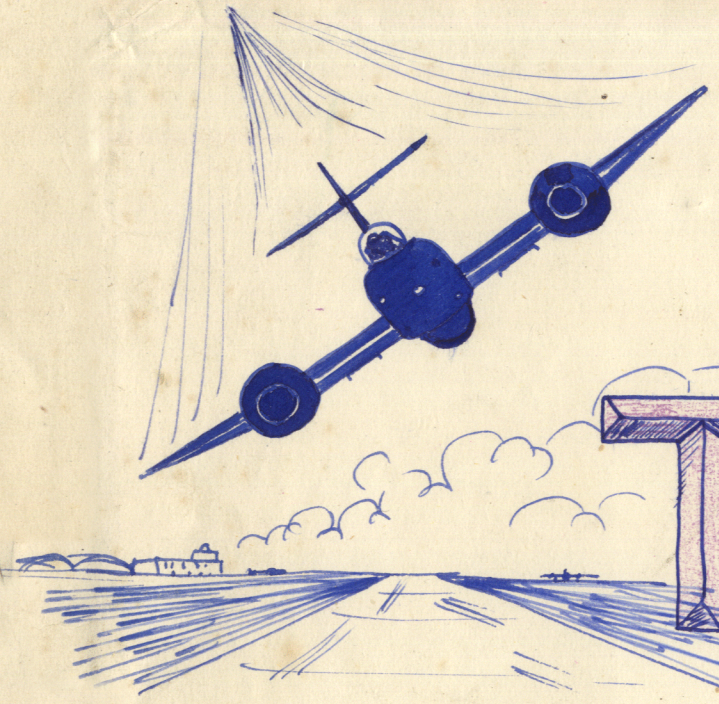
585573 S/A/A ARNOLD

1



T.R. 3561.

A.M.E. TYPE 14.

SETTING UP.

T.R. 3561 [modified NT 277]

INTRODUCTION.

T.R.3561 is a modified form of NAVAL TRANSMITTER NT 277. It is modified to work with standard AIR MINISTRY DISPLAY UNITS.

It is essentially a high power oscillator, operating at a frequency of 3000 mc/s with a pulse width of either .6 or 1.9 microsecs.

GENERAL INFORMATION

FREQUENCY	30) Mc/s
WAVELENGTH	10 Cms.
P.R.F.	500 [max range one pulse in target quick scanning]
P.W.	.6 or 1.9 Microsecs wide-coarding
PEAK POWER	500 K.W.
MEAN POWER	150 or 500 watts. (according to pulse width)
BEAM WIDTH	2° to 4° in the horizontal plane
RANGE MAX.	150 miles (approx) radio cons.

CAPABILITIES OF EQUIPMENT

BEARING	Accuracy within 1° up to 90 miles.
RANGE	Accuracy within $\pm$ 100 yards.
HEIGHT	Accuracy up to 40,000 feet at 75 miles $\pm$ 100 feet.
LOBE ANGLE	Very low, enabling this equipment to be used for the detection of shipping and low flying aircraft.

APPLICATION OF T.R. 3561

The following is a list of applications known as AIR MINISTRY EXPERIMENTAL STATIONS 52 - 57.

Type 52

The equipment is housed in a NISSEN hut straddled by a gantry supporting the Aerial System, it uses a 10' Dia. circular PARABOLIC DISH, with waveguide feed.

Type 53

The equipment is housed in a permanent structure with the Aerial system mounted on the roof. The difference being that a truncated cheese is now used in place of a PARABOLA.

Type 54

The equipment is housed in a NISSEN hut but the Aerial System is mounted on a 200 foot steel tower the array being a 10 ft. Dia. PARABOLA with waveguide feed. POWER LOSSES ARE GREAT DUE TO WAVEGUIDE ATTENUATION.

Type 55.

The equipment is housed in a NISSEN hut but the Aerial system is mounted on C.H. TOWER (AMES TYPE I) about 200 Ft. above ground it uses a 10 Ft. DIA PARABOLA with wave guide feed.

Type 56.

Same as for AMES TYPE 54 except that the PARABOLA is mounted on wooden tower APPROX. 184 Ft. high.

Type 57.

The equipment is housed in a trailer the Aerial System is mounted on the Roof. the Aerial System is a truncated cheese also an I.F.F. Transmit & Receive Aerial.
There are two applications known as TYPE 13 AND TYPE 14. the equipment used being the same except for the Aerial System and display unit.

AMES Type 13.

The equipment is housed in a radio vehicle the Aerial being attached to the side of the vehicle. The Aerial tilts 6 times / minute providing an indication of HEIGHT AND RANGE. On Console 15 of DISPLAY UNIT TYPE 5.

AMES Type 14.

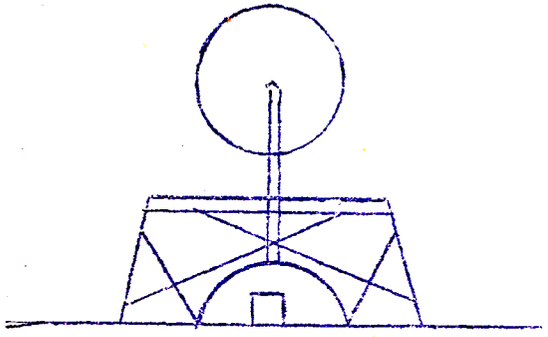
The equipment is housed in a radio vehicle the Aerial attached to the side of the vehicle the aerial rotates 6 revolutions/ minute and provides an indication of Bearing and Range on Console 16. of display unit type 5.

AMES TYPE 21 CONVOY.

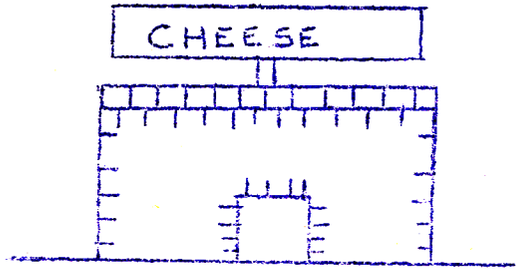
One other important application is in Convoy form and consists essentially of.

1. TYPE 13. Vehicle (Radio Vehicle Type 461)
1. TYPE 14. Vehicle (Radio Vehicle Type 462)
3. DIESEL (Electric Generator Vehicles (Radio Vehicles Type 456)
1. Operations Vehicle (Radio Vehicle Type 457)
1. each VHF Transmitter and Receiver Vehicles (Radio Vehicle Type 100 and Radio Vehicle Type 150).

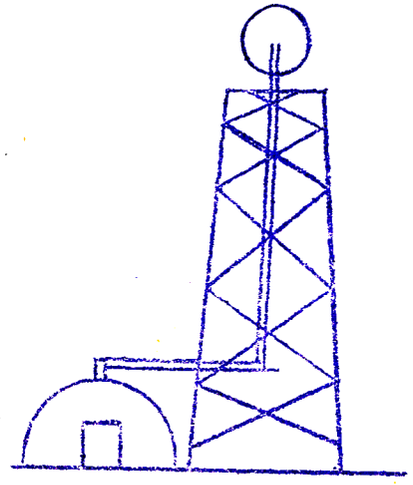
One Diesel Set is used as standby and the communication vehicles enable the Convoy to keep in touch with reporting centre.



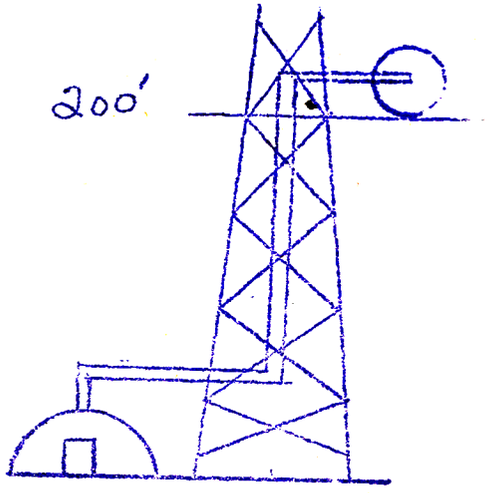
TYPE 52



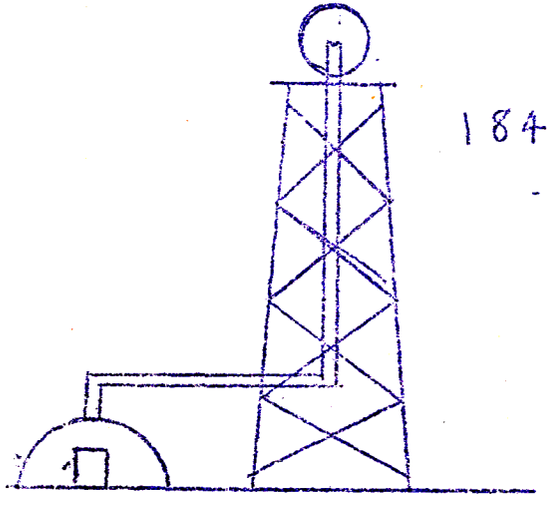
TYPE 53



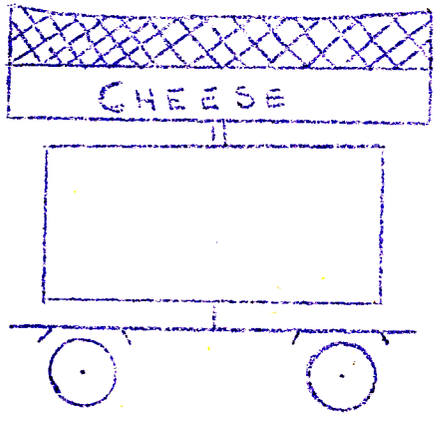
TYPE 54



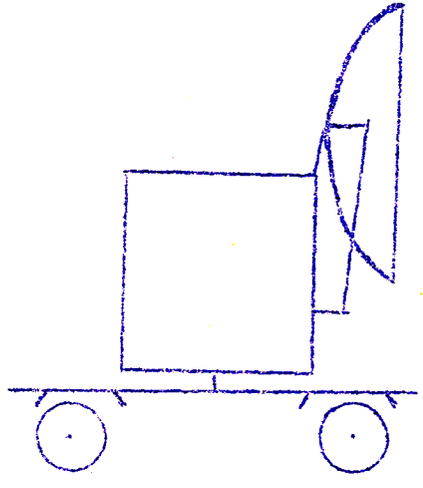
TYPE 55



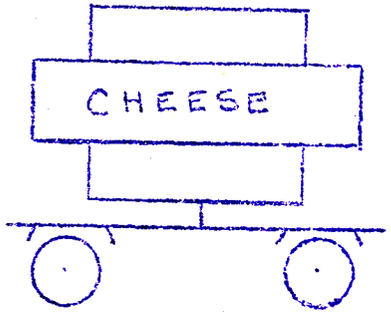
TYPE 56



TYPE 57

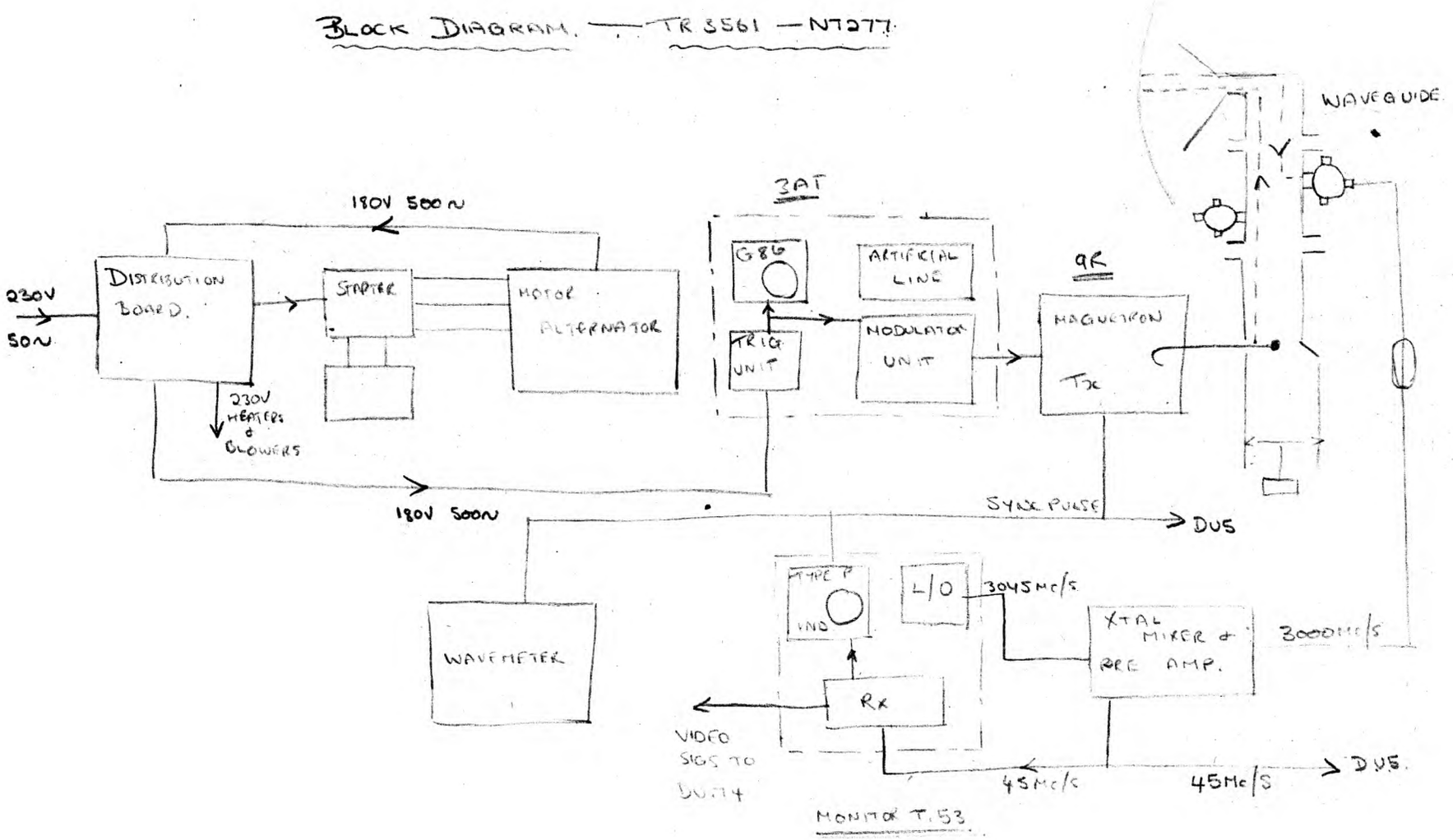


TYPE 13



TYPE 14

BLOCK DIAGRAM. — TR 3561 — N727



b.

SECTION OF EQUIPMENT. SIMPLIFIED.

The diagram opposite shows the main items of the equipment. The Starter, Motor Alternator and Power Distribution Board have been omitted for simplicity.

The 180v. 500 cycle input to 3AT MODULATOR. is supplied by the Motor Alternator and is stepped up to 12 KV. by H.T. transformer voltage charging the artificial line to 12KV VIA the MODULATOR RECTIFIER PANEL.

The Modulator valve in the MOD. RECT. panel on receipt of a trigger pulse from the trigger unit, discharges the artificial line through the pulse transformer in the transmitter 9R. The output voltage from the pulse transformer is -24 KV. and is applied to the cathode of the magnetron causing the magnetron to oscillate for a period of .6 or 1 . 9 microseconds. From a pulse of RF energy is conveyed to the Aerial where it is formed into a narrow beam. On striking a target a fraction of this energy is reflected and conveyed VI. Aerial and wave guide to the MIXER and PRE - AMPLIFIER where it mixes with a signal from the LOCAL OSCILLATOR is converted into an INTERMEDIATE frequency of 45 Mc/s. this is further amplified by main I.F. amplifier and after detection fed as a VIDEO signal to the indicator C.R.T. (Display Unit Type 7).

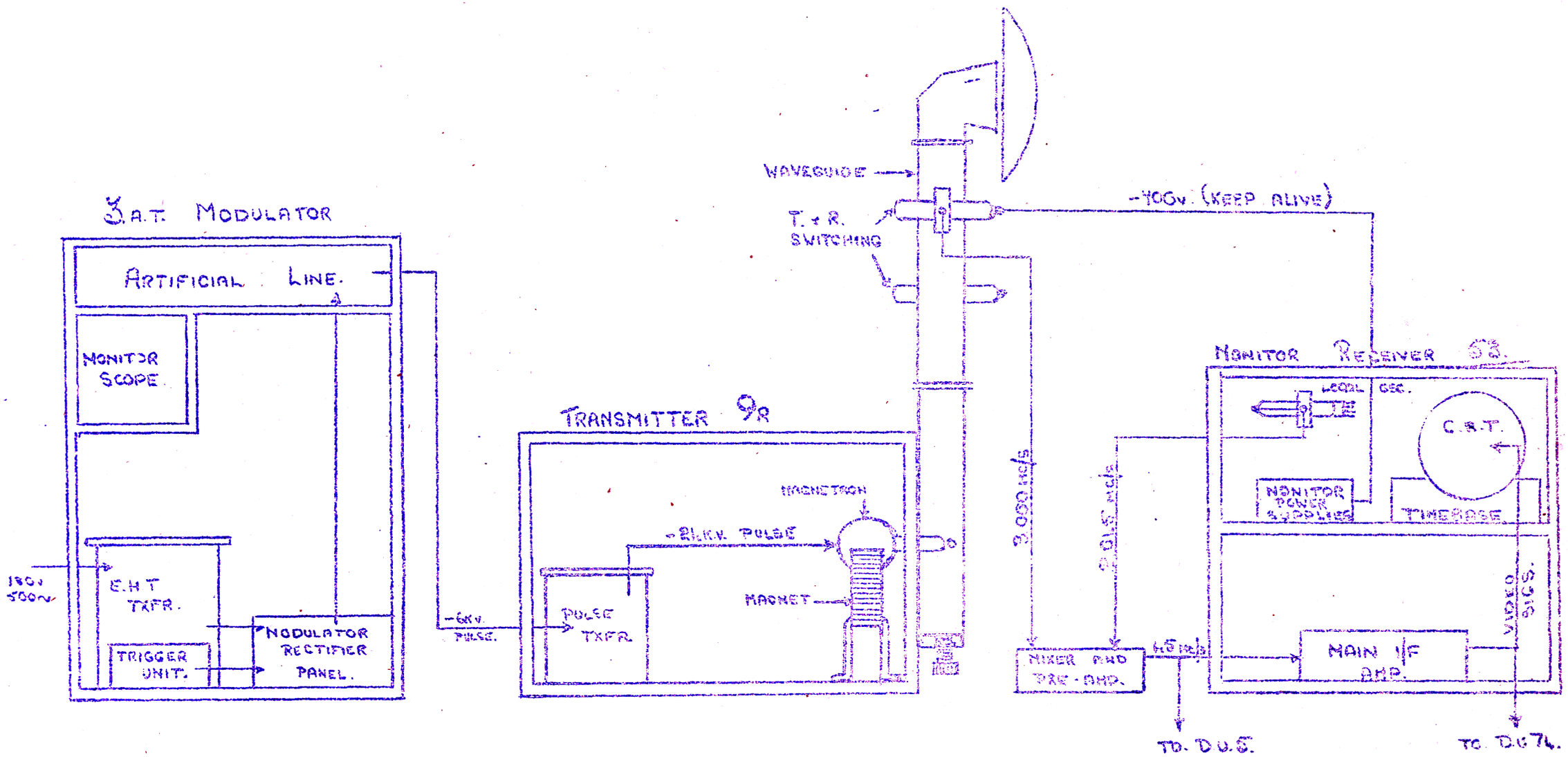
MOTOR ALTERNATOR.

The MOTOR is a squirrel cage Induction motor and its speed synchronised to the frequency of the main voltage. The frequency of the mains is 3000 cycles / minute and this is also the frequency of the motor except for slip, assuming the speed of the Motor - Alternator to be 50 Rev's per second. An output of 180v at 500cps. is acquired by having 10 pairs of coils each coil developing 9 VOLTS.

There are two field supplies to the MOTOR - ALTERNATOR obtained by splitting the phase.

a) MOTOR FIELD. An electrically rotating field is applied to enable motor to speed up. When motor speed approaches the frequency of supply the rotating field obtained by splitting the phase is removed and is replaced by the self produced rotating field obtained from single phase supply and rotation of the rotor.

PHYSICAL LAYOUT OF T.R. 3561.



T.B. HARRIS
FEB. 1952.

12. STARTER

ACTION :—

i) START POSITION: (A) Splits the phase

(B) Sets overload coil out of circuit

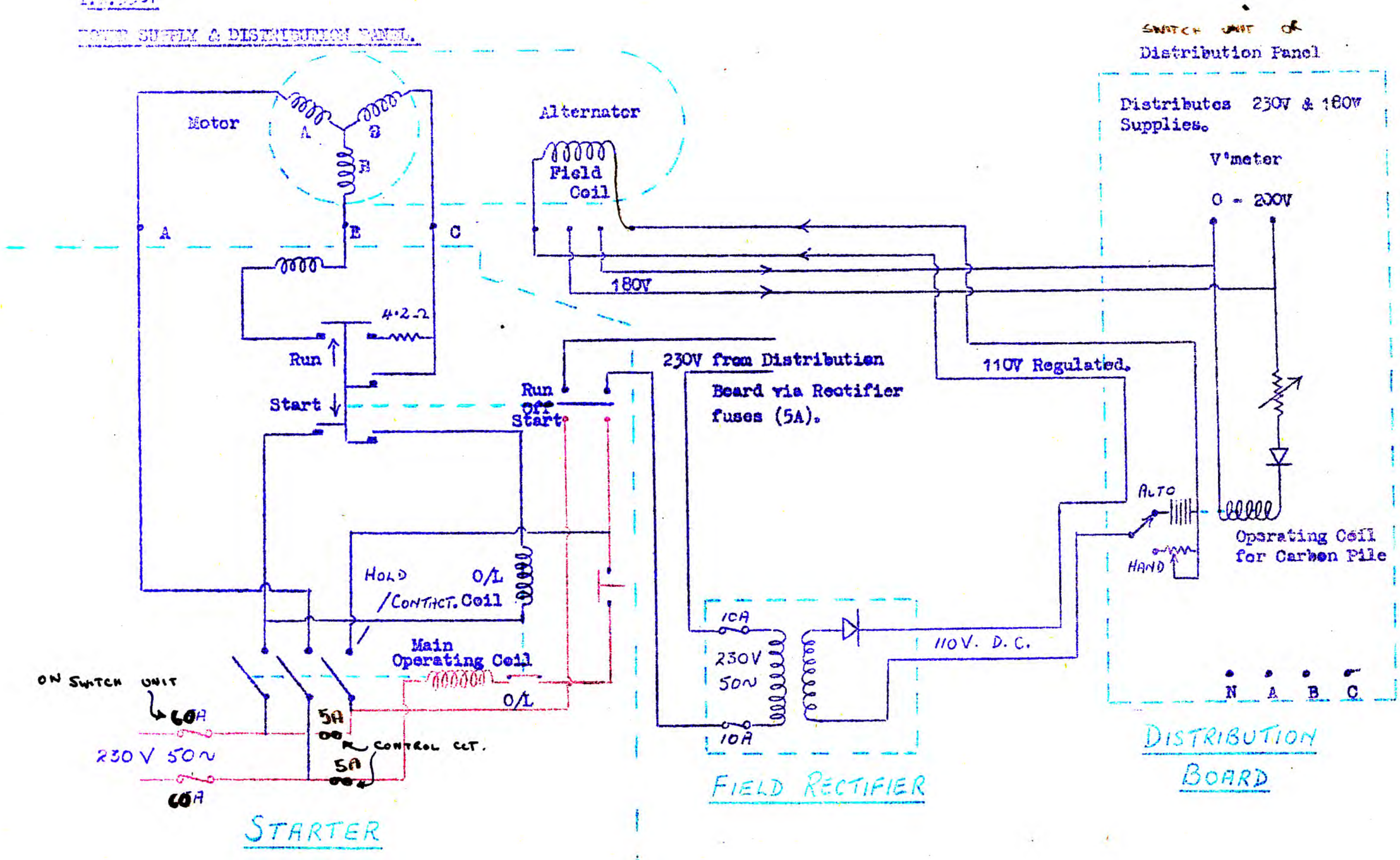
ii) RUN POSITION (A) Feeds single phase to the motor

(B) Incorporates the o/l coil to prevent damage to the motor

(C) Completes field supply to the alternator

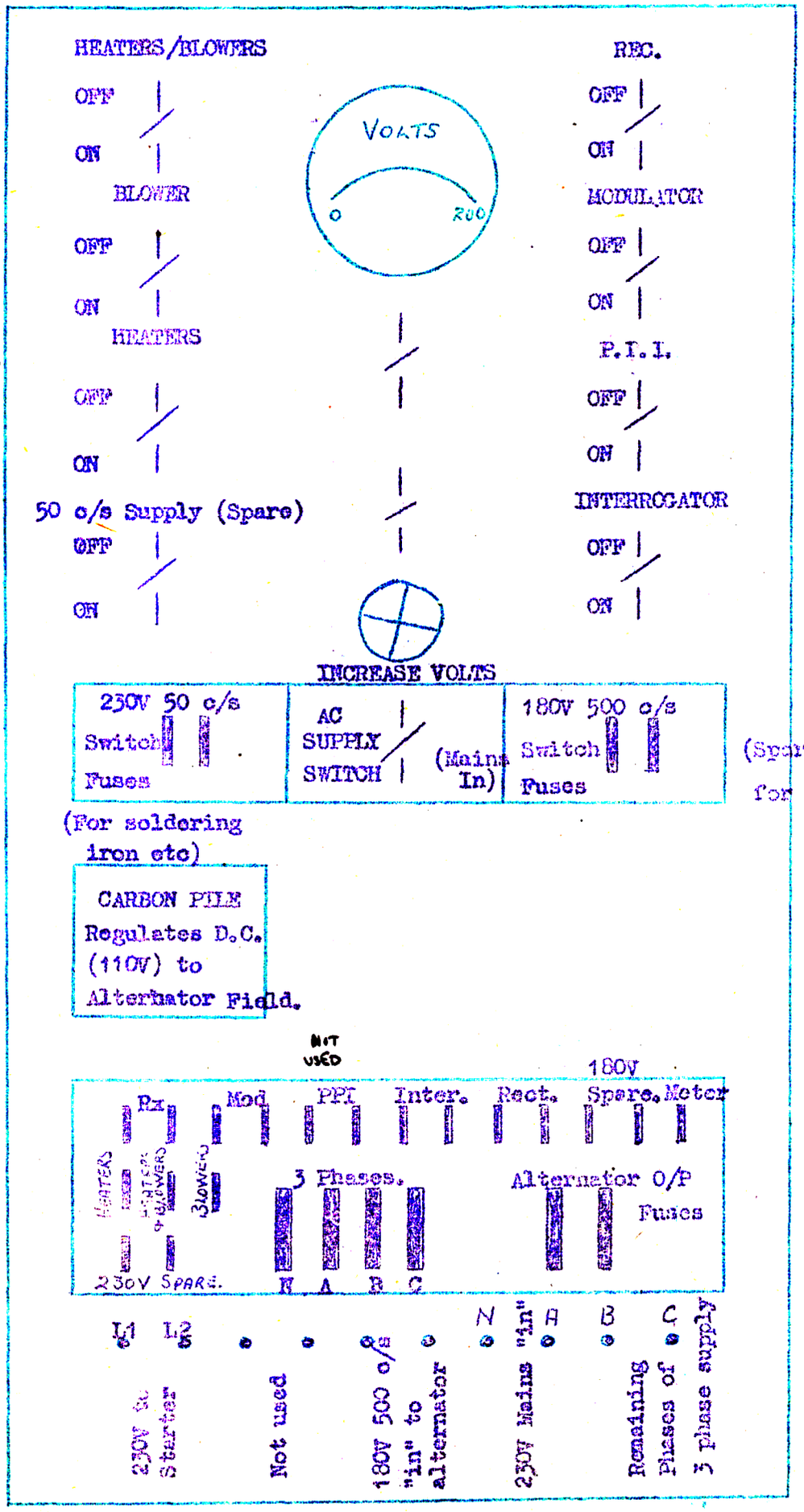
T.P.3561

POWER SUPPLY & DISTRIBUTION PANEL.



T.R. 3561.

POWER DISTRIBUTION PANEL



Running up

(i) Ensure all doors closed [Safety precaution]

(ii) Switches off [Safety precaution] Distr. Panel switch on "auto" [∴ correcting]

(iii) Close the isolator switch

(iv) Handle to "start" — wait 30 secs for charge of rate [½ charging current 40 amps Operating speed 5,000 revs current reduced, vibration reduced.]

(v) Handle to "run" position — check meter reading adjust for 180V in "hand" and "auto" positions Leave in auto position

(vi) Heaters and blowers switches [3 of] H/S B H

(vii) Switch on receiver and modulator [mod. lamp 1,000c/s note receiver CRT. and note]

(viii) Close magnetron fil "start" switch — wait 30 secs — close mags fil "on"

dull red lamp

(ix) Switch "Trigger" and G.86 "on"

(x) Scope E waveform sine wave ∿ Sync. control on Trig unit

(xi) Scope C waveform an elliptical scan [does not require to be triggered]

(xii) Switch off and wait 15 min ["Trans" not designed for continual operation] G86 not longer than 15 min

13) Switch on Monitor scope and scope E waveform after switching on H.T.

14) Apply H.T. 5,000 Volts as indicated. If blip or both of w/f, not fast enough if blip O.K. increase HT to 7,000 volts.

15) Switch mag fils 'OFF' scope w/f DF B & A

16) Run up to 12,000 volts scoping A.

CHECK ALL WAVEFORMS AGAIN.

Use neon for radiation

Long routine of Running Down
1) Variac Down.
2) HT off
3) All switches
4) Mond Rec Blair heater off
5) "STOP" button
6) Open isolator switch

Do not remove crystal.

O.D.

b) VARIABLE D.C. SUPPLY TO ALTERNATOR. Alteration of FIELD VOLTAGE enables the alternator output voltage to be varied.

STARTER.

The starter operates on 230v 50 cycles single phase supply and performs the following functions.

a) Phase splits the supply causing rotating field for starting of MOTOR.
b) Completes the field supply when alternator has acquired correct operating speed.
c) Incorporates an overload service to prevent damage to the Motor.

START POSITION :- Main Operating coil energised, input contacts closed, inductance and limiting resistance in circuit, rotating field applied to MOTOR.

RUN POSITION :- Inductance and resistance out of circuit, motor now operating on single Phase Supply.

POWER DISTRIBUTION BOARD. (P.D.B.)

Is the control panel for 230v, 50c/s and 180v 500 c/s power supplies. It also incorporates means for regulating the alternator output voltage either by HAND or AUTOMATICALLY. Automatic control is performed by the CARBON PILE REGULATOR. HAND control is by means of a variable resistance in series with alternator field.

FUSES ON LOWER PANEL ARE :- RECEIVER, MODULATOR, P.P.I., HEATERS AND BLOWERS, METER MAINS INPUT AND ALTERNATOR OUTPUT.

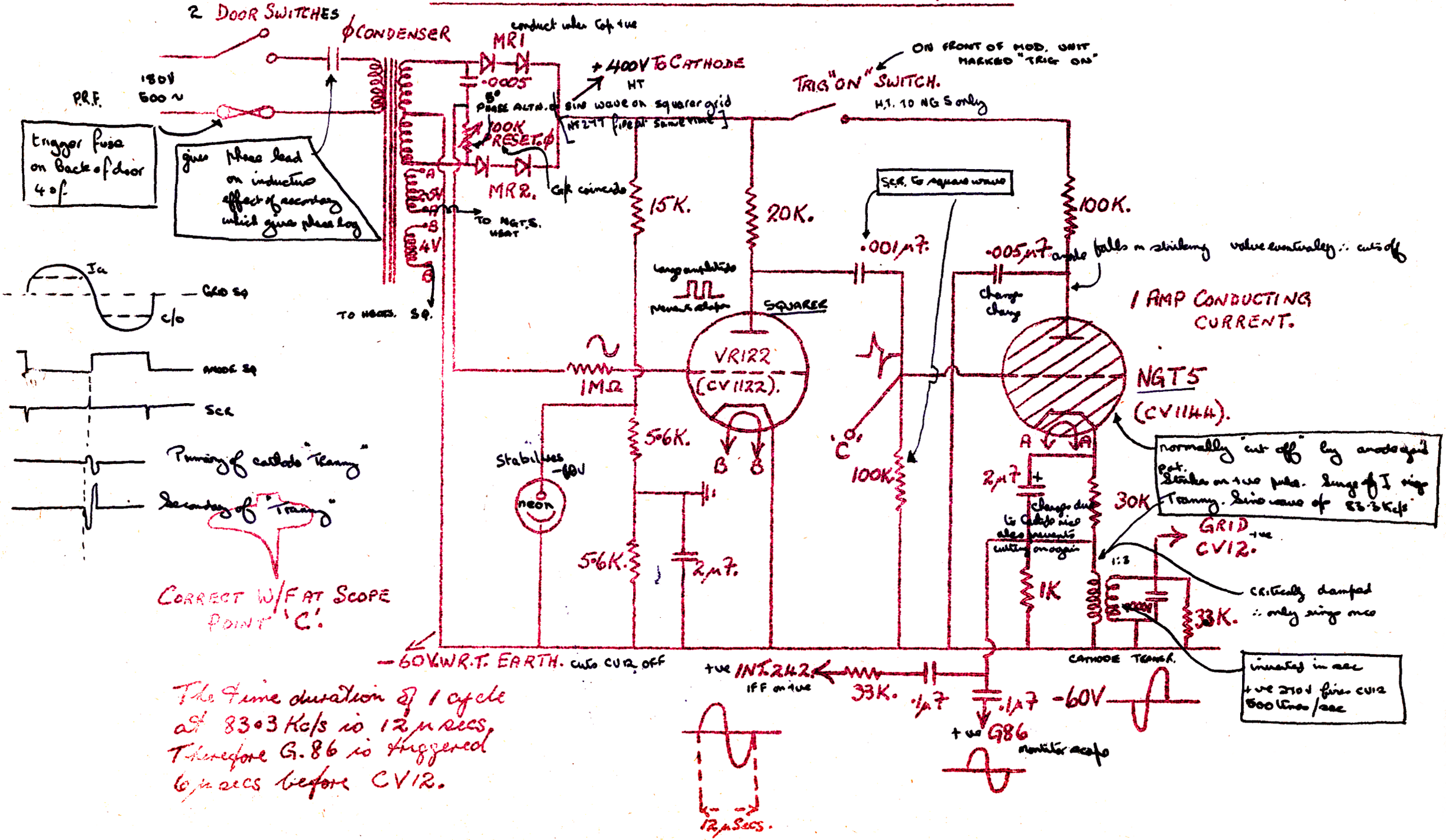
TRIGGER UNIT.

The trigger unit provides a firing pulse for the CV 12. (GAS REGULATOR VALVE). It also generates synchronising pulses for G 86 MONITOR (FAST SCAN) and I.F.F. interragator equipment (Type 243)

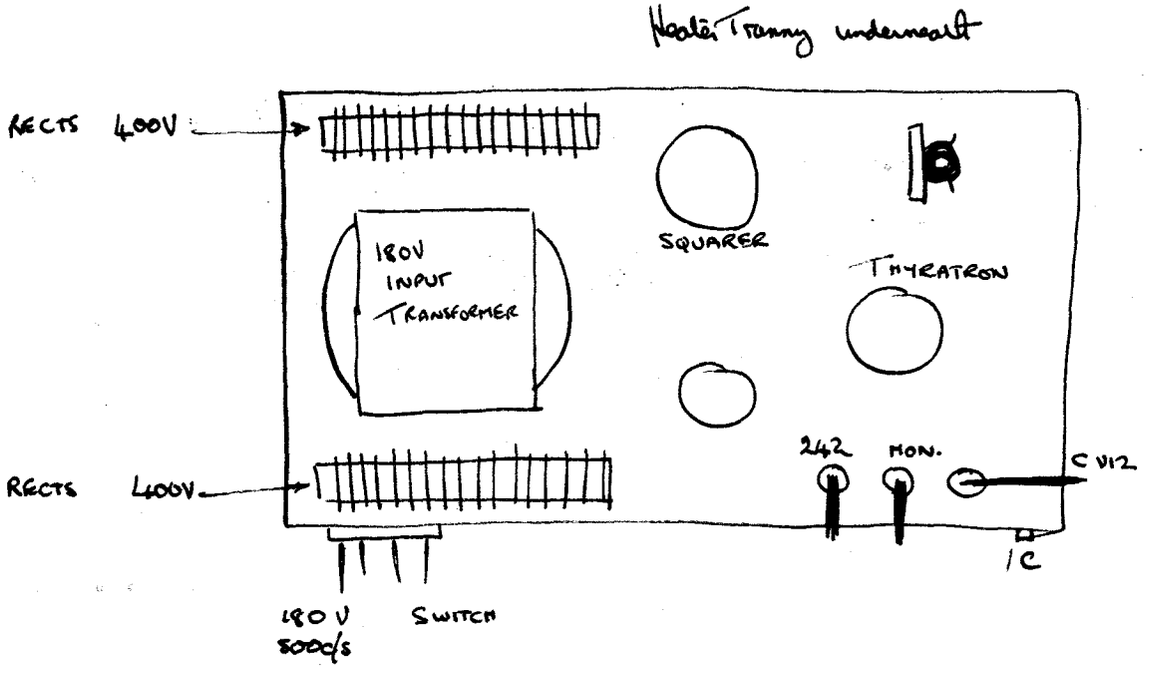
VALVES	ACTION.
(V4) VR 22.	SQUARER.
(V5) NGT5	TRIGGER.
(V3) VS70	STABILISING NEON. stabilising 90v fixed Bias for CV12.

FURTHER NOTES ON TRIGGER UNIT

SIMPLIFIED CIRCUIT OF TRIGGER UNIT ~ T.R. 3561.



TRIGGER UNIT LAYOUT



Running In Magnetron?

Heaters 2 hrs

H.T. 500 volts; increase 500 volts every 15 mins watching B waveform

Heaters off at 10KV.

NOTE

1. Door switches in series with Primary of trigger unit H.T. transformer.
2. Resonant frequency of V5 cathode transformer (T13) 83.3 Kc/s.
3. "C" waveform is scoped on grid of NGT.5 of trigger valve.
4. Pre-set phase control enables time of firing of trigger valve to be altered 5° on either side of the alternator voltage.
5. "C" waveform if correct indicates that CV.12 is cut-off while the line is charging, if waveform is incorrect input 180v leads must be reversed.

MODULATOR RECTIFIER PANEL.

There are three valves in the MOD. RECT. PANEL.

CV.5	V7	Charging diode.	NOTE. ALL MERCURY VAPOUR VALVES WHEN NEW MUST BE RUN WITH HEATERS ON FOR 30 MINUTES BEFORE APPLYING H.T.
CV.5	V8	Overswing diode (back stop)	
CV.12	V9	Modulator valve	

V7 Charges the artificial line to a PD of 12Kv.
V8 Ensures the line is uncharged between charging periods.
V9 On receipt of a trigger pulse from the trigger unit, the CV.12 ionises and causes the Artificial line to discharge.
This artificial line can be changed for pulse widths of .6 or 1.9 microsecs. Pulse switch also switches compensating network.
This ensures that load to line impedance remains constant.
LONG PULSE 1.9 microsecs. 5 sections
SHORT PULSE .6 microsecs. 1 section, gives better range discrimination between echoes.

VARIAC (T2)

Ensures smooth control of E.H.T. MAX, CIRCULATING CURRENT limited to 100 Ma. by setting up of variac brush positions.

CV.12 must reach operational temperature before H.T. is applied, a hot-air blower is provided for this purpose, temperature of CV.12 is kept constant at 64°C by a heater, controlled by thermostatic switch.

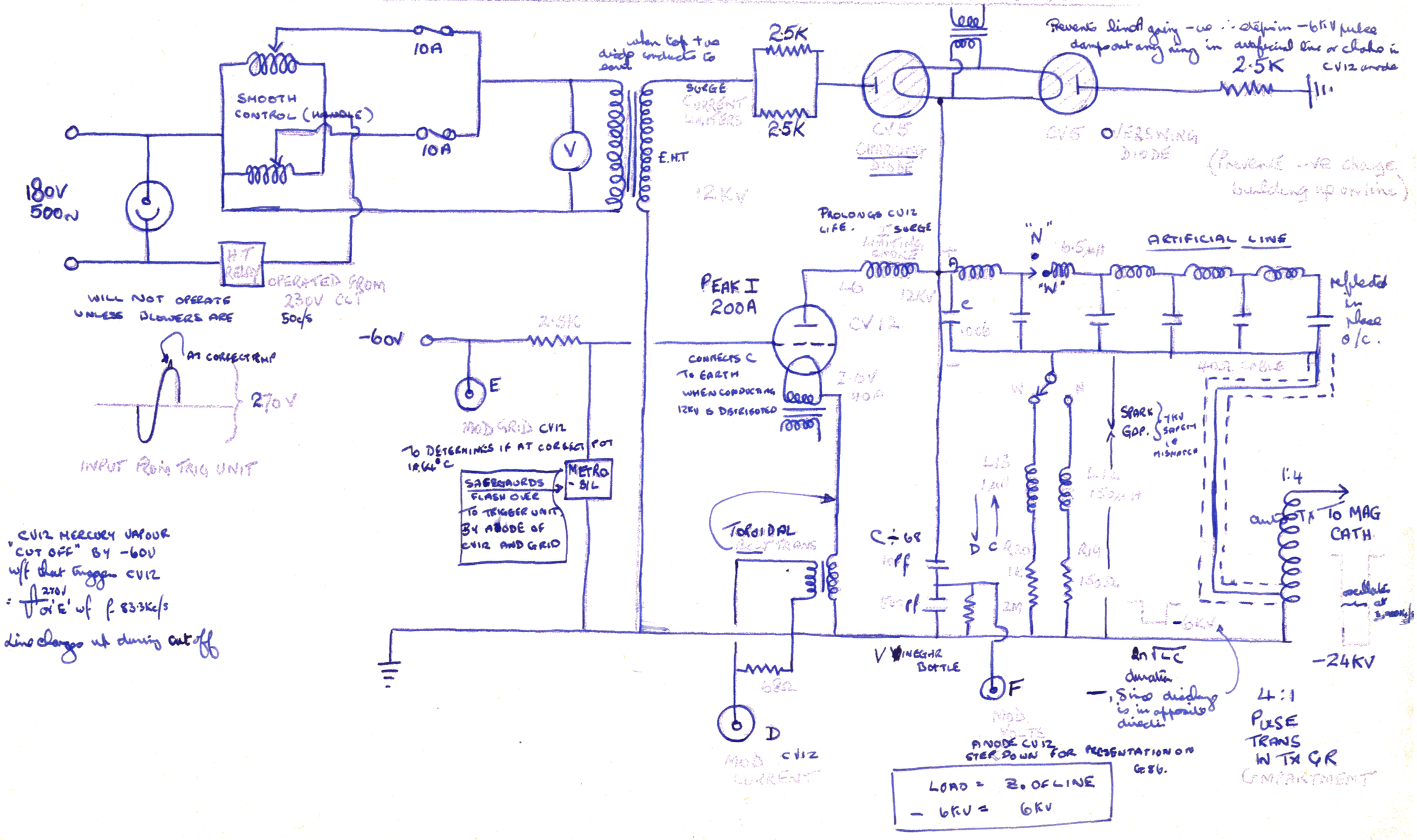
TRANSMITTER 9R.

The pulse transformer in this unit accepts -6Kv pulse from Mod. Rect Panel and steps it up to -24Kv, this pulse is applied to the cathode of the magnetron causing it to oscillate. The pulse transformer is an auto transformer - no phase reversal. The magnetron is essentially a fixed frequency oscillator but frequency can be varied within limits by altering the load reflected internally, this is affected by a plunger.

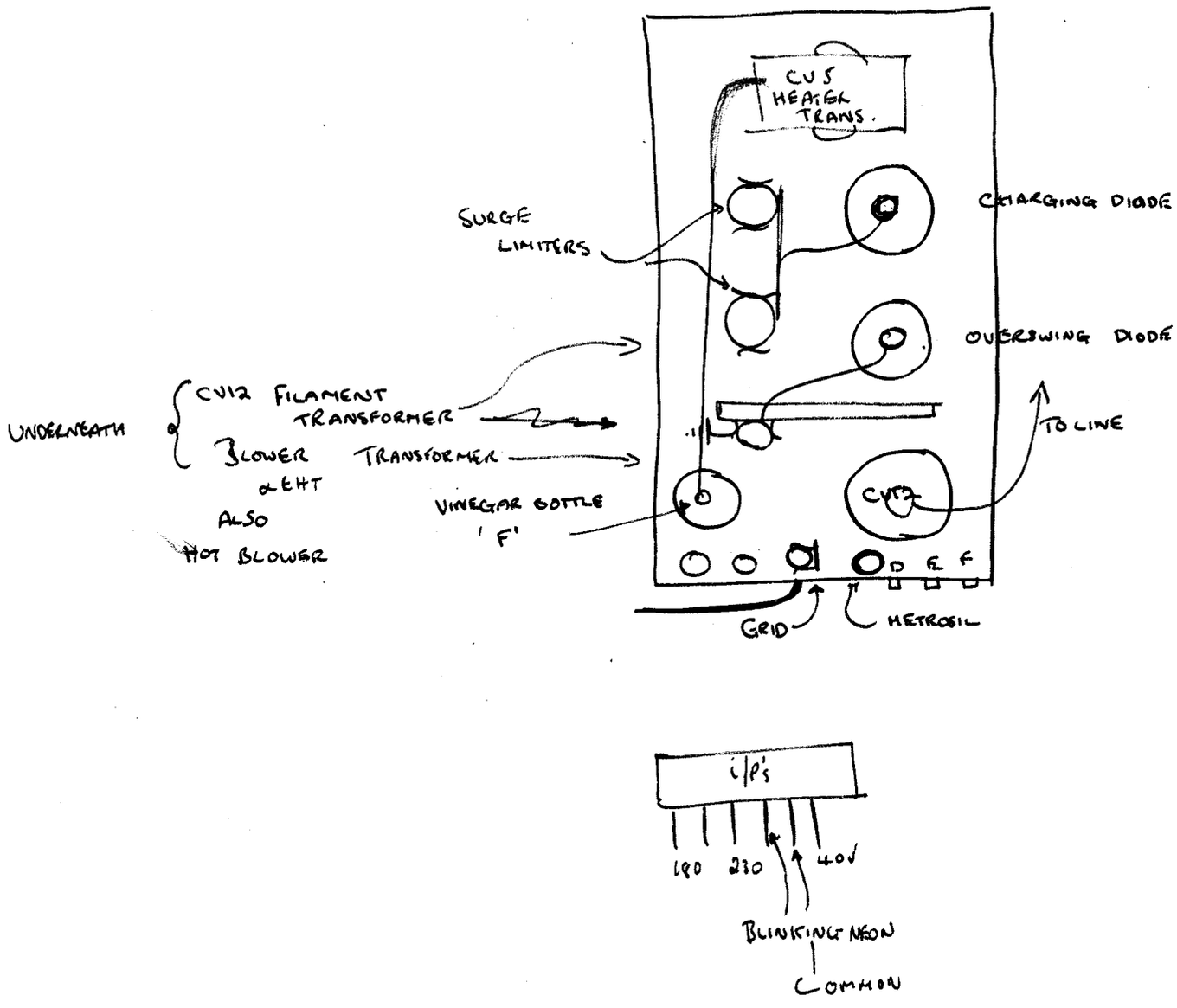
MODULATOR UNIT.

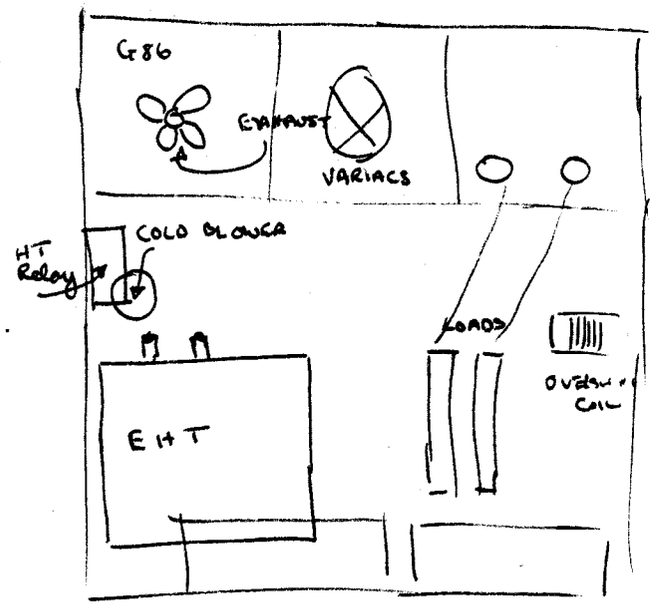
To provide -6kV pulse at PRF 500 to trigger off transmitter.
Artificial line modulator used.
Pulse width dependent length of line in use

MODULATOR UNIT AND POWER LINES IN 3A T. (SIMPLIFIED CIRCUIT ONLY)

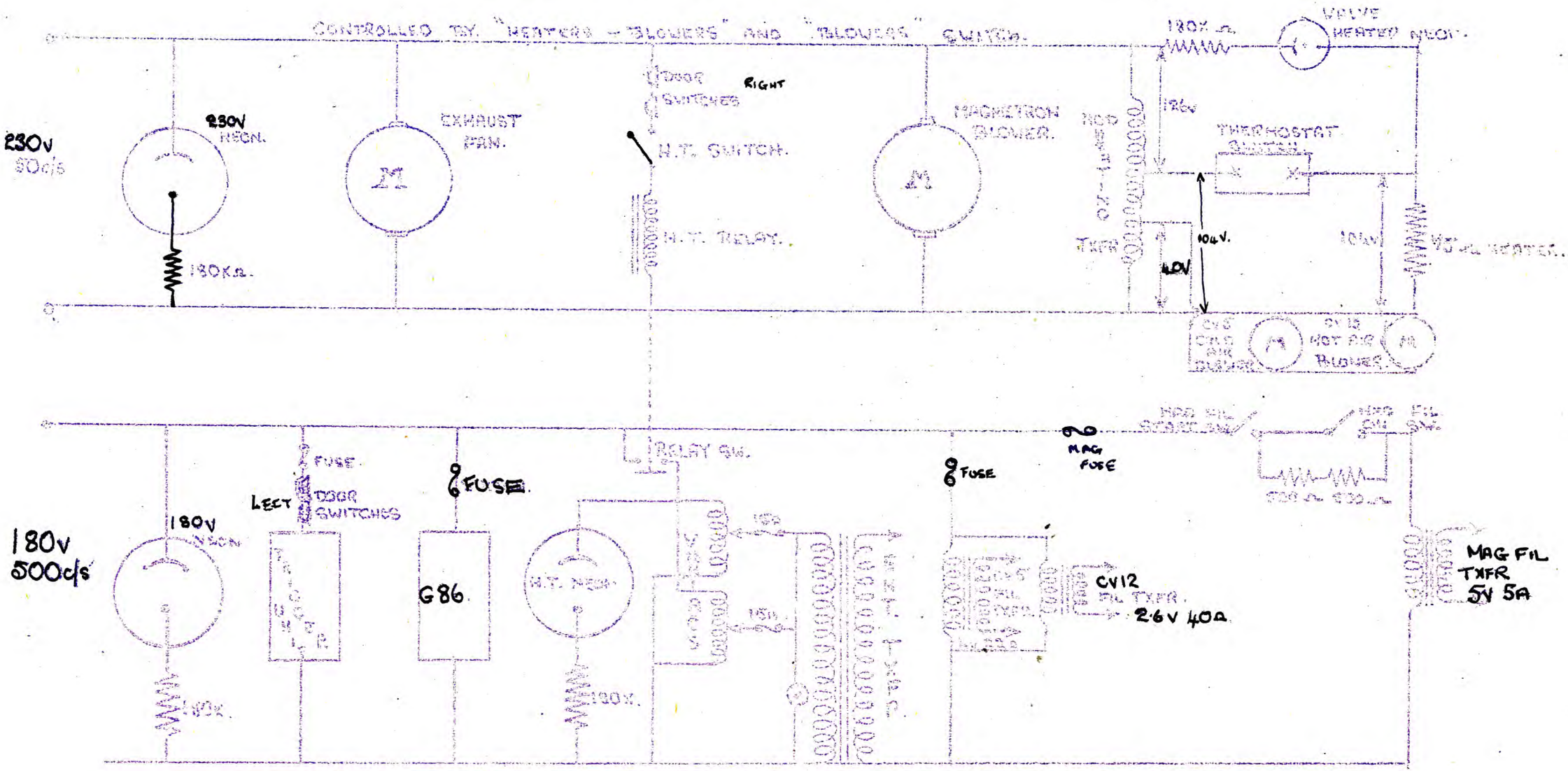


MODULATOR UNIT LAYOUT

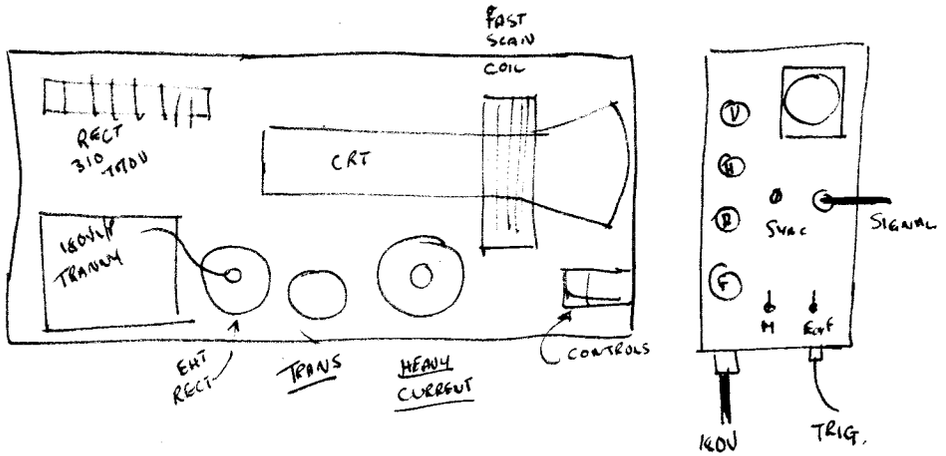




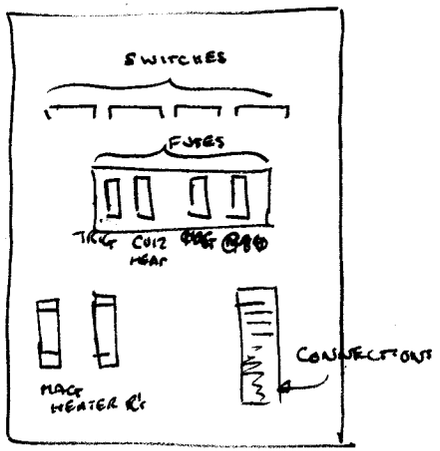
MODULATOR POWER SUPPLIES.



C486



Door

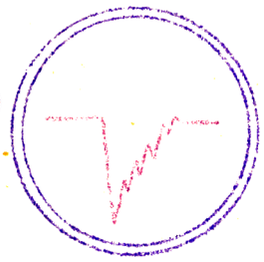


ALIGN ROUGHLY E.P. MECHANICALY
GRID SCREEN ONE BRUSH ONLY IS THEN MOVED
100 mA MAY TYPE'D'

ESSENTIAL W/F'S AS SEEN ON G86.

"A" 

CURRENT TROUGH MAGNETRON WHEN OSCILLATING.

"B" 

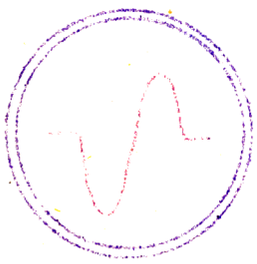
VOLTAGE APPLIED TO MAGNETRON CATHODE

"C" 

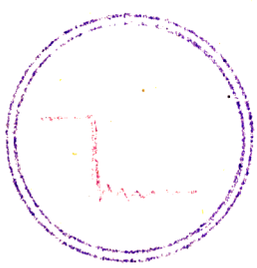
DIFFERENTIATED W/F APPLIED TO NGT5 GRID.

"D" 

CURRENT THROUGH "CV12" WHEN IONISED.

"E" 

TRIGGER VOLTAGE ON "CV12" GRID

"F" 

VOLTAGE ON ANODE OF CV12.

SPARK GAP breaks down at 8KV and protects pulse transformer. GAP I"

C.R. is connected across the pulse transformer to preserve pulse shape by presenting constant load to transformer.

L.R. the inductance overcomes the capacitive effect of magnetron and R prevents ringing thereby preserving pulse shape.

Magnetrons require conditioning and have shelf life of three months after which time they require conditioning again Any of the following magnetrons can be used as required.

CV. 1479	3045 Mc/s.
CV. 1480	3015 "
CV. 1481	2985 "
CV. 1482	2956 "

MARCONI ELECTRONIC SE2. (Output Unit).

The SE2 consists of a) Common T & R Switch
b) Matching Unit.

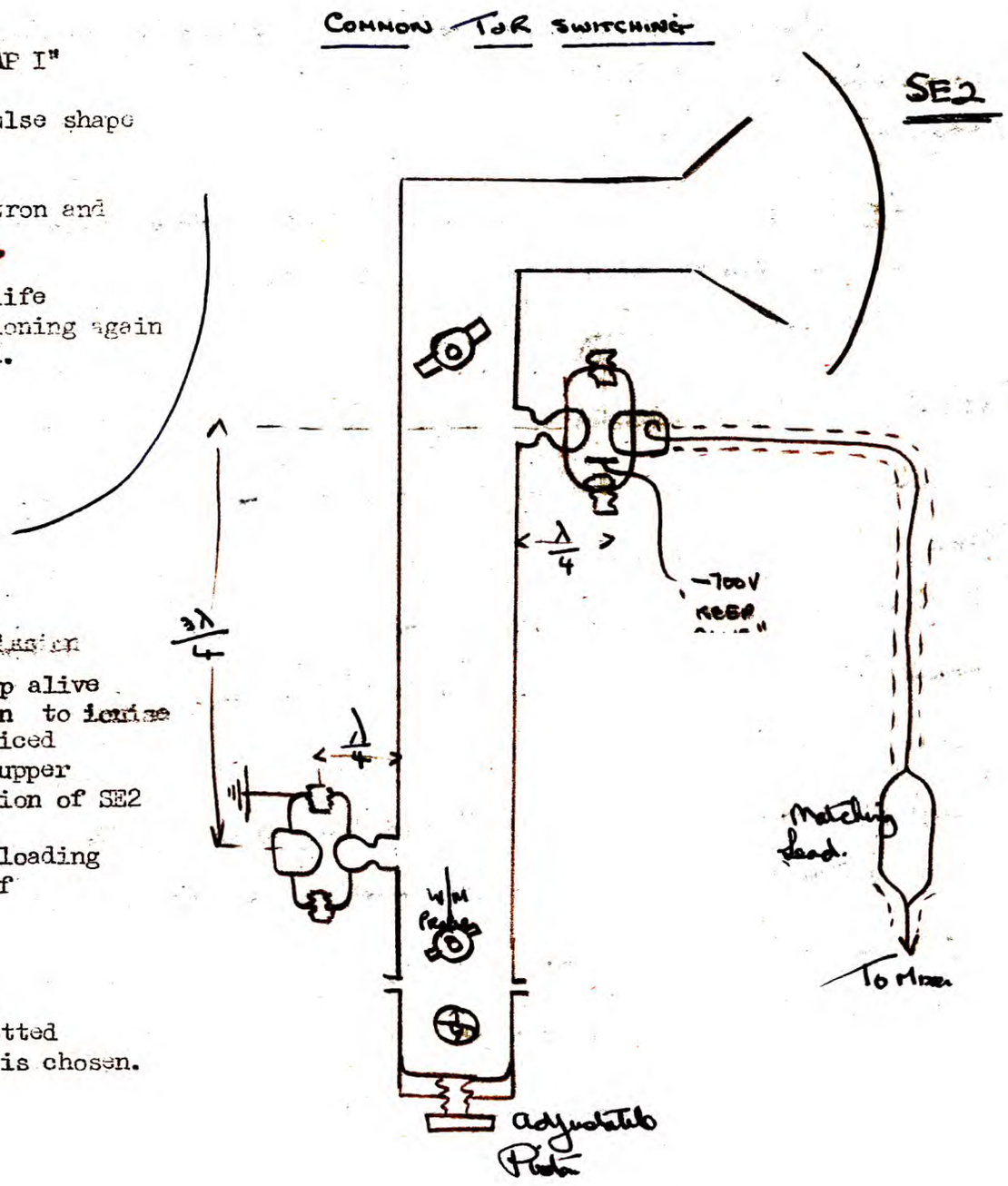
Use of a T & R Switch enables one Aerial to be used for both Transmission and Reception, the upper Rhumbatron primary electrode has -700v "keep alive potential applied. This to protect the xtal by assisting Rhumbatron to ionise immediately the transmitter fires. If serious loss of signal is noticed it is possible due to resonant condition caused by coupling between upper and lower Rhumbatron, this can be overcome by reversing upper section of SE2 making sure -700v lead is connected to upper rhumbatron.

Use is made of the matching plunger by adjusting until optimum loading condition is presented to the magnetron, this is done with the aid of POWER/FREQ curve.

POWER FREQUENCY CURVE.

REQUIREMENTS :- STABLE FREQUENCY with MAX. POWER.

Power (Radiation Meter) and Frequency. (G82A) are plotted against Plunger turns, from the resulting graph the operating pourt is chosen.



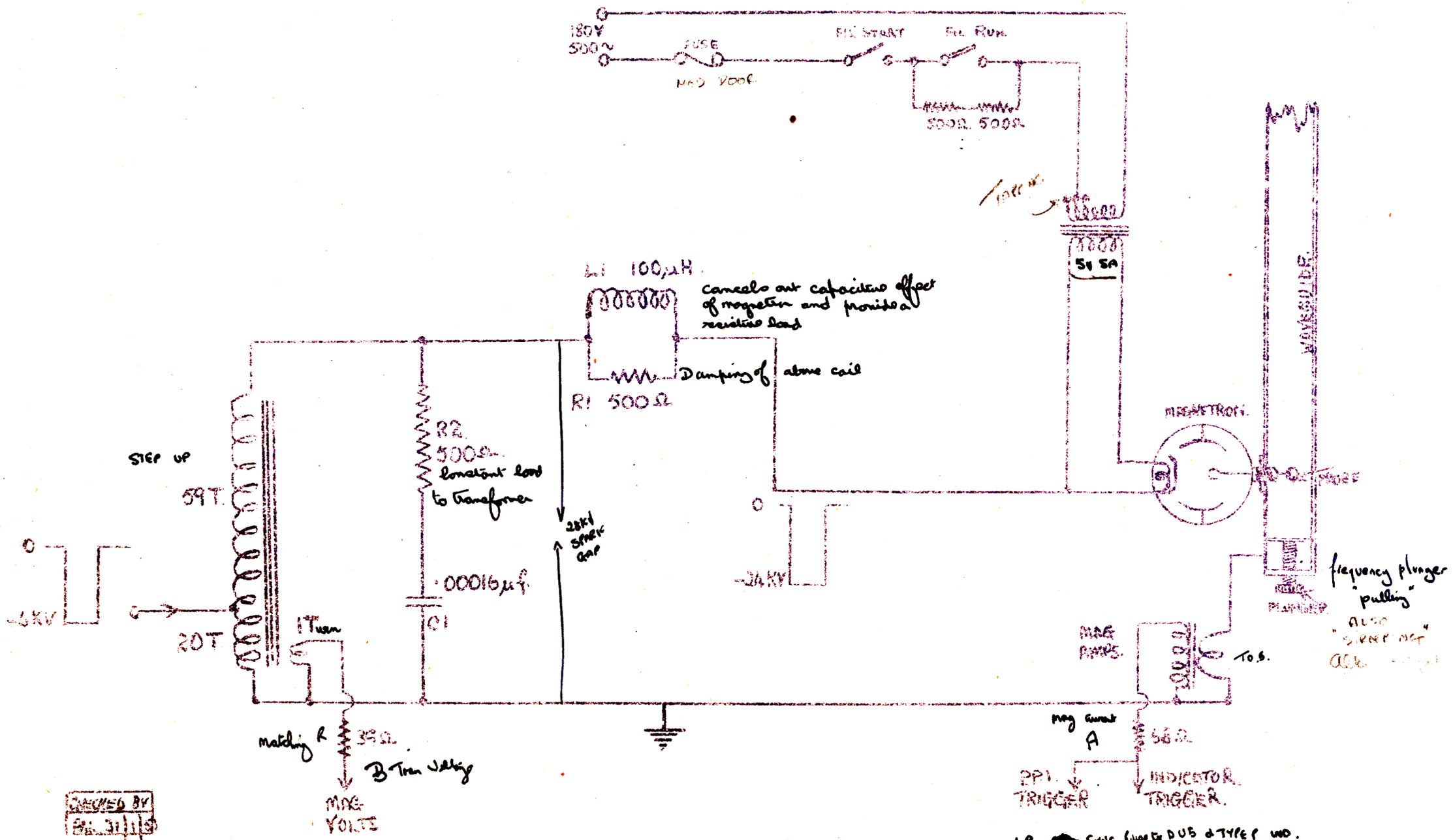
30 SE.2.

Uses the relative sizes of pulses travelling up or down the waveguide to determine whether the aerial is connected to the receiver or the magnetron

Transmit : Both stubs are set to provide a high impedance across the waveguide at the slot — this has the effect of placing a high impedance across the waveguide — thus all energy is fed to aerial.

Receive : Signal reflected from target travels down the guide & reflected by surface of plunger. Result of travelling and reflected wave is standing wave. High impedance point must occur just below upper stub being dependent on position of plunger which is set when adjusting magnetron. High imp point will also be varied by capacitive effect of magnetron probe. Tuning of bottom stub introduces variable reactive component cancelling out capacitive effect of probe and by adjusting position of high imp. point. Correctly adjusted when high imp point just below upper stub - indicated by max signal strength. If plunger has been varied e.g. new magnetron fitted — difficulty experienced in obtaining required signal strength — possibly to change upper and lower stubs — which actually changes distance from plunger to high Z point.

TRANSMITTER TYPE 9R.



L.P. SYNC PANEL DUB 4 TYPE UNIT.

TRANSMITTER TUNING.

REQUIREMENTS.

A Stable Frequency and Maximum Power.

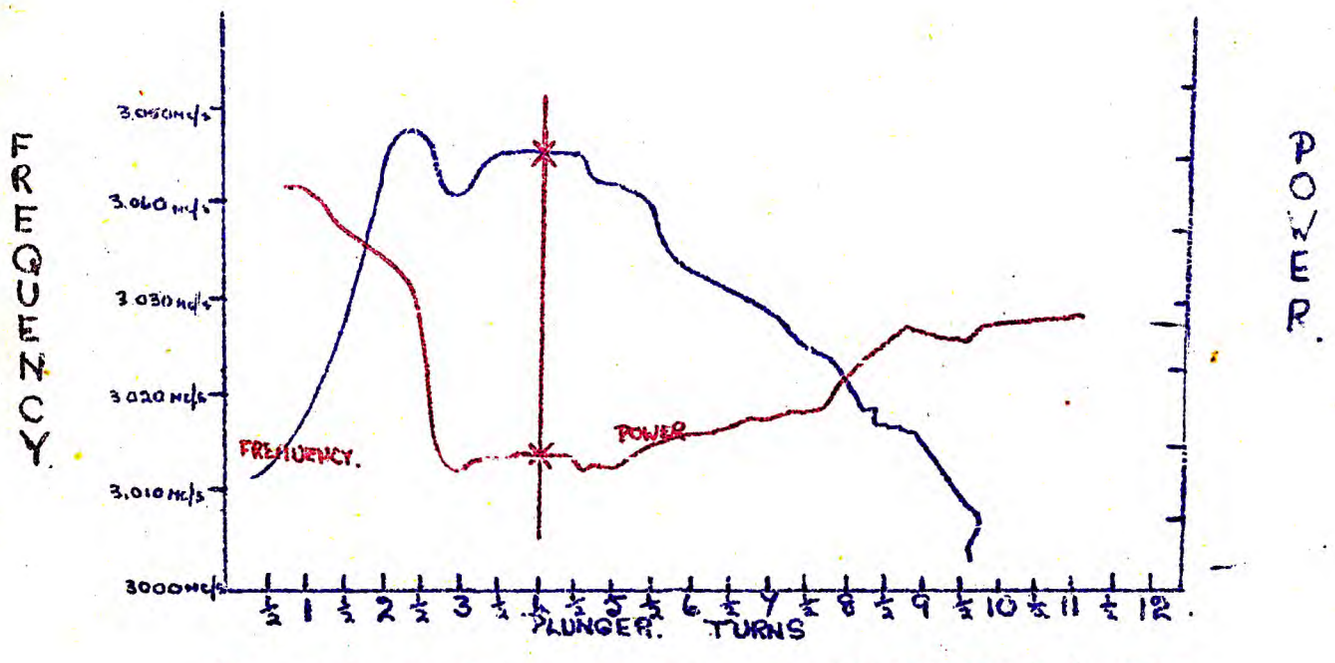
METHOD.

To plot frequency and Power against half turns of plunger.

PROCEDURE.

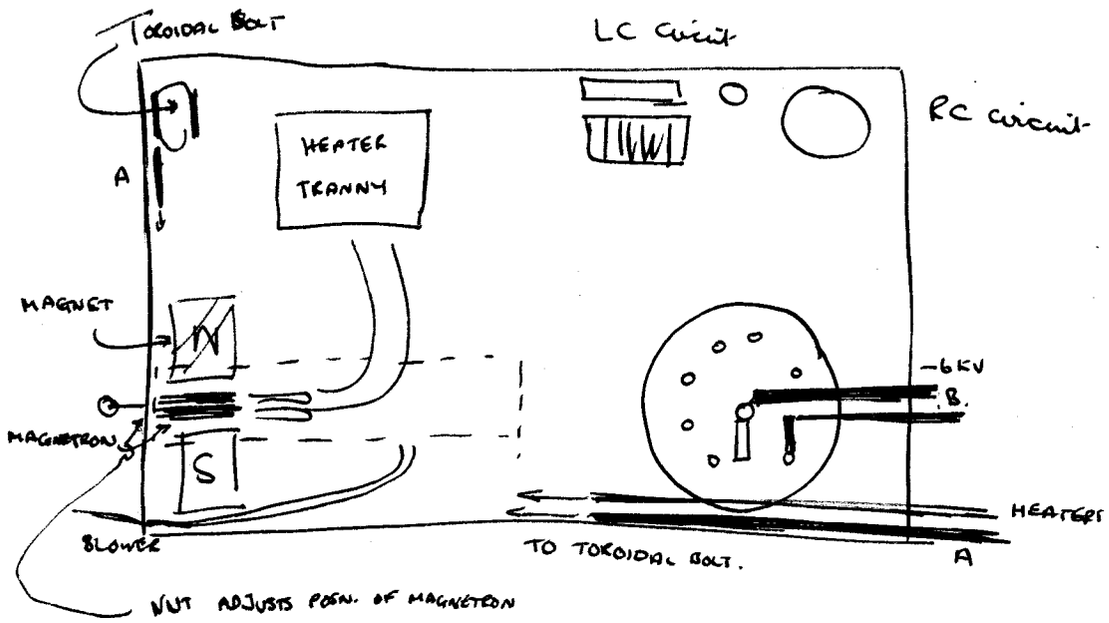
1. Unscrew plunger till arcing occurs. Mark Plunger knob. Take Power reading with radiation meter , and frequency with W/M.
2. Turn Plunger through half turn and take frequency and power readings.
3. Repeat, taking readings every half turn, till arcing reoccurs.
4. Turn Plunger to starting position.
5. Find stable frequency which gives maximum power and set plu[illegible]

EXAMPLE

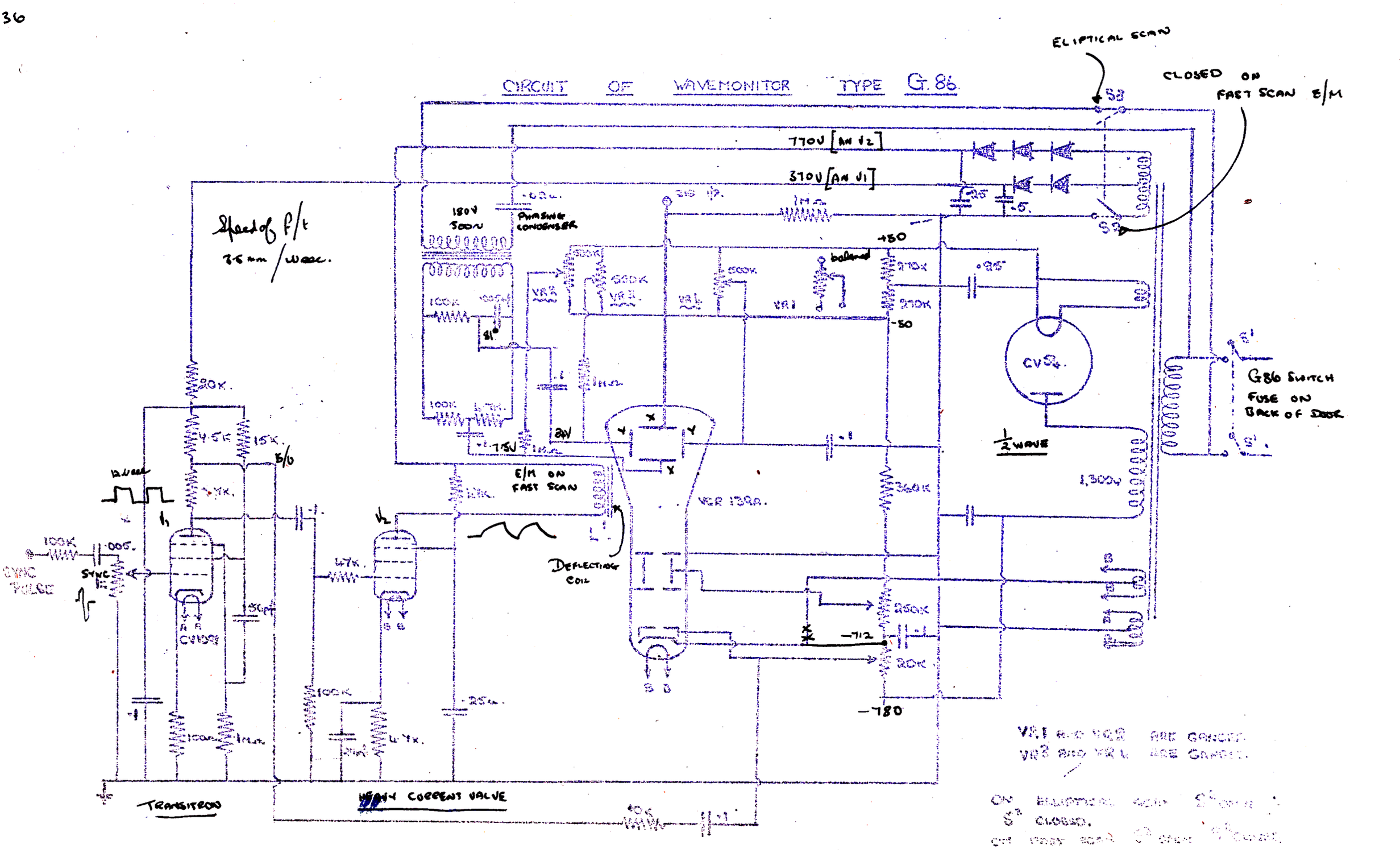


X = STABLE POWER CONSISTANT WITH STABLE FREQUENCY. ∴ BEST OPERATING POINT.

TRANSMITTER UNIT LAYOUT



CIRCUIT OF WAVEMONITOR TYPE G.86.



7.

G86. Wavemonitor.

Used for checking the operation of the equipment by viewing wave forms at points provided or measurment of voltages in other parts of equipment, sensitivity of Scope is 62 volts /CM. It has a FAST AND ELLIPTICAL scan.

FAST SCAN is used for checking waveforms and voltage ELLIPTICAL scan is used essentially for checking phase.

VALVES.	FUNCTION	ANODE VOLTAGE
VT 60A	CURRENT AMPLIFIER	+770v.
CV1091	TRANSITRON	+370v.
CV54	E.H.T. RECTIFIER	+1,300v. OUTPUT -1,300v

Pulse width can be measured on part scan 3.5 milimetres per microsecond.

CRYSTAL MIXER AND HEAD - AMPLIFIER.

The HEAD - Amplifier increases the signal / noise ratio. To fulfil this purpose it is mounted near the transmitter. The crystal mixer Unit forms a tuned circuit, the incoming R.F. signal and the local oscillator input are mixed, the best frequency otained is detected by the crystal and passed to the HEAD AMPS, the bandwidth of this Unit is 4 mc/s. DU5 is fed from t is Unit. Crystal current should not exceed 450 microamps. Normal working current 400 microamps.

MAIN I.F. AMPLIFIER.

This Unit consists of three I.F.s, DETECTOR, LIMITER AND VIDEO AMP. the band width of the main Amplifier is 1 mc/s.

Second detector current is used as an indication of signal strength when tuning receiver chain.

Signals are limited (to prevent swamping of later stages) to 3.5 volts amplitude.

Video Amplifier O/P is fed to "Y2" on CRT.

GAIN control on main amplifier alters cathode bias on three I.F. valves

Xtal Colour Codes.

Power rating:

Red Spot: maximum power 450 W amps normal running 400. 40 watts

Orange Spot: Maximum 350 V normal 300 5-10 watts

Sensitivity: Back to front ratio.

Line or record stat

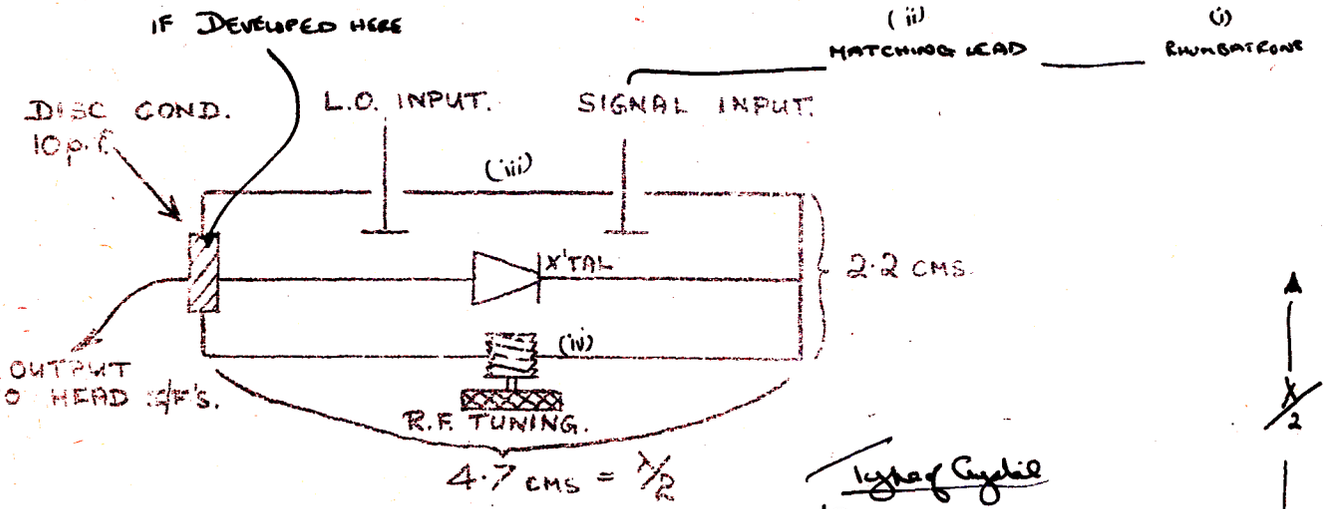
green: b/f ratio > 100:1 i.e. 3cm

Yellow: " " " 10:1 i.e. 10 cm

Blue " " < 5:1 Rejects used for experimental working.

Forward Resistance should not exceed 200 Ω. [With AVO sensitivity R.2. high ohm Range]

X'TAL MIXER.



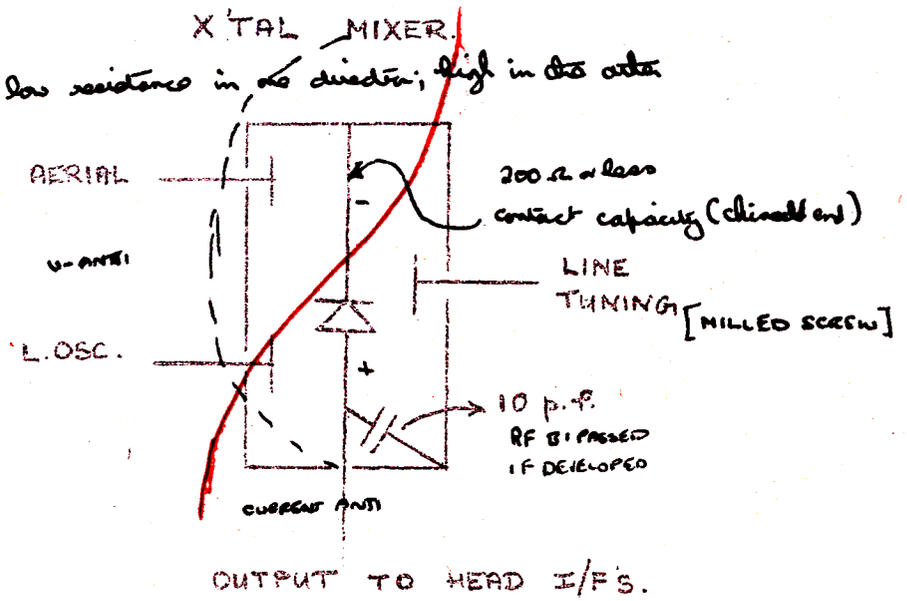
Type of Crystal
10cm
High resistance to Burnout
450 μA
10:1 Back to front ratio

Noise
Terms in T.I.M.S

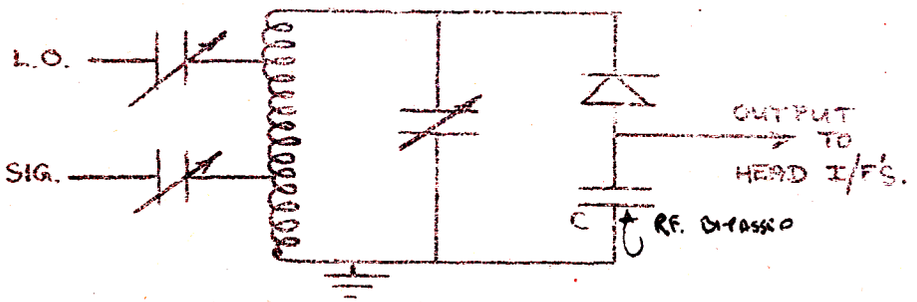
ALTERNATIVE DIAGRAM

X'TAL MIXER.

low resistance in one direction; high in the other



EQUIVALENT CIRCUIT OF
X'TAL MIXER BOX.



REACTANCE OF C

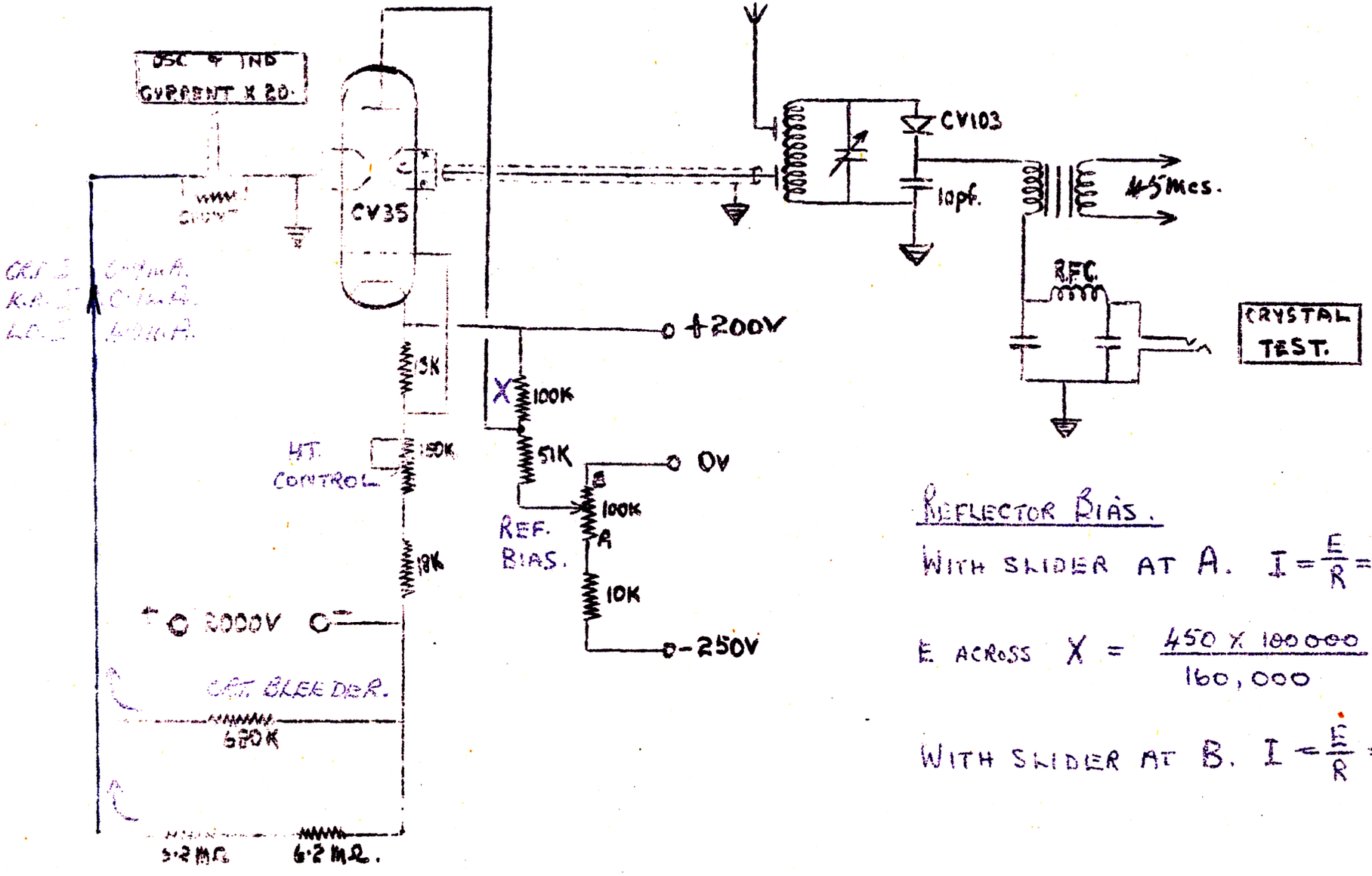
X_c AT 45 MCS = 350Ω APPROX.

X_c AT 3000 MCS = 5Ω "

X_c AT 6000 MCS = 2Ω "

THEREFORE C HAS MAXIMUM REACTANCE TO I/F OF 45 MCS.

OSCILLATOR AND CRYSTAL MIXER CCT.



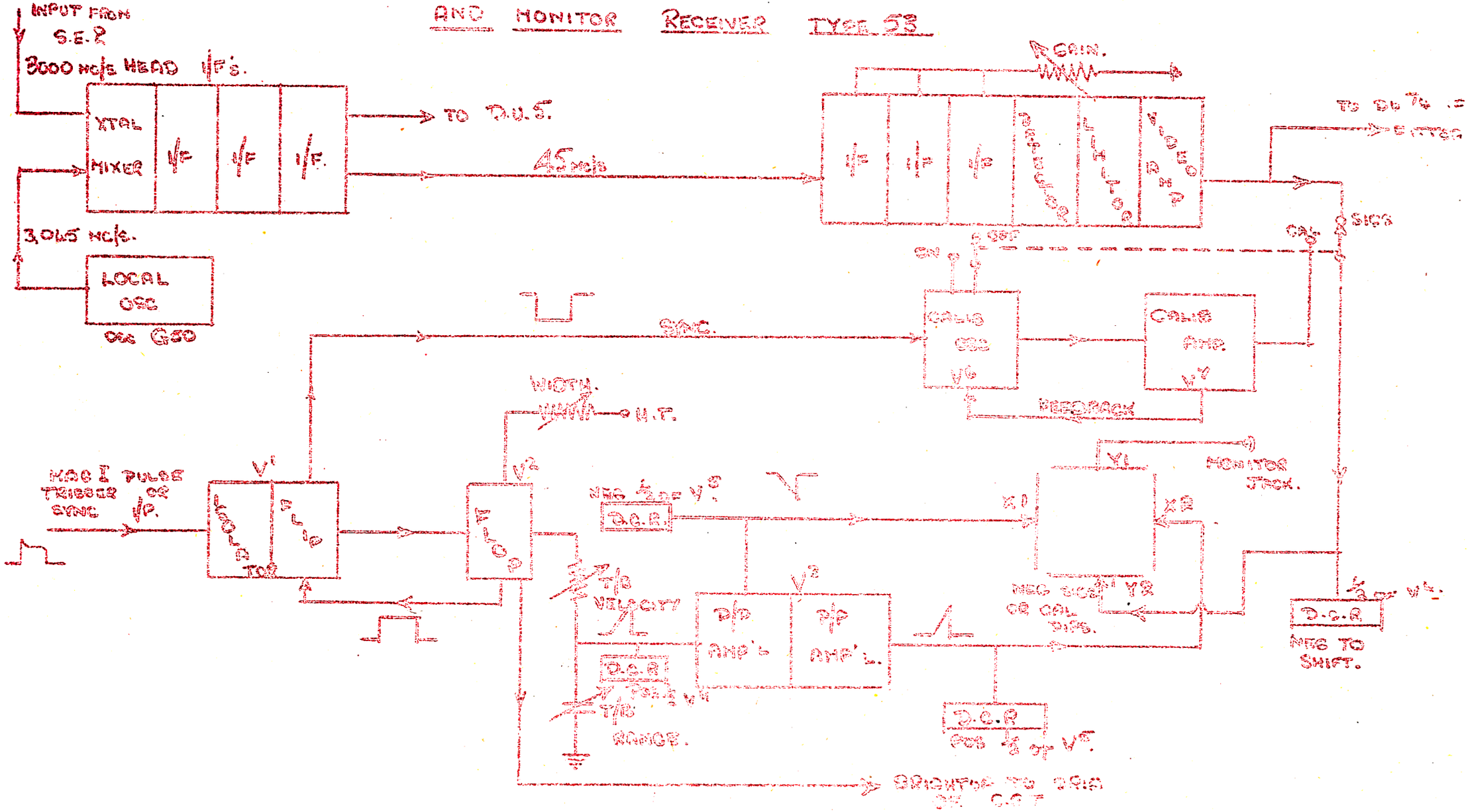
REFLECTOR BIAS.

WITH SLIDER AT A. $I = \frac{E}{R} = \frac{450}{160,000}$

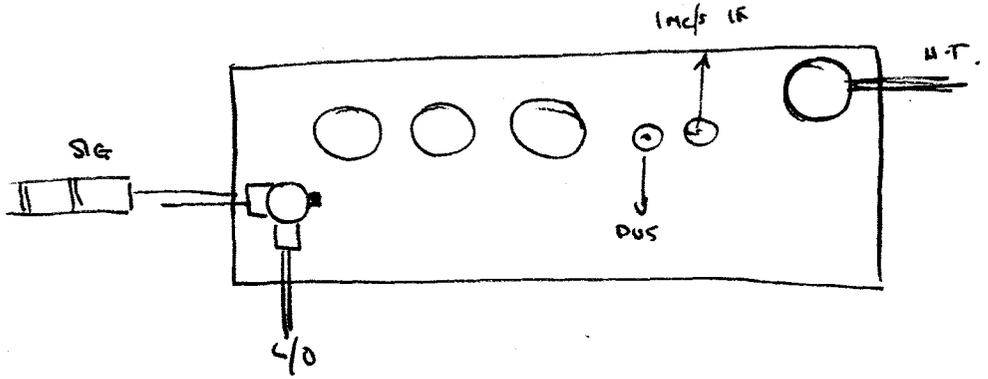
E ACROSS X = $\frac{450 \times 100000}{160,000}$ = 280V APPROX.

WITH SLIDER AT B. $I = \frac{E}{R} = \frac{450 \times 100000}{260,000}$ = 175V

SIMPLIFIED BLOCK DIAGRAM OF HEAD I/F'S AND MONITOR RECEIVER TYPE 53



XTAL MIXER AND HEAD AMP LAYOUT



POWER METER

TUNED CIRCUIT, THERMOSTAT & METER. CALIBRATED IN DECIBELS.

G 50 LOCAL OSCILLATOR.

The local oscillator is a REFLEX KLYSTRON. The output is taken via a coupling loop from the Klystron, loop is normally set 30° from the nortical position.

The local oscillator output is applied to the crystal mixer box, the local oscillator frequency is adjusted to be 45mc/s above or below transmitter frequency. (MAGNETRON FREQ.)

Controls associated with the local oscillator circuit are as follows.

H.T. CONTROL. Controls the potential of the Klystron cathode with respect to earth, also the grid to cathode potential, deciding the amount of current through the Klystron, maximum current 6M.A .

REFLECTOR BIAS. decides the potential of the Reflector electrode with respect to cathode and is adjusted for max. stable output from the L.O.

COARSE AND FINE TUNING PLUNGERS. provide a means of altering the physical dimensions of the tuned circuit, an increase of frequency is affected by reducing inner dimensions.

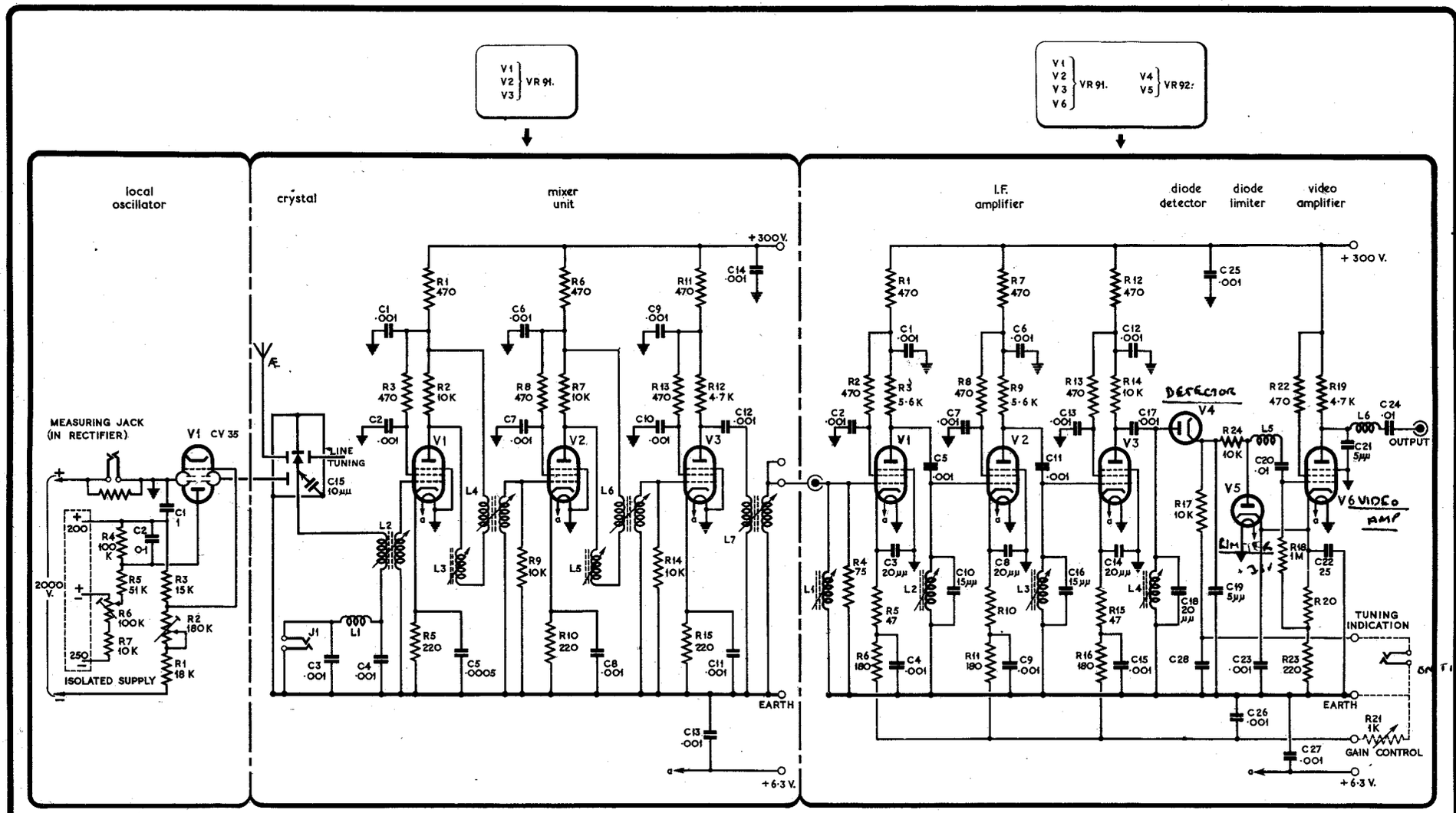
An Isolated supply is used with this circuit to ensure that once the Reflector bias potential bias been set, the Reflector will maintain this potential with respect to cathode even through the cathode potential is adjusted with respect to earth thus a stable frequency is assured.

TIMEBASE & CALIBRATION CIRCUITS

The Indicator panel contains TIMEBASE AND CALIBRATION circuits also CATHODE RAY TUBE.

VI is a double triode VT61B the first half acting as an isolator preventing inter - action between the timebase and external equipment using a common sync source
The second half of VI forms the flip - flop together with the cathode grid and screen of V2. The TIMEBASE is actuated by wave form on the anode of V2.
V3. is also a double triode VT61 and forms part of the P.P.A. cct.
V4. a double diode VR54, has one half D.C. restores negatively Sigs or cal on Y2 plate of C.R.T.
V5. (VR54) restores the "X" plates.
V6. (VR91) is the trigger in the Calibration circuit.
V7. (VR91) is an amplifier helping to maintain oscillations

Ranges
L - 240,000 yds.
M - 120,000 yds.
S - 60,000 yds.



OSCILLATOR G.50 | RECEIVING UNIT TYPE 177 | I.F. UNIT TYPE 105

Via DCR 2C/S switch toy plates of IND.

T.R.3561 {Receiving Unit / I.F. Unit & Oscillator}

FOR FURTHER INFORMATION SEE A.P. 2525 L

RESTRICTED

PREPARED BY THE MINISTRY OF SUPPLY FOR PROMULGATION BY AIR MINISTRY

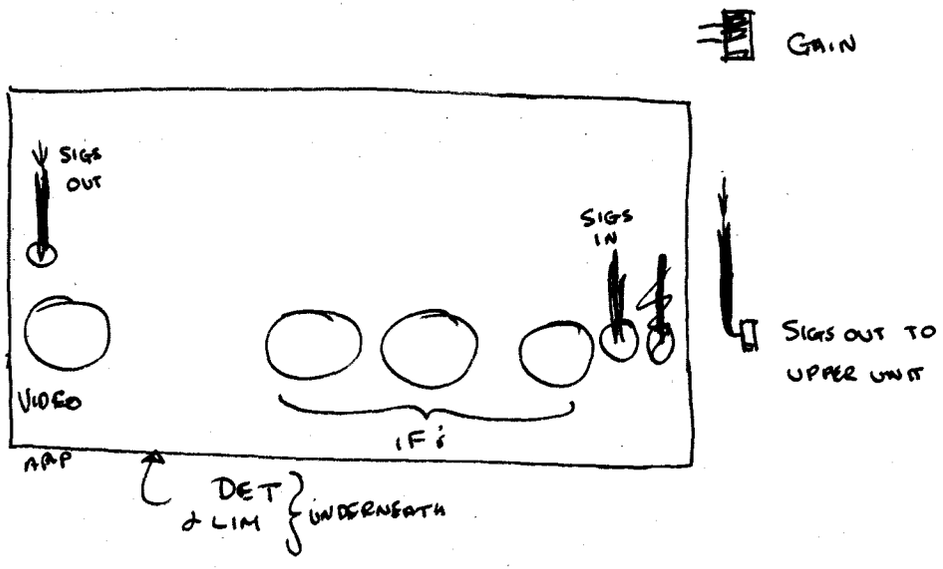
AIR DIAGRAM 4371 /MIN

ISSUE 1 1 SHEETS - SHEET 1. MAR. 1949

A.L. No.					
DATE					
INITIALS					

R.T.R

2ND IF STRIP LAYOUT



WIDTH CONTROL. Varies the leak away time of the coupling condenser in the FLIP-FLOP circuit thus deciding the width of Square wave from FLIP-FLOP
NEG. Squqre wave from the anode of V1 releases energy in Cal. OSC coil.
POS. Square wave from screen of V2 is applied to C.R.T. grid as bright up.

RANGE SWITCH. Brings into circuit various valves of C&R therby altering speed of SCAN.

SENSITIVITY CONTROL. controls amplitude of waveform fed to "X" plates of C.R.T. is used to correct for varying sensitivities of C.R.T's.

RANGES. LONG	240,000 yds.	49 CAL PIPS
MEDIUM	120,000 yds.	25 CAL PIPS.
SHORT	60,000 yds.	13 CAL PIPS.

Frequency of Cal. OSC. is 32.77KC/S

Distance between pips is 5000 YDS.

First cal pip is adjusted to coincide with zero mark on scale

G 82 A WAVEMETER.

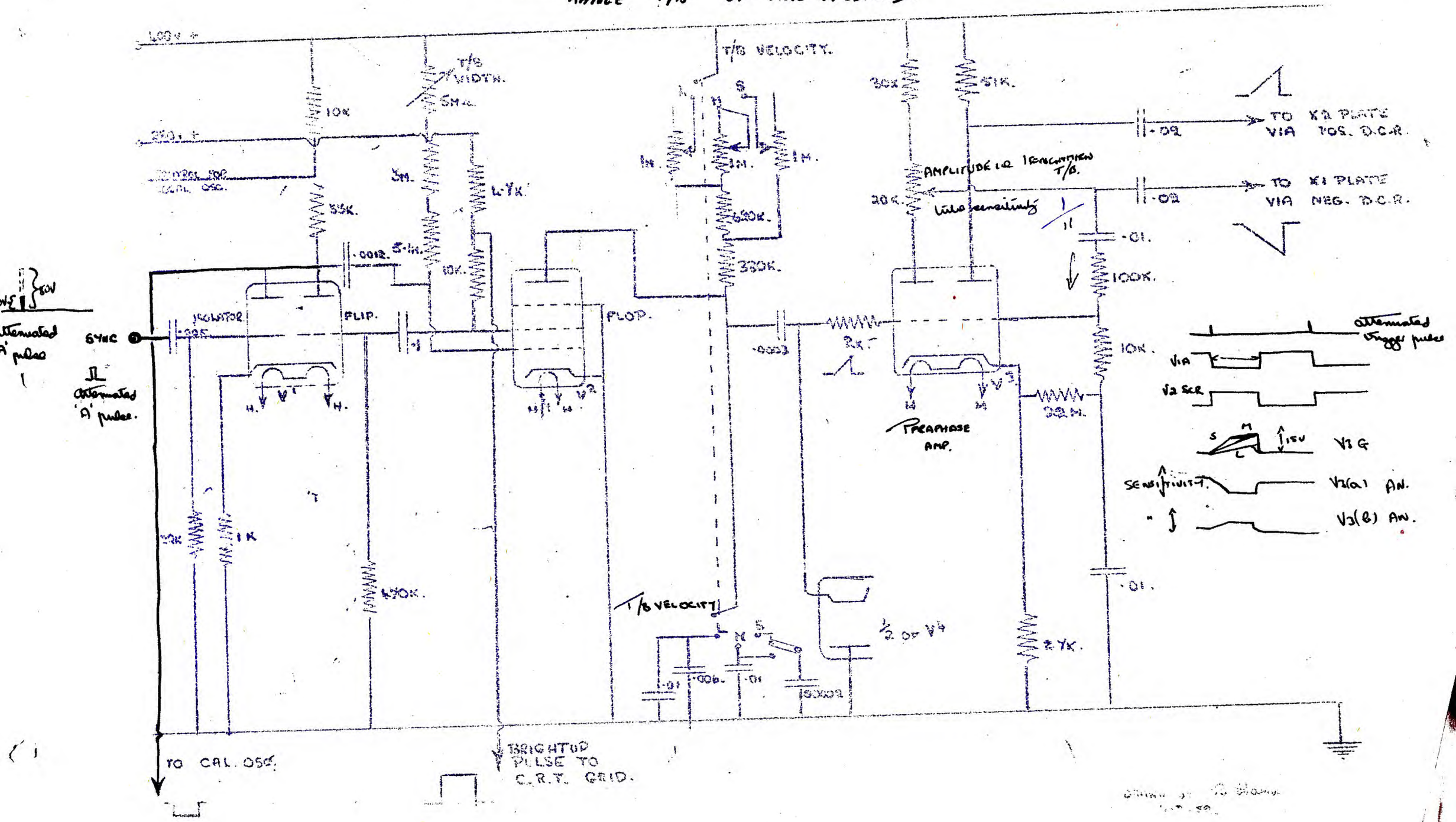
PRINCIPLE. This wave meter works on the Superheterodyne principle it has an internal oscillator the output of which mixes with the incoming signal to produce an I.F. After detection signal is fed to a MAGIC EYE indicator
The G 82 A can also be used to generate signals or pulses of R.F. every ten micro seconds, the R.F. frequency being about 3000 mc/s. It is therefore possible totune the receiver chain even though Permanent echoes are not available.

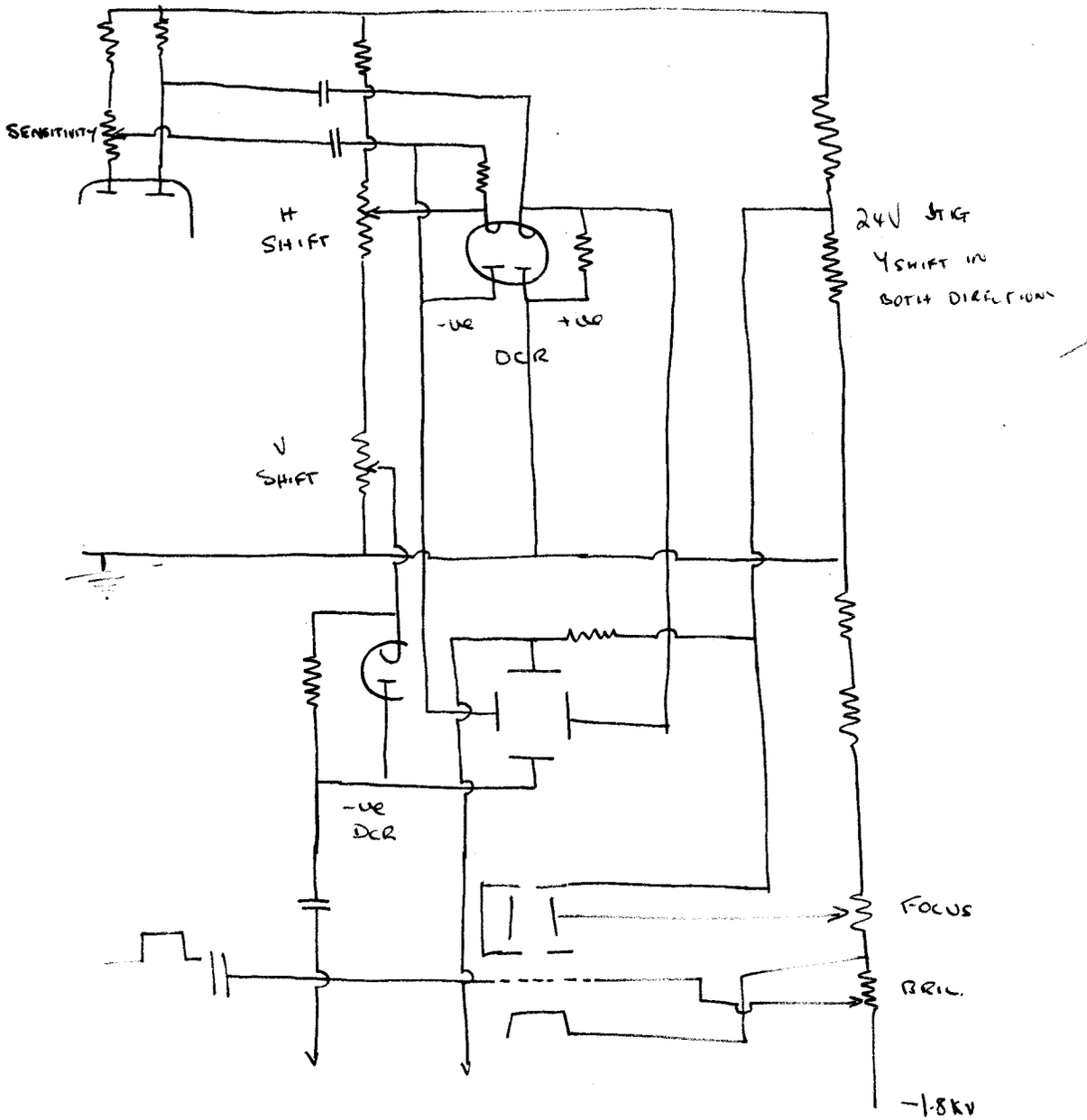
The three main functions of the G 82 A can be stated as follows.
a) For the measurement of Transmitter frequency.

b) to enable LOCAL OSC. (Klystron) to be tuned 45 mc/s above or below the transmitter frequency.

c) tuning of the Receiver chain without the aid of a Permanent echo.

INDICATOR UNIT TYPE 196 (IMPROVED).
RANGE T/B OF 425 MODIFIED.





TYPE 'P' IND.

Frequency of CRT OSC 33Kc/s

Square wave intensity

5 Concise Details

30 Layout and each description

25 Fact dig.

15 Fact recording

25 Fourth Test editing etc.

I II Vol I Layout

III Vol I Facts.

HEATERS AND BLOWERS.

There are two heaters incorporated in the equipment, one in the form of a 60 watt. lamp and housed in the MCN 53. provision is made for the fixing of a heater element on lower right side of 3AT, both these heaters have a common switch on Power Distribution Board.

There are four Blowers.

a) The magnetron Blower. situated underneath the Transmitter it circulates air around the magnetron and on to magnetron output probe.

b) Hot Air Blower. Keeps warm air circulating around the CV12 envelope the motor is situated underneath the Mod. Rect. Panel.

c) Cold Air Blower. Prevents CV5's (charging & Overswing diodes) from over heating the motor is situated underneath the artificial line inside the 3AT)

d) Extractor Fan. Keeps air circulating through 3AT preventing temperature rise. Fan situated at the back of the 3AT.

The Blowers are controlled from Power Distribution Board, DU5 the H.T. Relay ensures that E.H.T. (12KV) can NOT be applied without Blowers first being switched on.

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T.V.356A SETTING UP RANGES AND TUNING PROCEDURES.

RANGES. LONG. 240,000 yards. MEDIUM. 120,000 yards. SHORT. 60,000 yards

SETTING UP RANGES.

1) Switch to long range and turn all pre-set range controls fully clockwise.
2) Count number of cal pips on the trace and with the aid of pre-set range control(long) obtain 49 pips on the trace. If unable to obtain 49 pips with the pre-set control, bring the required number on to the trace with the width control.
3) Switch to Medium range and adjust the horizontal shift until first pip is opposite zero mark on scale. With medium pre-set control place the 21st pip opposite the 10th mark on top scale.
NOTE. If a cluster of pips appears on the end of the trace causing a bright blur the sensitivity control must be adjusted until cluster disappears round the side of the tube. THIS CONTROL SHOULD BE ADJUSTED ON LONG RANGE.
4) Switch to long range and with pre-set range control place the 41st pip opposite 20th mark on lower scale.
5) Switch to short range and with pre-set range control place the 11th pip to coincide with 10th mark on top scale.

SETTING UP LOCAL OSCILLATOR

1) Check 250 & 150 currents and with HT control adjust for a reading of 5ma.
2) Check crystal current and adjust with Reflector bias control for maximum stable output. This reading must not exceed 450uA
3) Check transmitter frequency and switch off HT.
4) Set local oscillator fine tuning control to centre of travel.
5) Set selector switch on G82A to the wavemeter position and feed output of local oscillator to G82A.
6) With the aid of calibration curve tune local oscillator 60 c/s higher than transmitter frequency.

TUNING SIGNAL CHAIN USING G82A

1) Check transmitter frequency and lock scale in this position.
2) Sync. G82A from 1.25.
3) Plug output from calibration on G82A into upper probe on S.M.2
4) Ensure that local oscillator probe and signal probe to crystal mixer box are not touching crystal, by inserting probes as far as possible and then withdrawing each probe .1 inches.
5) Plug meter into second detector test jack and adjust local oscillator fine tuning control for increase in second detector current.
6) Adjust output loop from S.M.2 for maximum second detector current.
NOTE. All the following tuning is for maximum second detector current.
7) Tune local oscillator.
8) Adjust plungers on top rhumbatron.
9) Retune local oscillator.
10) Adjust plungers on lower rhumbatron.
11) Retune local oscillator.
12) Adjust matching slug.
13) Retune local oscillator.
14) Adjust signal input and local oscillator input probes in mixer box and retune local oscillator.
15) Adjust milled screw on mixer box, lock and retune local oscillator.

CAL OSCILLATOR.

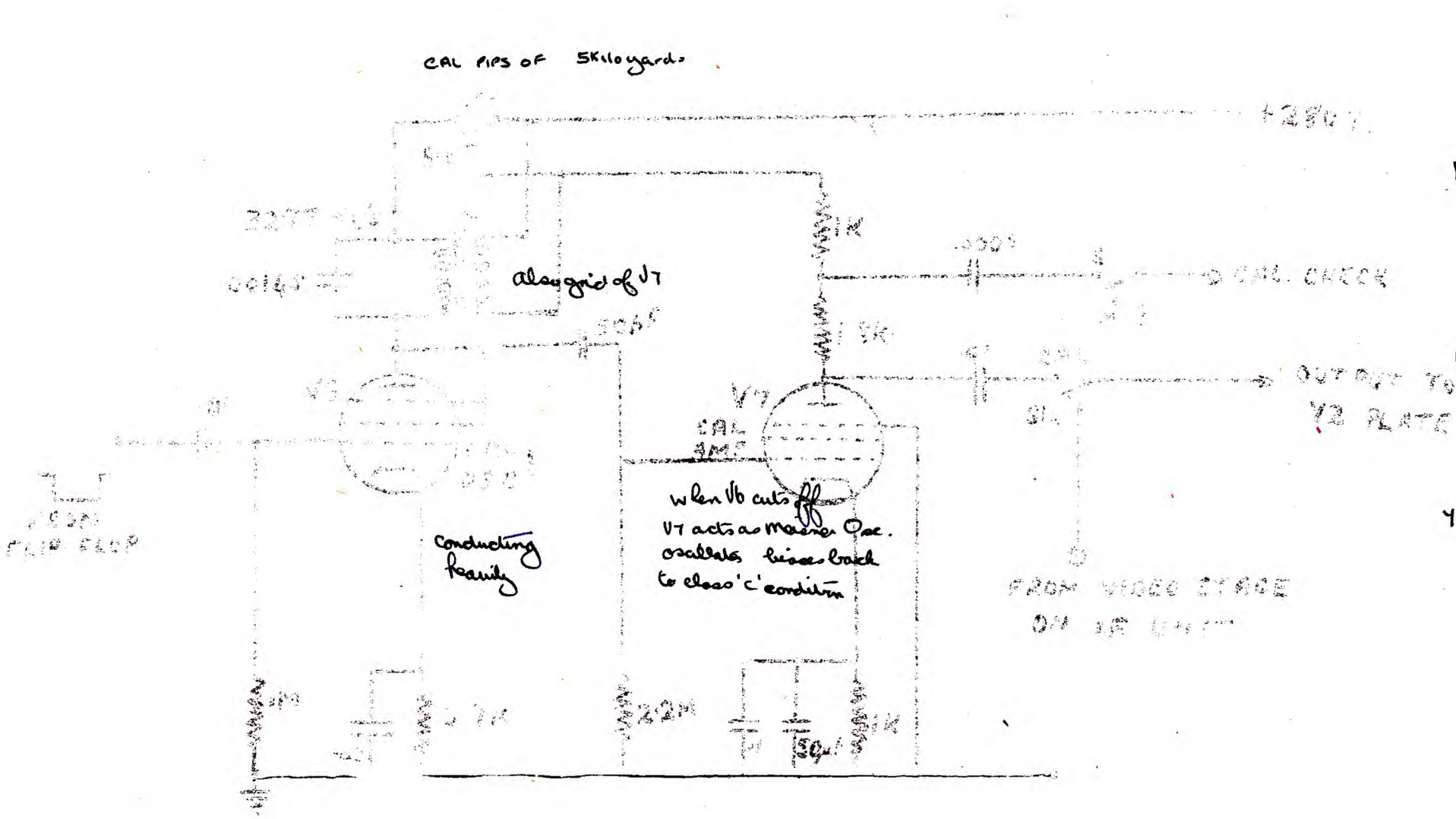
Produces cal pips at 32·77 Kc/s i.e. 5,000 yds.

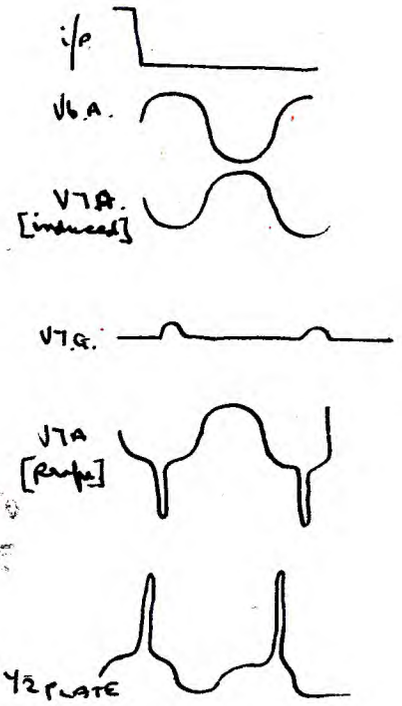
Action:

V_6 Normally conducting anode tuned circuit therefore damped [this is grid cct. of V_7.]. On arrival of -ve going square wave V_6 is cut off damping removed from anode tuned cct. permitting V_7 to function as a Mesine Osc. This oscillates so violently that it goes back to class 'C' condition this only on +ve tips of grid input waveform are effective on grid. Resulting in -ve pips in anode of V_7. Waveform applied to CRT is a combination of these negative pips and sine waves from V_6 anode by inductive coupling.

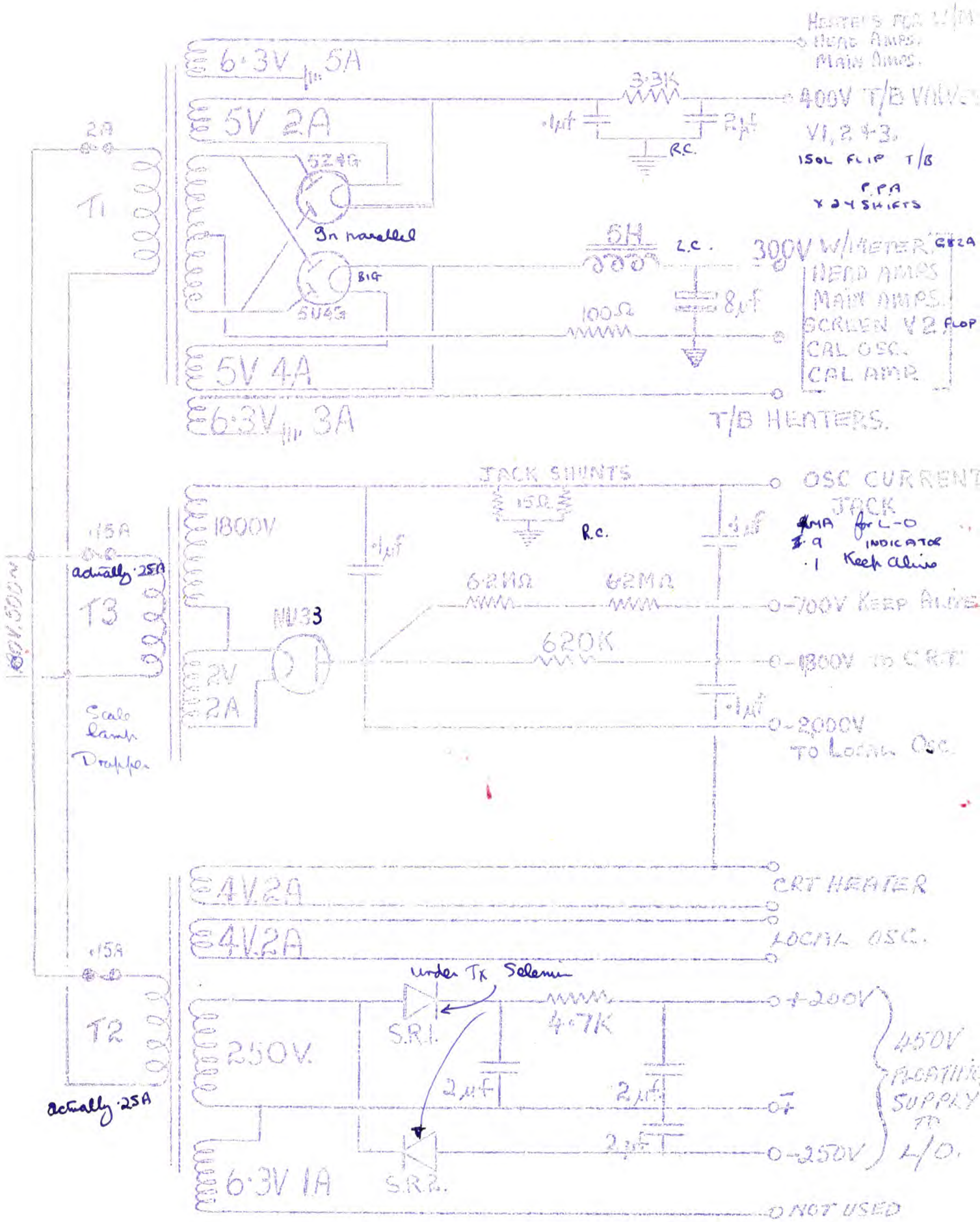
12. OSCILLATOR AND CAL. AMP. (cont.)

CAL PIPS OF 5Kilo yards





Power Supplies on Monitor Panel

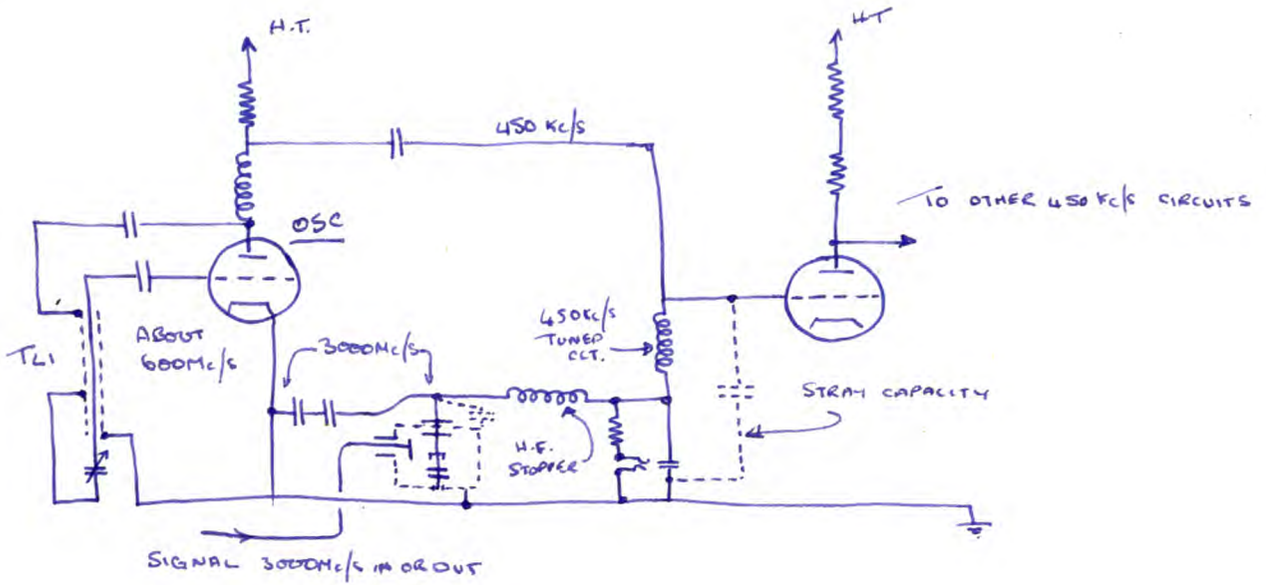


"Defect Report" — Information.

SIMPLIFIED DIAGRAM

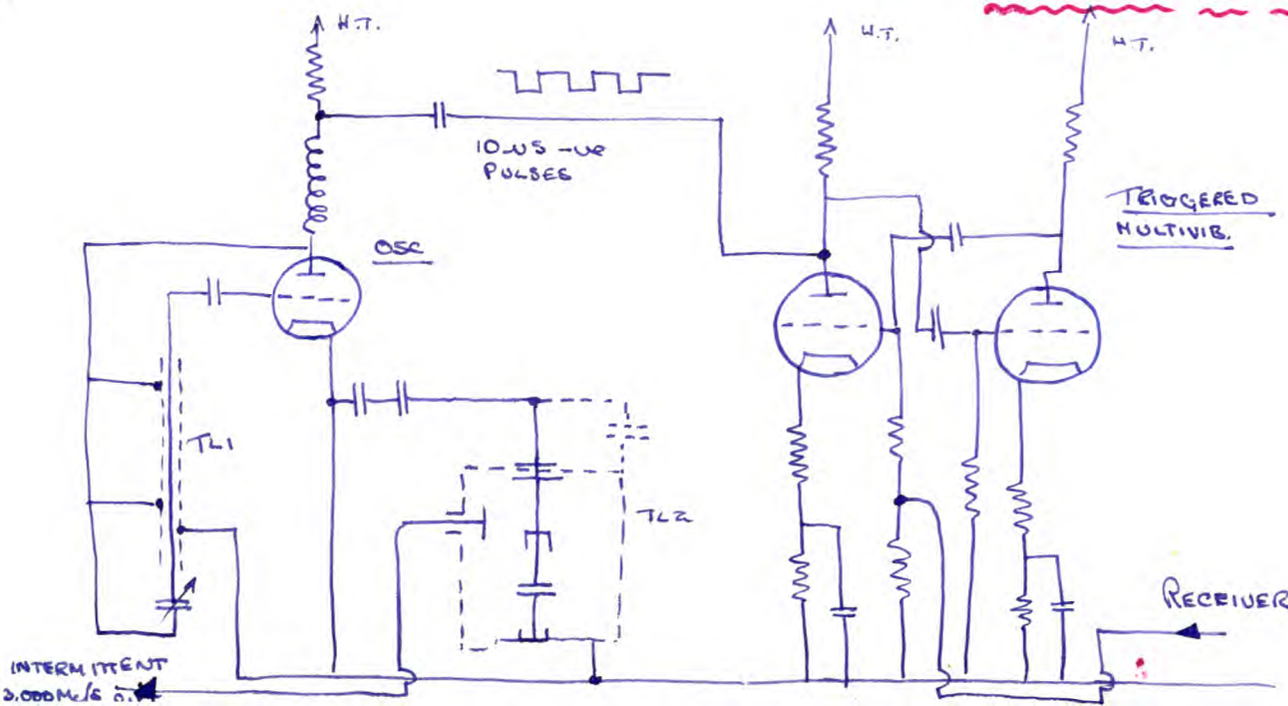
MEASUREMENT OF I/O AND Tx FREQS.

[HET. RECEIVER] [SWITCH AT W/M]



MEASUREMENT OF RECEIVER TUNING

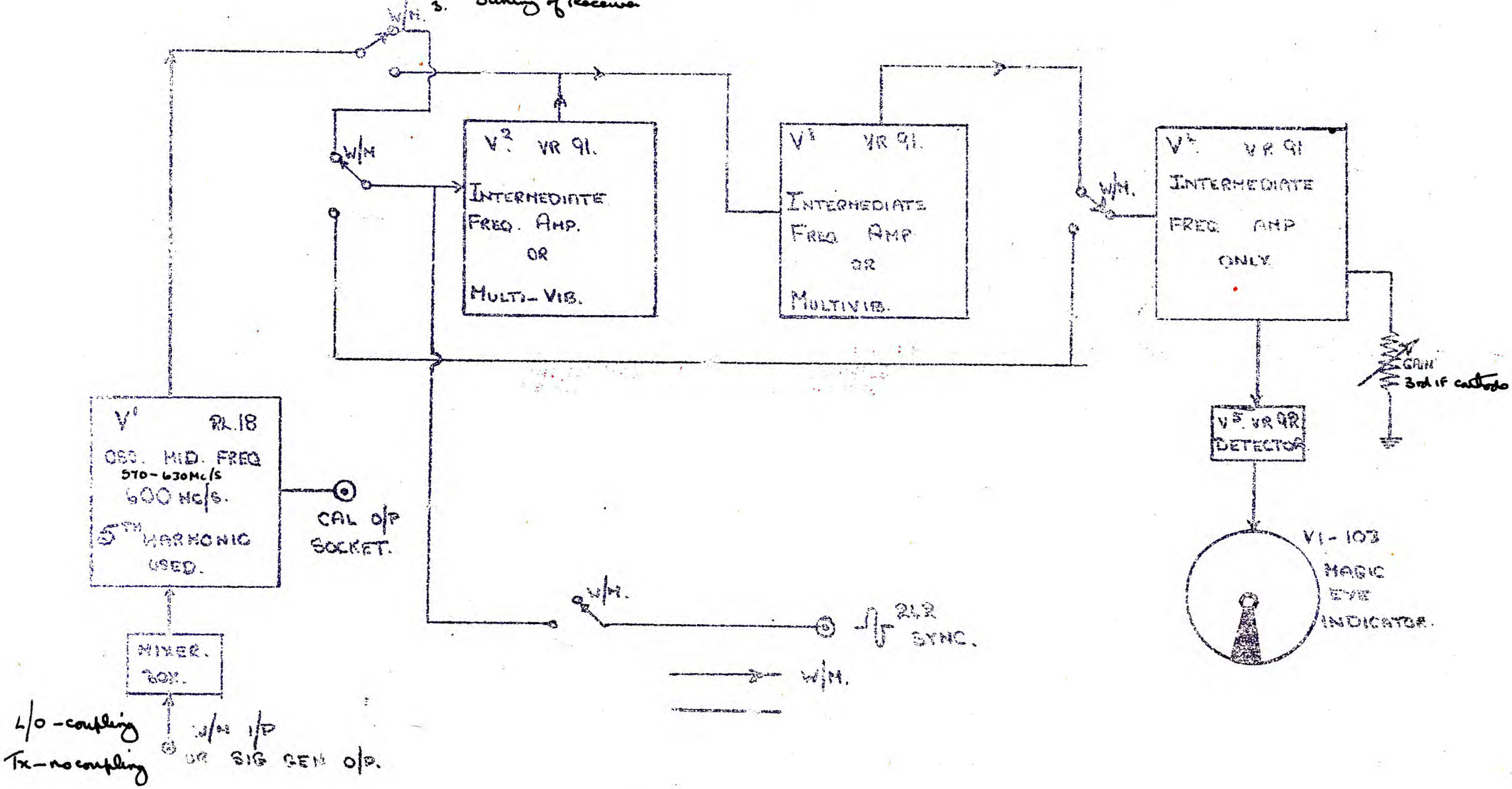
[SWITCH TO "OSC."]



f of MULTIVIB $\quad \frac{1}{R_1 C_1} + \frac{1}{R_2 C_2}$

Block Schematic G 82B Wavemeter

1. measurement of L/O freq
2. " " " Tx "
3. Tuning of Receiver



62.

WAVEMETER G82 A.

1. Measures

   4/o frequency
   Tx frequency
   } Functions as a Heterodyne receiver

2. Tunes

   Receiver

WAVEMETER LAYOUT

When used as Wavemeter.

The signal to be measured ± the G 82 A oscillator frequency will create an INTERMEDIATE FREQ (300 - 600 Kc/s.) An indicatro will be given on the Magic Eye as two points of minimum shadow.(Incoming signal + intermediate frequency and incoming signal - intermediate frequency. The mid-point of both indications when read off from the calibration curve provided, will be the frequency of the signal being measured.

When used as Signal Generator.

The first two I.F. valves (VR91) are switched into a MULTIVIBRATOR circuit the frequency of the M/V being 50 Kc/S. The output from the M/V is a square wave, one period being of 20 microseconds duration this output is used to modulate the oscillator output. The resulting signal is fed to wave guide above the T and R Switch position and simulates a returning echo.

SE6 POWER SUPPLIES.

TRANSFORMER I. :-	+300v.	T2 :-	+200v.	T3. :-	-2,000v. (-700v.)
	+400v.		-250v.		(-1,800v.)
	6.3v.		CRT HEATER		
			LOCAL OSC. HEATER		

TI. provides +300v. for Wave meter, MAIN I.F's, HEAD I.F's AND CAL. OSC circuits Rectifier valve (5U4G)
+400v. for Indicator (TIMEBASE) circuits also VERT. and HORZ. shifts Rectifier valve (5Z4G).
+6.3v. Heaters for the above TI FUSED 2 AMPERES.

T2. provides -250 & +200v for the Isolated supply to LOCAL OSCILLATOR(METAL RECTIFIER)
+4v for CRT and Local OSC Heater. T2 FUSED 150 M/A.

T3. provides -2000v reduced to -700v for the keep - alive electrode Rectifier valve (NU33)
-1,800 for C.R.T. E.H.T.
T3 FUSED 150 M/A.

95

PIPE WATTMETER, TYPE M.[illegible]

GENERAL.

The wattmeter is designed to measure the Mean Power from the TRANSMITTER SR. in SR.356[illegible]. by multiplying the Mean Power by a factor depending on the P.R.F. and the Pulse Width. PEAK POWER CAN BE ASCERTAINED.

For example:-

If the P.R.F. is 500 and the Pulse Width 1·9 micro/sec. The factor will be

$$\frac{10^6}{500 \times 1{\cdot}9} = 1052$$

Attached is the physical layout of the Pipe Wattmeter.

USAGE.

1. Insert Wattmeter in waveguide set attenuator knob "D" by some scale reading lager than that required for the M = 0·1 position.

2. Switch on Transmitter.

3. Adjust tuning plunger "C" until there is maximum response on the galvanometer "K". If necessary the attenuator control can be brought to a rather more sensitive position.

4. Move resonance box "A" along waveguide with knob "G".

5. Set attenuator to the M = 0·1 position taking great care that the full scale reading of the galvanometer is not exceeded, should the power be rather low the attenuator can be set to the M = ·03 position, great care is needed to avoid burning out VACUO JUNCTION.

6. Move resonance box along the guide, with control "G" and record maximum and minimum readings of the Galvanometer and also the multiplying factor .

Calculate the Power thus:-

MEAN POWER = M(S.max.) x (S.min.) WATTS.

Where M is the multiplying factor.
S.max. the maximum, and
S.min. the minimum scale reading.

In order to deal with POWERS normally met, two multiplying factors are sufficient namely:- M = 0·1 and M = ·03 the former being used for high Power and the latter for low Power.

Each attenuator assembly is individually calibrated and the setting on the attenuator scale corresponding to the factor being used to indicate the calibration label attched to the attenuator head.

Standing wave ratio can be measured from the relation :-

$$\text{STANDING WAVE RATIO} = \frac{\text{S. max.}}{\text{S. min.}}$$

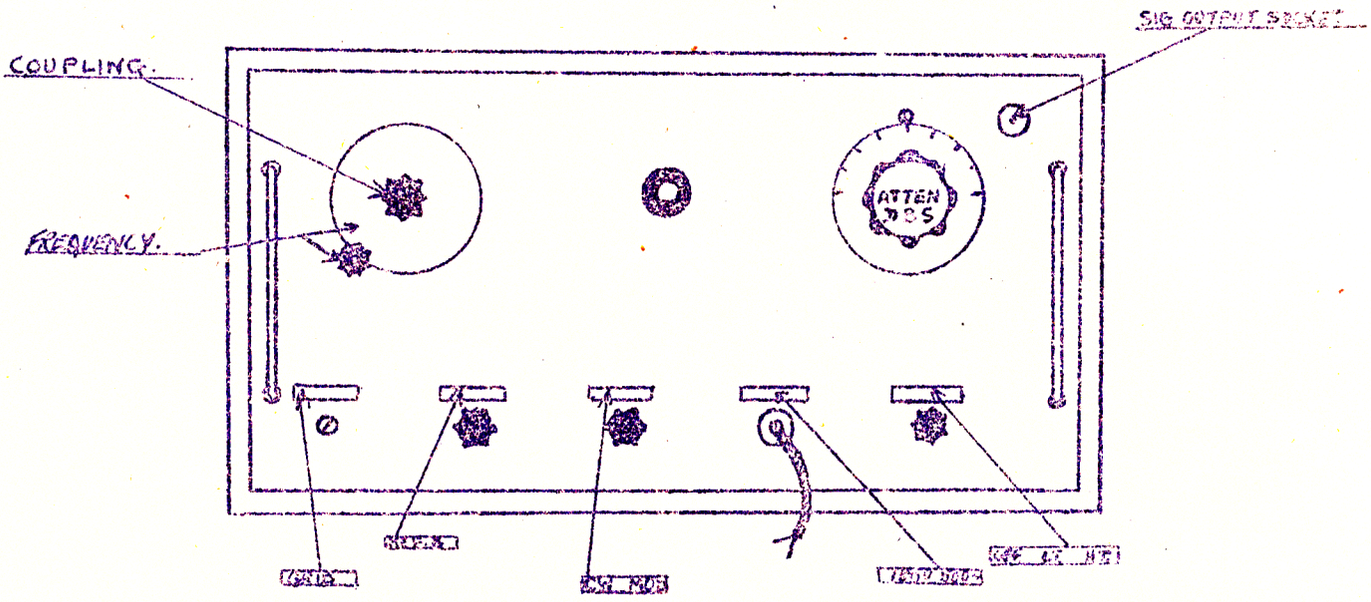
INDEX

ITEMS: THEORY

BLINKING NEON.

ITEMS: PRACTICAL

SENSITIVITY TEST FOR MONITOR RECEIVER 53



SIGNAL GENERATOR TYPE 108

PURPOSE

Signal Generator 108 enables a comparative measure of sensitivity to be obtained for the entire signal chain. i.e. Before and after alignment of Intermediate Frequency amplifiers or after valve or Crystal replacement.

METHOD

1) Connect Signal Generator to 180V 500 cycles spare terminals on Power Distribution Board.
2) Adjust coupling knob in centre of wavelength dial until Bolometer lamp just glows. Adjusting reflector and if necessary grid voltages for stable operation.
3) Adjust Gain Control on Monitor 53 for 5 - 10 M.M. Noise.
4) Turn Attenuator dial to 30DB setting and switch to long range on Monitor 53.
5) Insert plug end of signal output cable to socket above S.G2.
6) Turn wavelength dial until step is seen on C.R.T. trace Fig. 2.

FIG.2.

FIG.3. SIGNAL + NOISE NOISE.

7) Rotate coupling knob until Bolometer lamp is just visible. Attentuate if necessary so that signal on C.R.T. does not saturate.
8) Turn Attentuator Control so that ratio of signal plus noise to signal is 2 : 1. Check that Bolometer lamp is still correctly set.
9) The reading of the Attentuator dial minus 30 DB will now give overall sensitivity of signal chain.

NOTE :-

If step in trace does not appear in convenient position. Reverse 180V supply to Signal Generator or try altering phase control on trigger unit. CV35 in the Signal Generator can be tuned by coarse plungers to cover frequency range required.