIPS 3' WIDE.)

DIMENSIONS NOT GIVEN MAY BE SCALED.

NATIONAL RESEARCH COUNCIL
RADIO SECTION - OTTAWA

Title: BILLBOARD FOR 140 CM ARRAYS - N.W. #2
Orig. by J.C.M.
Drawn by J.C.M.
Ck'd by C.J.B.
Date Sept. 5/41 REF.#36