The VMARS Archive

VMARS is a not-for-profit organisation specialising in all types of vintage communications electronics. We maintain an archive of documentation to help people understand, research, repair and enjoy their vintage radio equipment.

Guidance on using this electronic document

Acrobat Reader version

You need to view this document with Acrobat Reader **version 5.0** or later. It is possible that the document might open with an earlier version of the Acrobat Reader (thus allowing you to get this far!), but is also likely that some pages will not be shown correctly. You can upgrade your Acrobat Reader by direct download from the internet at http://www.adobe.com/products/acrobat/readermain.html or going to http://www.adobe.com/ and navigating from there.

Bookmarks

This document has had "bookmarks" added. These allow you to quickly move to particular parts of the document, a numbered section or maybe the circuit diagrams for instance, merely by clicking on the page title. Click on the "Bookmarks" tab on the left hand side of the Acrobat Viewer window to access this feature – move the cursor over these titles and notice it change shape as you do so. Click on any of these titles to move to that page.

Large diagrams

The large diagrams are given in two formats – in A4 size sheets to allow easy printing, and complete as originally published to allow easy on-screen viewing. These versions are in different sections of the document, which can be found within the bookmarks.

Printing the document on an A4 format printer

The document has been optimised for printing on A4 size paper (this is the common size available in UK and Europe, which measures 29.7cm by 21.0cm). Please follow these steps (these are based on Acrobat Reader version 6.0 – other versions may differ in detail):

1. Work out the page numbers you want to print. If you want to print the whole document, then within "Bookmarks" (see above), first click on "**Front**", and note the page number given at the bottom of the Acrobat window – this will give you the page number of the first page to be printed. Similarly click on "**End of A4 printable copy**", to determine the last page to be printed.

2. Select "File – Print" or click on the printer icon. This will bring up the print dialog box.

3. Select the correct printer if necessary.

4. In the area marked "Print Range" click on the radio button marked "Pages from..", then enter the first and last page numbers worked out in step 1 into the "from" and "to" boxes.

5. In the "Page Handling" area, next to "Page Scaling", select "Fit to paper". The press "OK"

Printing the document on an US Letter format printer

Since A4 and US Letter sizes are similar, it is expected that this document should print satisfactorily on the latter format paper. This has not been tested however, and is not guaranteed. Follow the steps as for A4 printing, and make doubly sure that "Fit to paper" is selected (step 5).

Any other problems?

Please get in touch with me at archivist@vmarsmanuals.co.uk.

Richard Hankins, VMARS Archivist, Spring 2004

STATION KIT, RADIO, AMPLIFIER, R.F., NO 7

(Power supply, rotary No 47 and Loading coil assembly, aerial)

TECHNICAL HANDBOOK - TECHNICAL DESCRIPTION

This EMER must be read in conjunction with Tels L 392 Part 2 which contains figures and tables to which reference is made.

SUBJECT INDEX

Distribution - Class 335. Code No 3

Para

AMPLIFIER, R.F., NO 7

DETAILED DESCRIPTION

POWER SUPPLY, ROTARY NO 47

AERIAL LOADING COIL

INDEX TO FIGURES

INDEX TO TABLES

INTRODUCTION

ROLE AND PURPOSE OF EQUIPMENT

1. The Amplifier r.f. No 7 is used with the Transmitter-receiver C13 (TRC13) to provide a substantial increase in r.f. output, thus increasing the operational range of a TRC13 installation.

2. It is normally used as a vehicle installation and is intended to be used with Radio control harness type A or B, and fits into Carrier, set, No 82 or equivalent.

MAIN PARAMETERS

3. The amplifier is a single stage class C and the nominal output power is 200W into 70Ω.

4. The frequency coverage is 1.5 to 12Mc/s, covered in three bands of 1.5 to 3.0, 3.0 to 6, and 6 to 12Mc/s.

5. Drive power of at least 12W is required for the amplifier, this is provided by the TRC13.

6. The amplifier contains its own antenna matching circuits, thus, when operational conditions do not require the additional power of the amplifier it functions as a radio frequency tuner for the TRC13 in lieu of the Tuner, radio frequency No 11 (TRF No 11).

7. Transmission systems which may be used with the amplifier are:-

   a. RT/PHASE (F3)

   b. CW (hand speed morse) (A1)

Note:- The amplifier is not designed for use with a.m.

8. The antenna matching circuits provided, permit the amplifier to be used with the following antennae:-

   a. 12 ft vertical rod from 1.5 to 12Mc/s

   b. 27 ft vertical rod from 1.5 to 8Mc/s (approximately)

   c. Other lengths of rod with corresponding frequency restrictions

   d. End fed sky wave antennae adjusted to just under $\lambda/4$ or just under $3\lambda/4$.

   e. A $\lambda/2$ dipole connected to the unit via Coupler, antenna, dipole. (It is not intended to feed a dipole from the 70Ω output of the amplifier)

Note:- Whenever possible, the antennae listed in a., b., c. and d. will be used in conjunction with an earth counterpoise consisting of eight 20 ft lengths of wire.

9. Power is supplied from a nominal 24V secondary battery, or equivalent source, through Power supply, rotary, No 47 (PSR No 47). This unit provides the necessary h.t. supplies for the amplifier.

10. This regulation deals with the following items of the station:-

a. Amplifier, r.f., No 7 (Z1/5820-99-949-2150)

b. Power supply, rotary, No 47 (Z1/5820-99-949-2152)

c. Loading coil assembly, aerial (Z1/5820-99-949-3231)

11. The amplifier and the power supply are both housed in sealed casings, the loading coil switch assembly is also sealed and the loading coil itself is encapsulated in Araldite which provides adequate protection under all climatic conditions.

BRIEF DESCRIPTION

PRINCIPLES OF OPERATION

12. The Amplifier, r.f., No 7 is basically a single stage class C device using two 65W tetrodes, type CV1905, in parallel. The frequency range of 1.5 to 12Mc/s is covered in three bands, as in the TRC13.

13. The grid and anode circuits are tuned simultaneously by ganged variable capacitors, both grid and anode inductances are tapped to match the 70Ω input and output. Coarse and fine capacitance and variable inductance, controls permit end fed antennae to be matched and tuned for maximum power output.

14. An external loading coil is provided (designated Loading coil assembly, aerial), this is brought into circuit below about 2.2Mc/s. At higher frequencies the loading coil is automatically short-circuited by the COARSE MATCH switch which is set to the appropriate position during the tuning procedure.

15. The Power supply, rotary, No 47 provides outputs to the amplifier of 2,000V, 400V and 24V; the first two supplies are obtained from the rotary generator, and the low voltage supply directly from the secondary battery. A voltage control relay in the harness (usually in the J1 box) is used to operate a relay in the p.s.r. and this regulates the 24V output supply to the amplifier. The high voltage supplies are not regulated.

CONSTRUCTION

Amplifier

16. The amplifier is contained in a sealed die-cast light alloy case (see Fig 1). Fins on the external surface of the case offer a large area to assist in cooling.

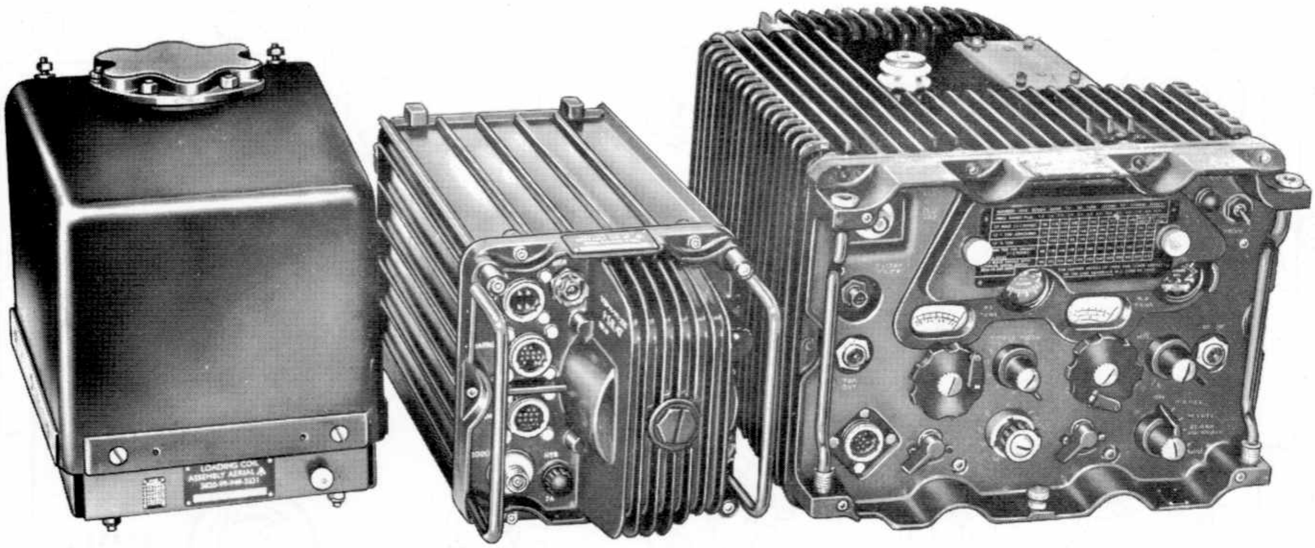
17. A heat exchanger, with external fins, is attached to the rear of the unit and stands off from the main case to allow a free passage of air around it. The heat exchanger is connected by vents to the amplifier case and forms part of the sealed compartment. Hot air from the amplifier compartment is blown by the fan through the heat exchanger, cooled there, and on re-entry to the amplifier compartment is passed through the antenna tuning inductance, thus cooling it. This is necessary

as approximately 124W is dissipated in the coil.

18. The feed, to an end fed antenna, is taken from the stand-off insulator fitted in the top of the amplifier case via the external loading coil to the antenna base.

19. A valve heater supply dropping resistor is fitted externally and adjacent to the insulator, this is protected by a metal cover.

20. The p.a. valves dissipate approximately 110W when the amplifier is in use, and, as the amplifier is a sealed unit, an efficient heat sink had to be designed to conduct the generated heat away quickly to the case. This has been accomplished by mounting the valves in a light alloy block which is clamped to the side of the case by means of six socket headed screws. The valves are fitted into two holes in the block with helically wound beryllium copper springs interposed between the valve envelopes and the block, these springs allow for glass tolerances and expansion, and also provide good heat conduction.



T L392 P1 / 1-1 2584/34

Fig 1 - Amplifier, p.s.r. and loading coil assembly

Power supply, rotary

21. The p.s.r. is also housed in a sealed die-cast light alloy case (see Fig 1) with external cooling fins. A fan is mounted on the generator shaft to provide forced air circulation for cooling purposes.

22. In order to restrict the deposition of carbon dust from the brushes in the rotary transformer, a filter is mounted in the rear of the case, this filter is wetted with high temperature grease and allows about 1000 hr running between filter cleaning.

Loading coil assembly, aerial

23. The loading coil assembly consists of two separate items, the loading coil itself and the actuating switch with its associated drive motor and gearing. The complete switch assembly is contained in a sealed light alloy casting. Both items are fitted in the case shown on the left-hand side of Fig 1.

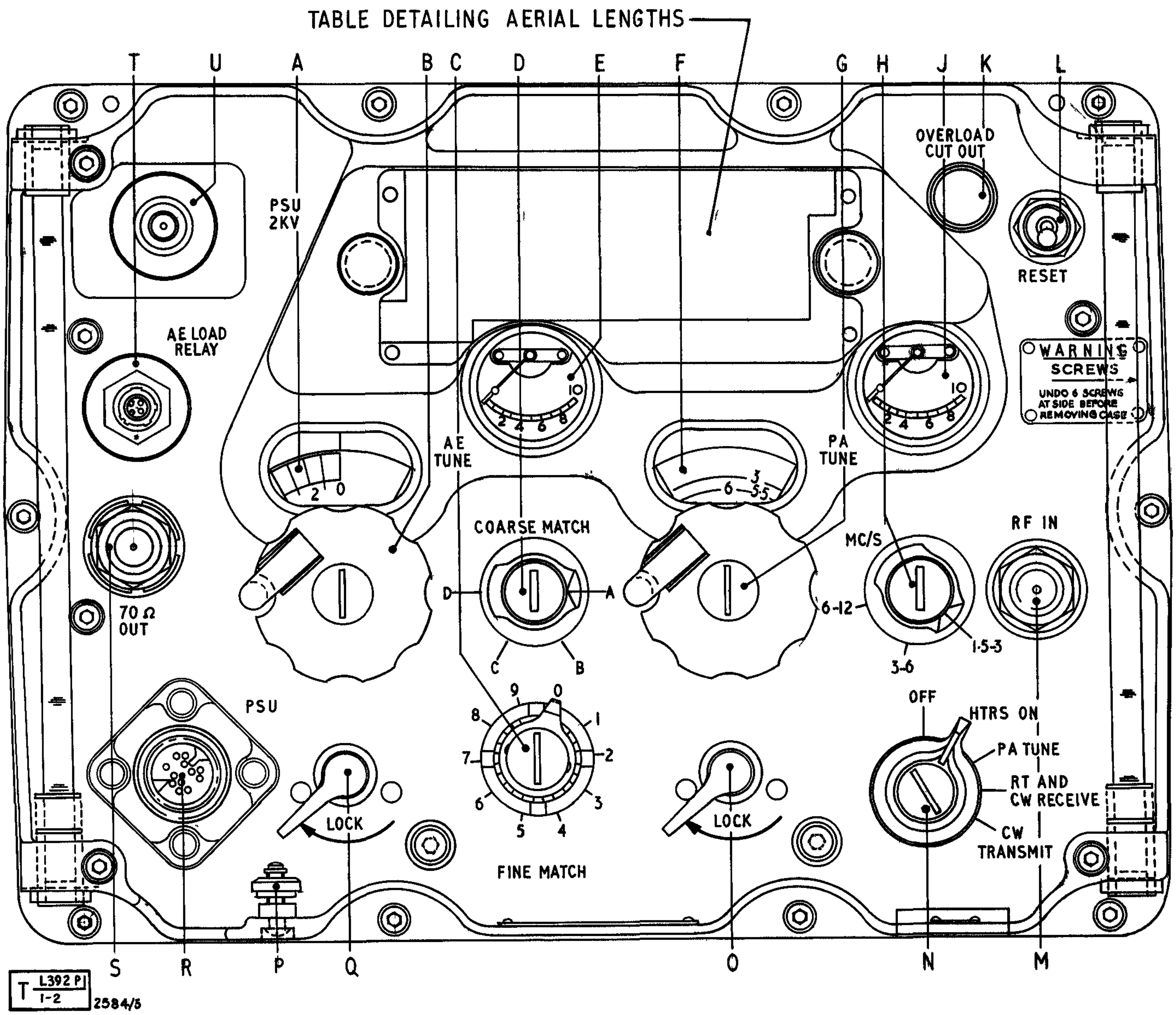


Fig 2 - Layout of front panel and controls

Controls

24. The amplifier front panel controls are shown in Fig 2 and details are given in Table 1.

Table 1 - Amplifier front panel, items and controls

Item	Fig 2 ref.	Function
AE TUNE (Scale)	A	Adjusts antenna tuning inductance. Scale lamp lights in the PA TUNE position of the system switch and HTRS ON.
AE TUNE (Control)	B	Controls A. Used in conjunction with C and D
FINE MATCH (C17)	C	Used in conjunction with B for tuning and matching end fed antennae, indication of correct tuning is shown on meter E
COARSE MATCH (SB)	D	(as C)
AE TUNE (M2)	E	Meter, reading antenna current. Meter lamp lit on PA TUNE and on RT and CW when the pressel or key is down
PA TUNE (Scale)	F	Set to required frequency and tuned by G. Scale lamp lit on PA TUNE and HTRS ON
PA TUNE (Control)	G	Used for tuning p.a. circuits in conjunction with F and H
MC/S (SA)	H	Bandswitch for p.a. circuits
PA TUNE (M1)	J	Meter indicating p.a. circuit tuning (adjusted by PA TUNE control G). Meter lamp lit on PA TUNE, RT and CW when pressel or key is down
OVERLOAD CUT-OUT (ILP3)	K	Indicates that cut-out has operated
RESET (SD)	L	Biased switch which overrides overload cut-out and allows retuning
RF IN (PLC)	M	Coaxial 70Ω input from TRC13
System switch (SC)	N	Switch selecting operating conditions and OFF
LOCK	O	Locking lever for PA TUNE control
Earth terminal	P	-
LOCK	Q	Locking lever for AE TUNE control
PSU (PLA)	R	Mk 4 12-way plug for power supplies and control circuits
70Ω OUT (PLF)	S	Coaxial plug for connecting 70Ω output cable
AE LOAD RELAY (SKTA)	T	4-way socket connecting to loading coil relay
PSU 2kV (PLB)	U	Coaxial high voltage plug for 2kV input from p.s.r.

NUMBERS GIVE ROUGH GUIDE TO "AE TUNE" LETTERS TO "COARSE MATCH"

FREQ. BANDS Mc/s 1·5 1·6 1·7 1·9 2·1 2·5 3·0 4·0 5·0 6·0 7·0 8·0 12·0

27' MAST (+ C'POISE)	9B	11B	15B	20B	23C	33C	35C	37C	39D	41D	MAY NOT TUNE ABOVE 7 Mc/s	
12' 1 TON ARMOURED	7A	11A	20A	10B	16B	23B	29C	34C	36C	37C	39C	41D
12' ¼ TON	7A	13A	21A	8B	13B	21C	26C	32C	35C	37C	39D	40D
END FED 150' (BRAID) (+ C'POISE) ZA.54152	8B	11B	16B	19B	23C	28C	32C	36C	37D	38D	39D	40D
HALF-WAVE DIPOLE WITH COUPLER, AERIAL, DIPOLE 5820-99-949-3203	18C	20C	22C	26C	29C	33D	36D	38D	39D	40D	40D	41D

FOR FURTHER DETAILS OF THESE AND OTHER AERIALS SEE THE USER HANDBOOK W.O. CODE Nº 13109

T L392 P1 / 1-3

Note: COARSE MATCH switch positions A and B are used only on the low frequency band 1.5 to 3.0Mc/s.

If settings A or B are used on the other two bands the amplifier will exhibit fault conditions on running up

Fig 3 - Table detailing AE TUNE and COARSE MATCH settings

25. The p.s.r. front panel items are shown in Fig 4 and details are given in Table 2.

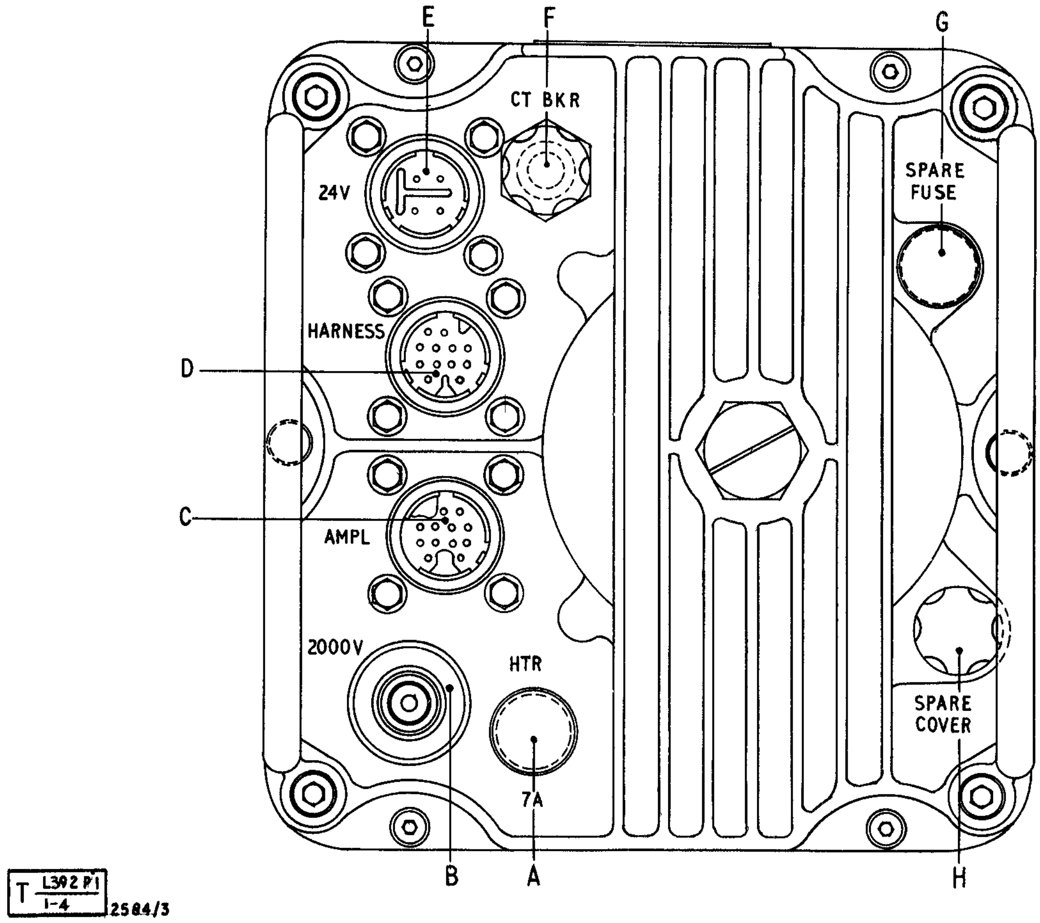


Fig 4 - Front panel of PSR No 47

Item	Fig 4 ref.	Function
HTR 7A (FS1)	A	Heater and relay circuit supply fuse
2000V (PLB)	B	Coaxial high voltage plug
AMPL (SKTA)	C	Mk 4 12-way, power supplies and control circuits
HARNESS (PLC)	D	Mk 4 12-way, control circuits to harness
24V (PLA)	E	24V input from supply Mk 4 4-way
CT BKR	F	Thermal overload cut-out
SPARE FUSE	G	-
SPARE COVER	H	-

Table 2 - PSR No 47 front panel items

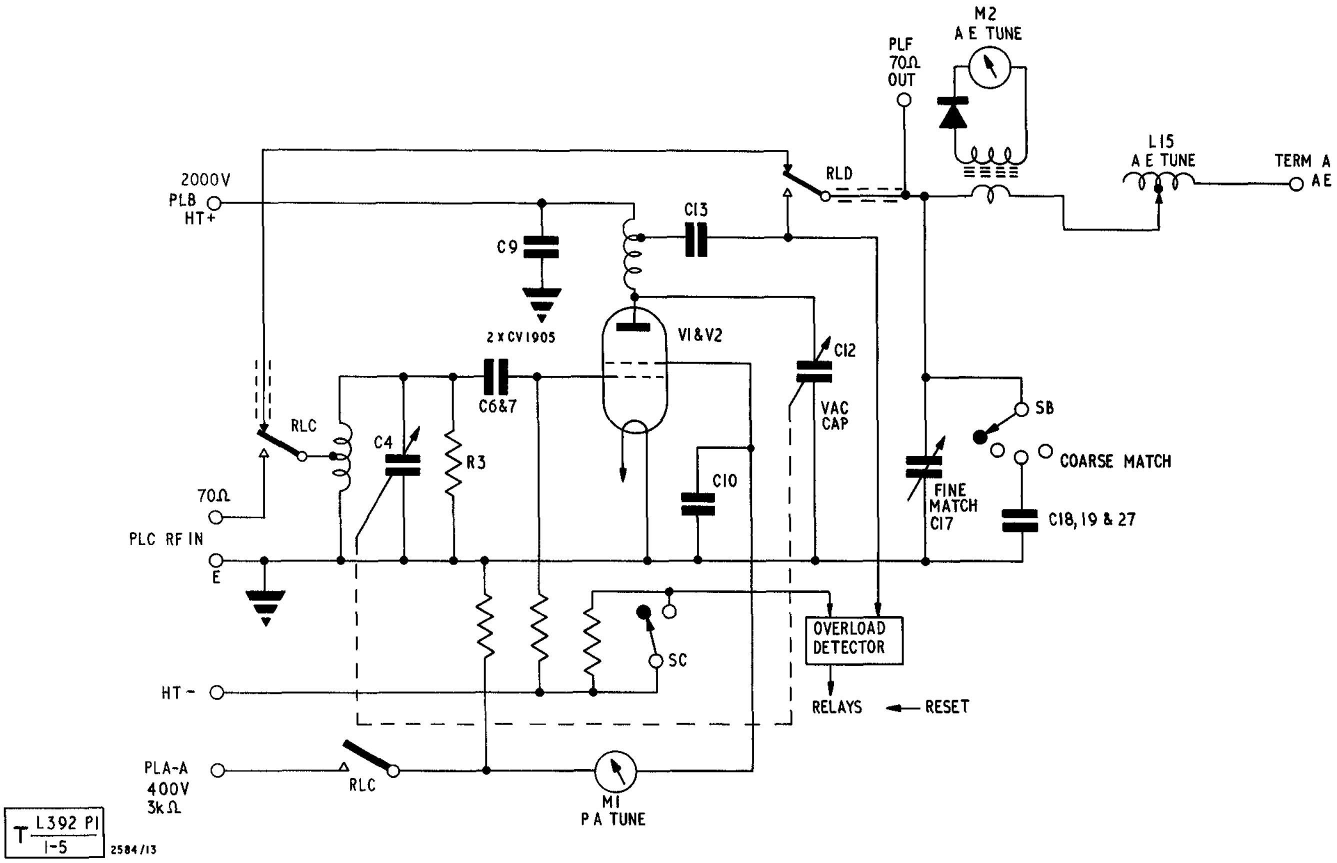


Fig 5 - Simplified r.f. circuit

AMPLIFIER, R.F., NO 7

DETAILED DESCRIPTION

R.F. CIRCUITS, PRELIMINARY

26. A simplified basic circuit of the amplifier is given in Fig 5, this provides a quick overall appreciation of the r.f. circuitry.

27. As can be seen by reference to Fig 5, both grid and anode circuits of the amplifier are tuned by the ganged capacitors C4 and C12.

28. The grid input coils and the anode coils are both tapped to provide a 70Ω impedance to keep the amplifier in line with the TRC13 and also to allow the same setting of the antenna tuning circuits to be used for both transmitting and receiving. Grid current bias is employed in an overload detecting circuit which guards against loss of drive. In order to maintain a reasonably constant drive to the amplifier grids and to load the TRC13 correctly, some of the excess drive power is dissipated in the damping resistor R3 which is in circuit on all bands.

29. The antenna matching circuit has a wide range of conditions to accommodate requiring a large inductance swing, this is met by using a rotating coil type of antenna tuning inductance (L15) which gives continuous variation even down to the strays of the internal connections.

30. Correct loading is obtained by using a switched bank of capacitors (C18, C19 and C27) which provides coarse match condition with a fine match variable capacitor (C17) for precise matching.

R.F. CIRCUITS, DETAILED
(Fig 2501b)

Grid circuits

31. Drive input from the TRC13 is fed into PLC, RF IN, and thence via the closed contact of RLC1 and wafer SA1B of the MC/S switch (SA) which selects the 70Ω tap of the grid coil in use (L1, L2 or L3). The grid section of the PA TUNE control (C4) is switched across the whole of the grid coil in use by section SA2B.

32. Grid matching is provided by further taps on the coils, selected by section SA2F, and coils not in circuit are shorted, to avoid mutual coupling losses, by SA3B.

33. Pre-set trimmers (C1, C2 and C3) are also wired across the tapped portions of the coils.

34. A damping resistor, R3, is connected into the grid circuit on all bands, this consists of 3 x 24kΩ wire-wound resistors connected in parallel to give an effective value of 8kΩ. The function of this resistor is to maintain a reasonably constant drive to the grids and also to assist in loading the TRC13 correctly.

35. Wire-wound resistors have been used here as the C13 output tends to fall off at the higher frequencies so that little damping is needed from 6Mc/s upwards, and, as these resistors exhibit an increase in resistance with frequency that approximately matches the fall in drive their use simplifies the grid circuit design.

Amplifier stage

36. The amplifier stage consists of 2 x CV1905 tetrodes in parallel with a maximum dissipation of 65W per valve, adequate safety factor for this stage is ensured by keeping the dissipation to approximately 55W per valve under working conditions, an efficient heat exchanger system, and a heat sink around each valve.

37. Bias for the stage which operates in class C is obtained by a combination of:-

a. Grid current bias, developed across the network C6 and C7, R8 and R9, (approximately 200V).

b. Cathode bias, developed across R14 and RV1, connected to the negative h.t. line via contacts SC3F (approximately 15V).

Note: When SC is switched to HEATERS or PA TUNE an additional cathode bias resistor (R12) is introduced into the bias chain by contacts on SC3F.

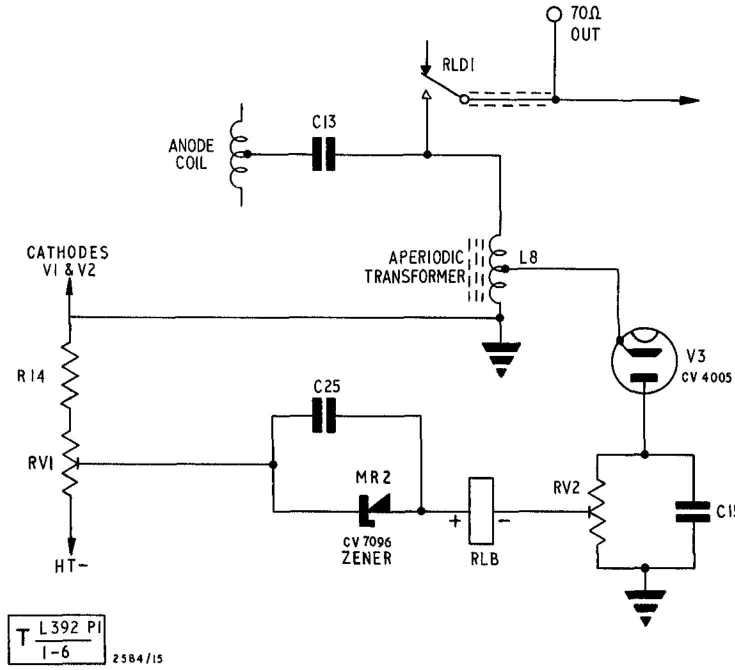


Fig 6 - Simplified overload detection circuit

Overload and mismatch circuits

38. Due to the ease with which a mismatch can occur, either by mistuning, physical damage to the antenna or a change in its surroundings, an overload detection circuit is used. Fundamentally, the circuit compares the d.c. cathode current of the amplifier stage with the r.f. voltage fed to the antenna coil at 70Ω impedance.

39. The circuit will trip when the efficiency is either too high or too low, but it has a strong bias towards tripping on low efficiency. Tripping on high efficiency is necessary to prevent overheating the anode coils. A simplified diagram of the overload detection circuit is shown in Fig 6.

40. The overload relay RLB is used in a see-saw circuit which allows it to operate by current flow in both directions. Either by excessive positive volts from the cathode chain via R14 and RV1, which occurs under low efficiency conditions, or by excessive negative voltage derived from the r.f. voltage on the 70Ω output line via the aperiodic transformer L8 which is tapped to provide the correct amount of sensing voltage to the cathode of V3. The rectified product of V3 is applied across the preset RV2 which acts as the diode load with C15 as reservoir and r.f. decoupling.

41. The presets RV1 and RV2 are adjusted in the setting up procedure for zero to -2V across the combination MR2 and RLB in series, with a normal 70Ω load.

42. The zener diode MR2 is connected in series with RLB coil, its function is to ensure that RLB comes in firmly when overload conditions occur either due to low or

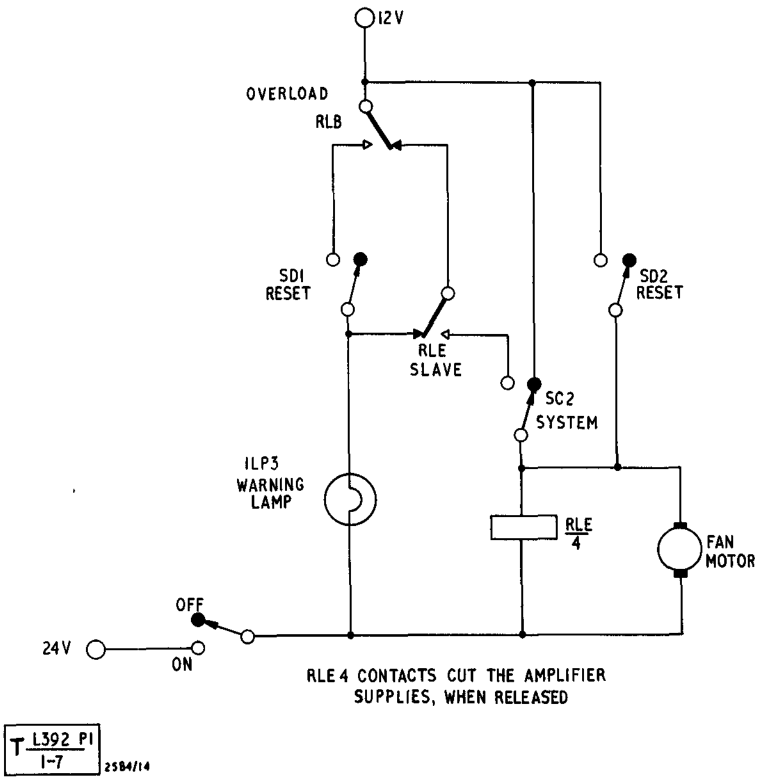


Fig 7 - Simplified overload and reset circuit

high efficiency. The zener will hold off the operation of RLB until approximately 10V are developed, due to mismatch.

43. When RLB operates, it releases the self-holding slave relay, RLE, (see Fig 7) which in turn switches off the amplifier and, in doing so, switches on ILP3, OVERLOAD CUT OUT. A spring loaded reset switch (D) is provided on the front panel (RESET).

44. To prevent tripping the amplifier during transitory changes in loading conditions, eg, alterations in antenna impedance whilst passing under trees, bridges etc. A delay of about 3/4 second is introduced into the trip circuit. This delay is short enough to prevent damage to the valves but long enough to prevent unnecessary use of the RESET switch. The delay is introduced by the simple expedient of connecting the cooling fan motor in parallel with RLE and also providing the fan motor shaft with a flywheel. Thus if a transitory overload occurs, the kinetic energy in the flywheel keeps the fan motor turning, which keeps RLE coil energized, preventing an immediate trip.

45. In addition there is another added advantage in that, if the fan motor should fail, the lack of delay in the overload circuits is readily noticed by the operator.

Fan motor

46. The fan motor is fitted into a tubular assembly which is mounted above the antenna coil, a reasonable life for the motor is ensured by using a long drive

spindle for the fan, by this means the motor is kept well clear of the circulating hot air stream (approximately 60°C above ambient). The fan rotor bearing is made from sintered bronze filled with p.t.f.e. and is self lubricating.

Anode circuits

47. The anode coils L5, 6 and 7 are connected directly to the 2kV line which is fed via PLB (+2000V). R.F. decoupling is provided by C9, and a 30MΩ bleeder circuit, R4, R5 and R6, connected across the supply.

48. Band selection is carried out by three sections of SA (MC/S). Two of the coils L5 and L6 are toroids wound on dust iron cores and L7 is a solenoid on a ceramic former.

49. Switch rotor SA5F selects the two lower bands by switching L5 into circuit for 1.5 to 3Mc/s, the next position, 3 to 6Mc/s, brings L6 in parallel with L5. In the 6 to 12Mc/s position SA5F shorts L5 and L6 directly to the h.t. line thus preventing any absorption effects when L7 is brought into circuit by wafer SA6B.

50. All the coils are tapped to provide a 70Ω output which is fed to the antenna circuit via the d.c. blocking capacitor C13. The appropriate tap, for the coil in use, is selected by wafer SA4B. There are no preset trimmers in the anode circuits as the coils are very carefully matched in production, the tuning is carried out by a special evacuated and sealed capacitor (C12) which is mechanically ganged with C4.

Matching and antenna coil circuits

51. The r.f. output is fed to the matching circuit and antenna coil through the closed contact of RLD.

52. As this circuit has to operate over a very wide range of conditions and also under high r.f. potentials of up to 10kV peak, circuit design calls for a wide variation of inductance coupled with extremely good insulation.

53. The antenna coil L15 (front panel control AE TUNE) is a rotating coil type of variable inductance with a copper-carbon brush tapping off the required value. The inductance variation is from 100μH down to 1μH, with a Q value around 300.

54. The matching circuit comprises the FINE MATCH control (variable C17) and three sets of fixed capacitors C18, 19 and 17 (COARSE MATCH), switched by SB3F. These are both front panel controls and the required amount of matching capacitance is brought into circuit, in conjunction with AE TUNE, by reference to the table on the front panel of the amplifier.

55. An additional fixed inductance, the Loading coil assembly aerial (L1), is switched in series with L15 by further wafer sections of the COARSE MATCH switch, these wafers are SB2F, and selection of a frequency below 2.2Mc/s by contact SA1F brings the loading coil into circuit. This is accomplished by a motor driven switch in the loading coil assembly (see para 78 for details). Note: Coarse match positions A and B are used only on the low frequency band (1.5-3.0Mc/s).

56. As the normal dissipation in the antenna coil is around 124W, efficient cooling is necessary, this is accomplished by blowing the cooled air from the heat

exchanger through the coil and as the cooling fan is running continuously, the cooling process is carried on during receive periods.

Metering circuits

57. The two metering circuits, PA TUNE (M1) and AE TUNE (M2), provide means for accurately tuning the amplifier.

58. M1 is actually measuring the screen current of the p.a. stage. By placing this meter in series with the screen, instead of in the anode circuit, a sharper indication of resonance is obtained. This is accomplished by the fact that when M1 is brought into circuit, by switching SC to PA TUNE (and operating the pressel), R12 is in series with the p.a. cathodes, this keeps the p.a. dissipation down, and as RLD has not yet operated the anode circuit is running unloaded under conditions of high Q, thus the screen dissipation bears a direct relation to that of the anode circuit and a sharp indication of resonance is obtained. Another advantage gained by placing the meter in the screen circuit is the lower voltage involved (400V instead of 2kV). The diode MR1 provides a non-linear shunt across the meter, its impedance decreases as the applied voltage increases. It thus increases the useful range of the meter and provides some measure of overload protection whilst retaining high sensitivity at low levels.

59. M2 (AE TUNE) provides indication of resonance in the antenna circuits, the circuit is energized by means of the current transformer L10 which is placed in the outgoing line. The r.f. energy is rectified by the diodes MR3 and MR4 in conjunction with the low-pass filter C20, R20, C21 and R21. The resulting d.c. is fed to M2, via R25, and the meter decoupled by C24.

60. The meter indicates a maximum when resonance is reached by using the AE TUNE control in conjunction with the matching controls.

System switch (SC) and control circuit sequence

61. The amplifier is protected by a system of sequential control relays which are wired into the system switch circuit, thus preventing full operation until correct matching and tuning has been carried out. For the steps in switching sequence reference must be made to Fig 2501b.

SC at HEATERS

62. a. SC4F, selector 1 to contact 2, completes heater line from SKTA (C and D), SKTE, and the 12V heater dropper R15 (mounted outside case). SC4F is a microswitch mounted on the rear of SC and is made for all subsequent settings of SC.

b. SC2F (r.h. section), selector 1 to contacts 2 and 3, completes 12V circuit across SD2 (RESET) and lights panel lamps ILP4, ILP5 via SC1F (r.h. section). RLE/4 operates and the three contacts used make the following:-

(1) Contact RLE1 completes 12V line to contacts 4, 5 and 6 on SC2F (r.h.) ready for PA TUNE.

(2) Contact RLE2 prepares the circuit for S/R line, and later allows the RLA line to operate by pressel or AE TUNE on C13, (RLA is in P.S.R. No 47).

(3) Contact RLE3 provides the earth return for CW TRANSMIT.

c. SC2F (l.h. section), selector 7 to contact 9, no action.

d. SC3F (r.h. section), selector 7 to contact 9, no action. (l.h. section) selector 1 to contacts 2 and 3, no action.

e. SC1F (l.h. section), selector 7 to contact 9, no action.

SC at PA TUNE

63. a. SC1F (r.h. section), selector 1 to contact 4, keeps panel lights ILP4 and ILP5 on.

b. SC1F (r.h. section), selector 7 to contact 10.

(1) Lights meter lamps ILP1 and ILP2.

(2) Energizes coil of LRC/2 and completes circuit through R2, SC3F contact 4, RLE2 and contacts on SB1F, SA1F to S/R line.

(3) Connects screen supplies via contacts RLC2.

(4) Connects drive input from C13 via contacts RLC1.

c. SC2F (r.h. section) selector 1 to contacts 3 and 4, action as in HEATERS b.

d. SC2F (l.h. section) selector 7 to contact 10 completes circuit (via SC3F) to RLA1.

e. SC3F (r.h. section) selector 7 to contact 10, no action.

f. SC3F (l.h. section) selector 1 to contacts 3 and 4, completes circuit to S/R line (as in b.(2)).

64. With the system switch at PA TUNE, operation of the pressel switch (or switching C13 to TUNE AE) will close RLA and switch on h.t. supplies. (Under these conditions R12 is in series with the p.a. cathodes limiting p.a. dissipation whilst the amplifier is tuned using drive from the C13.) Tuning must be carried out before proceeding to next switch position.

SC at RT and CW RECEIVE

65. a. SC1F (r.h. section), selector 1 to contact 5, dial lights ILP4 and ILP5 extinguished and 12V supply fed to fan motor.

b. SC1F (l.h. section), selector 7 to contact 11, meter lights ILP1 and ILP2 fed via RLD2 contacts and light in sympathy with action of this relay.

c. SC2F (r.h. section), selector 1 to contacts 4 and 5, RLE/4 coil is now controlled by RLE1 contact via RLB, so if overload occurs the amplifier trips.

d. SC2F (l.h. section), selector 7 to contact 11, functions as in PA TUNE position.

e. SC3F (r.h. section), selector 7 to contact 11, shorts out limiting resistor R12 in p.a. cathodes and allows full power operation.

f. SC3F (l.h. section), selector 1 to contacts 4 and 5, completes circuit for RLD, which, when made on send, joins the load and matching circuits to the anode coil taps via RLD1 contact.

66. With the system switch at RT and CW RECEIVE and with pressel unoperated the amplifier acts as a t.r.f. for the C13. Operation of the pressel starts the rotary transformer and, after a delay of approximately two seconds, p.m. transmission can be made. Note: This position is not suitable for c.w. sending.

SC at CW TRANSMIT

67. The only change of SC function in this position, compared with RT and CW RECEIVE, is in SC2F (l.h. section), selector 7 to contact 12, this provides an earth return for RLA via RLE3 contact.

68. With the system switch at CW TRANSMIT send/receive conditions are still under control of the pressel, but the rotary transformer is operating all the time and puts a considerable (approx 10A) drain on the battery. There is, however, no delay on the h.t. line so for c.w. conditions this position must be used.

POWER SUPPLY, ROTARY NO 47

DETAILED DESCRIPTION

69. The 24V supply is used to energize the primary circuit of the rotary transformer, the control relay circuits, and the heater supply for the amplifier. A simplified circuit is shown in Fig 8.

70. The supply is fed into the unit at PLA and thence via FS1 and R4 to contacts C and D of SKTA. The connection between SKTA and PLA in the amplifier provides the necessary interlock for the 24V circuit to prevent the operation of the supply unit unless connected to the amplifier. This interlock is completed by contacts C and D (HEATER +24V) on PLA and the amplifier system switch (contacts SC4F) which control the 24V heater circuit in all positions except OFF and the return line PLA-SKTA contact L (24V switched).

71. On initially switching on, lines G and L (SKTA) make provision for energizing RLA, but not until the amplifier system switch is set to PA TUNE; this brings the 24V through from contacts 10 and 11 on SC2F, contacts RLE2, and the interlocks provided by COARSE MATCH (SB1F) and the Mc/s switch (SA1F), link (S/R) ON PLA-SKTA(B) and thence to the pressel switch via the harness plug PLC.

72. Use of the pressel switch will energize RLA and start the rotary transformer (this applies to the 3rd and 4th positions of the system switch). The closure of RLA1 contacts energizes the bridge circuit formed by R1 with R2 and R3 with the rotary primary. Since at the moment of starting, there is virtually no back e.m.f.

across the rotary primary, the bridge circuit will be unbalanced causing RLH to be energized by current flowing via MR1.

73. Contact RLH1 disconnects RLG (which has a slower action than RLH) so that R3a/R3b remain in series with the rotary primary, limiting the starting surge current until the rotary has reached sufficient speed for the back e.m.f. across the primary to equal the voltage across R2. Balance in the circuit will de-energize RLH and energize RLG via contacts RLH1. Contacts RLG1 short out R3a/R3b connecting the rotary primary directly across the 24V line via the circuit breaker X2.

74. Whilst RLH is energized (ie during the run-up period) contacts RLH1 keep the pressel line earthed even if the pressel itself is released thereby ensuring that RLA never has to break the high starting current (approx 140A).

75. The 2000V supply is taken directly from the 2000V winding on the rotary (X1), the positive line is filtered by the r.f. choke L3 and decoupling capacitor C12, and is fed through the front panel via the high voltage coaxial plug PLB (2000V). Note that the negative line is below earth potential and is filtered to earth by means of C7, C8, C11 and R6, additional filtering is obtained by ferrite beads (L1).

76. The 400V supply is taken directly from the 400V winding and is filtered by R5 C9 and L2 (ferrite), this supply is fed out via SKTA on pins A and E.F.

77. The voltage control facility is provided by RLF, connected between SKTA-L and PLC-K. Line K is fed through to the VCR in the harness box and provides an earth return to operate RLF if the input voltage drops to approximately 21V. Operation of RLF closes the parallel connected contacts RLF1 and RLF2 shorting out R4 in the supply line to the valve heaters.

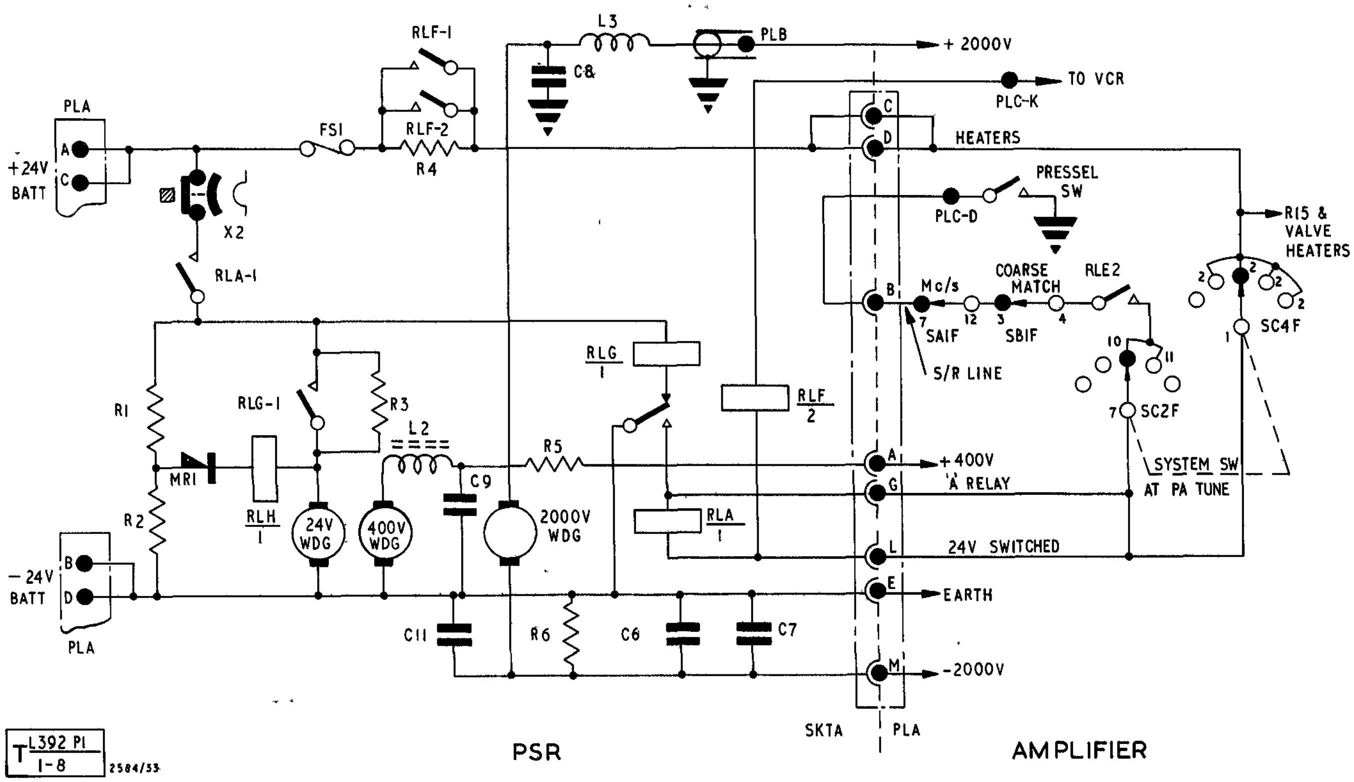


Fig 8 - Simplified diagram of P.S.R. No 47 and control relay circuits

AERIAL LOADING COIL

DETAILED DESCRIPTION

78. As explained briefly in para 55, the loading coil L1 is switched in series with L15 and the antenna lead when the amplifier (or C13) is operating below approximately 2.2Mc/s. The precise frequency at which the loading coil is brought into circuit is governed by the setting of the COARSE MATCH switch (wafer SB2F).

79. The loading coil switch (SC) is designed to operate under the conditions of high r.f. potential up to 10kV to earth and 5kV across its contacts. It is operated by the motor X1 through a system of worm gears and a cam and geneva cross escapement. The cams operate a changeover microswitch SB and a limit micro-switch SA which confines the loading coil switch to swings of 90° on each cycle of operation (see Fig 2508 for details).

80. Fig 9 is a simplified diagram of the loading coil control circuit, showing the loading coil in circuit (contact SC open). The COARSE MATCH switch is in position A and the 24V line to the motor X1 is open, due to the setting of the limit micro-switch.

81. Changing the setting of the COARSE MATCH to position B will energize motor X1 through SB and the motor will operate until the cam changes over SB contacts. SA acts as the limit switch and stops X1 turning at the correct point when SC is made.

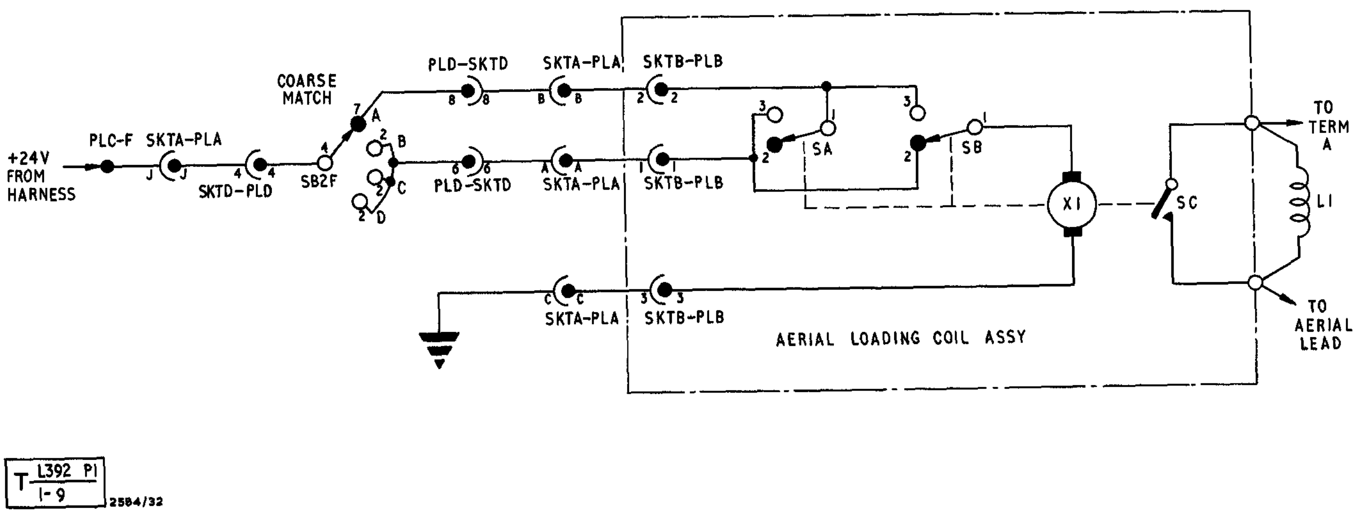


Fig 9 - Loading coil control circuit

EME8c/2584/TELS

END of Part 1