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 our members understand, research, repair and enjoy their vintage radio equipment. Access by non-members is extended as a gesture of goodwill, but not as a right.

Rare documents are frequently provided free of charge by VMARS members, and all scanning and document processing is carried out on a voluntary basis. Accordingly, we do not expect others to profit from the hard work of volunteers, who give their time freely without charge.

This is a gentle reminder that the document attached to this notice is provided to you **for your personal use only**. This edition remains copyright of VMARS, and while you may sell or give your copy to someone else, this right does not extend to making further copies of this information, either to give or sell to others. This includes a prohibition on placing it on websites, or printing it for sale at rallies, boot fairs or similar public events. **If our goodwill is abused, then withdrawal of public access to our archive will be the result.**

Please refer anyone else wanting a copy back to VMARS – either to our website at http://www.vmars.org.uk/ or by email to the Archivist at archivist@vmarsmanuals.co.uk. If you want to know more about our copyright, please see the FAQ below.

FAQ on copyright of VMARS documents

Q How can you copyright a document that is already in the public domain?

A. *Plainly the original copyright of the content has expired, or we have obtained permission to copy them. What we copyright is our own edition of the document.*

Q. Surely your "own edition" is identical to the original document, so cannot be copyrighted?

A. *Our editions are **not** identical to the original document. You will find that full advantage has been taken of electronic publishing facilities, so pages are cleaned up where possible (rendering them better than originals in some cases!), and large diagrams are prepared for both on-screen viewing and for easy printing at A4 format.*

Q. Why do you not just give your manuals away, as so many do via the internet these days?

A. *We do make all our manuals available free of charge (in soft copy) to VMARS members. These members have already covered the costs of running the archive via their subscriptions. The only time members are charged for copies is when they request them on paper, in which case charges are restricted to the cost of paper, ink and postage.*

The VMARS archive is not a "shoe-string" operation. Money is spent on computing facilities to make copies available, and on shipping original documents securely (usually costing several pounds per shipment) to carry out the scanning. As members have already contributed to these costs, it is only reasonable that non-members should do likewise – and thus a very moderate charge is levied for copies provided to non-members. With typical commercial photocopying charges starting at 5 pence per A4 side, it will be evident that paying 4 pence for our equivalent on paper is excellent value (amounts current at Spring 2004). We also think "you get what you pay for" – we invite you to make the comparison and draw your own conclusions!

Despite the above, we will be making copies of essential technical information (circuit diagram, parts list, layout) freely available to all via our website from late 2004 onwards. This will be done to try and encourage and enable the maintenance of our remaining stock of vintage electronic 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.

Don't miss the index!

This document has had "bookmarks" added – which provide you with an "on-screen index". 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"

Note that the document is set up for double-sided printing – if you print it out single-sided then you will find a number of blank pages present, which may be removed and reused.

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, Summer 2004

RADIO TELEGRAPH ADAPTOR NO 1 AND NO 2

TECHNICAL HANDBOOK - TECHNICAL DESCRIPTION

CONTENTS

CONTENTS - (cont)

LIST OF FIGURES

CONTENTS - (cont)

LIST OF TABLES

INTRODUCTION

PURPOSE OF EQUIPMENT

1. The Radio telegraph adaptors No 1 and No 2 have been designed in conjunction with the Teleprinter T100/R, to provide radio-teleprinter facilities with the radio equipments listed in Table 1. Provision is also made for 750 baud data operation.

Table 1 - Compatible radio equipments

Z1/5820-99-911-0849~~0850~~	Transmitter, radio, C11/receiver, radio, R210
Z1/5820-99-949-0505	Transmitter, receiver, radio, C13
Z1/5820-99-949-9932	Transmitter, receiver, radio, C13 No 2
Z1/5820-99-949-2815	Transmitter, receiver, radio, C14
Z1/5820-99-900-9997-9	Station, radio, C15
Z1/5820-99-943-9362	Transmitter, receiver, radio, C42 No 1
Z1/5820-99-949-2153	Transmitter, receiver, radio, C42 No 2
Z1/5820-99-949-5151	Transmitter, receiver, radio, C42 No 3
Z1/5820-99-943-9363	Transmitter, receiver, radio, C45 No 1
Z1/5820-99-949-5476	Transmitter, receiver, radio, C45 No 2
Z1/5820-99-949-5152	Transmitter, receiver, radio, C45 No 3
Z1/5820-99-104-7182	Transmitter, radio, C11 (SSB)

2. The adaptor converts teleprinter d.c. signals to v.f. tones and received tones to d.c. signals for single current working either on two or four wire simplex or half duplex. Teleprinters designed for double-current working can be used by suitably biasing the receive solenoid of the teleprinter for the receive condition and using only the tongue and mark contacts of the transmitter in the transmit condition.

3. The adaptor is a multi-purpose equipment and the facilities provided are detailed in para 22 to 36. Provision is also made for automatic transmit/receive switching, in the simplex mode, thus allowing the station to be left unattended, if necessary.

MAIN PARAMETERS

4. Physical and electrical data are covered in EMER Tels L 570.

TECHNICAL DESCRIPTION

GENERAL

5. This description refers to Fig 2001 except that details of some auxiliary functions covered in the circuit description are omitted.

CONSTRUCTION

6. The equipment is housed in a cast alloy case one end of which forms the front panel. Access to the interior is obtained by removal of the bottom plate. The sub-units are contained in individual metal boxes, which are bolted to the case and wired in with sufficient cable length to permit removal. Additionally, seven p.w. boards plug into a main socket mounting board.

OUTLINE OF WORKING

Transmission section

7. The telegraph transmission section consists basically of a free-running multivibrator (voltage controlled oscillator) centred on 2kHz. The application of d.c. telegraph signals cause a change in frequency of ±100Hz or ±425Hz, ie between 1900Hz and 2100Hz or between 1575Hz and 2425Hz, as required.

8. A limiter and low-pass active filter is provided on the input side of the oscillator. A low pass filter for the removal of harmonics is included in the v.f. output circuit. The v.f. signals are passed to the microphone input of a radio transmitter.

9. An additional variable-gain amplifier (reactor amplifier) with a separate output socket enables those transmitters with built-in reactor stages, eg C11, to be frequency modulated by the tone signals, the output level of which is sufficient to give a ±2kHz deviation. Provision is also made to switch speech signals to this amplifier, in place of the keyed tone signals, so that the associated radio transmitter may be alternatively used for narrow-band f.m. telephony. An inbuilt microphone preamplifier is provided for this purpose.

C.F.S. output

10. Amplitude limited d.c. telegraph signals may be switched to an alternative output for direct application to the reactor of the associated transmitter. This produces a carrier frequency shift in the normal manner and the voltage may be adjusted to provide a nominal shift of 850kHz.

Testing

11. For test purposes, steady mark or space conditions may be simulated by an inbuilt source.

Reception section

Headset inputs

12. Incoming v.f. telegraph signals are converted into the d.c. signals required to drive the teleprinter (or data receiver) by means of the appropriate discriminator.

13. The discriminators are preceded by a limiter and a switched band-pass filter.

Headset amplifier and low pass filter

14. The discriminator in use is followed by a common low-pass filter and a d.c. signal shaping circuit. The output drive circuit takes the form of an electronic relay which is suitable for direct application to a teleprinter without the intervention of a mechanical relay. This electronic relay is not used for data output.

I.F. input

15. An alternative input is provided to accept f.m. telegraph or speech signals from a suitable receiver (R210) at an i.f. of 460kHz. For this purpose an additional discriminator, preceded by a limiter and followed by a v.f. amplifier (headset amplifier) may then be switched, as required, to the main discriminator for conversion to d.c. signals or to an audio output terminal (f.m. speech to head set) for f.m. speech reception.

16. In addition to the f.m. telegraphy signals previously mentioned, simultaneous a.m. reception is possible, via a speech low-pass filter which reduces the telegraph tones present in the speech channel below audibility.

Testing facilities

17. The front panel meter provides a means of measuring:-

a. The level of the received signal.

b. The extent of deviation or shift of a signal.

c. The teleprinter line currents.

18. Two neon indicators provide a check on the operation of the adaptor and its associated equipment; V1 representing the mark conditions and V2 the space conditions. If a correctly biased teleprinter signal is being received, both lamps glow alternately. If the tone signal is grossly asymmetric, one or the other indicator will be permanently extinguished. This ccondition will also exist when only an idle signal, or a continuous mark or space, is being received. These indicators are not used on data reception.

Power supplies

19. A d.c./d.c. converter is incorporated in the adaptor which provides a stabilised ±12V supply and telegraph supplies from a nominal 24V battery input. Protection is provided against accidental reversed polarity.

20. An alternative a.c. mains power supply unit is available for operation from 100-120V or 200-240V at 49-60Hz.

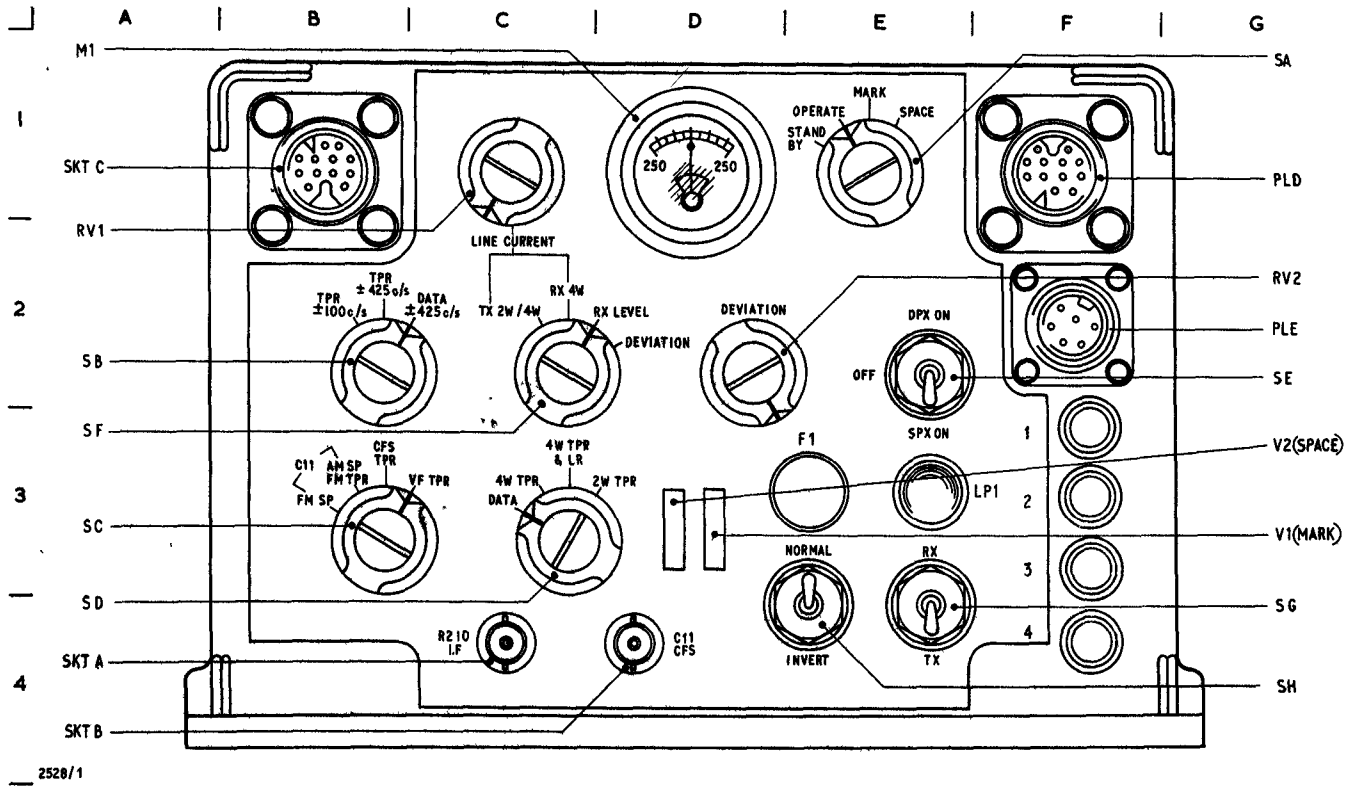


Fig 1 - Front panel controls

Accessories

21. Applique units for various purposes eg TC11, interconnections with Control harness type B, etc, is dealt with under separate headings in paras 89 to 93.

EQUIPMENT SYSTEMS

SRC42, SRC45 and SRC13 system

22. In stations employing the Control harness type B, interconnection of the adaptor (with correct switch settings) between the radio and the first Junction box, 1 set J1 (J1), re-routes the microphone input, headset output and send-receive switching circuits through the adaptor.

23. During the transmission of telegraphy, two tones are applied alternately to the microphone input of the associated transmitter. The tones are 1900Hz (mark) and 2100Hz (space) for 200Hz shift (50/75 baud telegraphy), or 1575Hz (mark) and 2425Hz (space) for 850Hz shift (750 baud telegraphy).

24. On receive, the tones from the associated receiver headset are taken (via PLD/M) to a band-pass filter centred on 2kHz with alternative bandwidths suitable for the reception of 50/75 baud signals of 200Hz shift, 50/75 baud signals of 850Hz or 750 baud signals of 850Hz. This filter restricts noise and provides for optimum signal/noise ratio. The signal from the filter is applied via a limiter (operating range

of 50dB to counteract fading) to an audio discriminator with bandwidth corresponding to those of the input filters. The discriminator output is d.c. pulses of positive and negative polarity corresponding to the transmitted mark and space signals. These are passed through a low-pass filter, amplified, shaped and then used either:-

a. To trigger an electronic telegraph output relay which, in turn, switches the telegraph supply (60V-0V) to the teleprinter.

b. To by-pass the electronic relay and feed ±6V signals to the data terminal.

SRC11(SSB)/R210(M), SRC14 and SRC15 system

25. The system involving these sets is similar to that given in para 22 to 24 inclusive, but since these equipments use s.s.b. with supressed carrier, tone modulation results in the radiation of a c.w. r.f. signal, the actual frequency being directly related to the tone frequency. For example, if the transmitter is tuned to 7MHz (carrier reference frequency) and the upper side-band has been selected, the mark (1575Hz) and space (2425Hz) signals will produce r.f. frequencies of 7,001,575Hz and 7,002,425Hz respectively at the aerial. These frequencies are identical with those that would be radiated from a conventional c.f.s. station operating on an allocated frequency of 7.002MHz with 850Hz (±425Hz) shift.

26. It should be noted that equipments using the adaptor in this way are entirely compatible with conventional c.f.s. stations.

SRC11/R210 system

27. The facilities provided by the adaptor for SRC11/R210 installations are more comprehensive than for other equipments and will be dealt with under separate headings.

a. Simultaneous f.m. telegraphy and a.m. voice

(1) To overcome the marginal stability of the SRC11/R210 system (continuously tunable master oscillator), a narrow-band f.m. telegraph system is used. This system involves the use of the TC11 reactor and the i.f. output of the R210 and provides the required high order of frequency stability for distortion-free transmission necessary in c.f.s. working.

(2) During transmit conditions, the adpator feeds 2kHz ±100Hz tone (via TC11 reactor amplifier and SKTB) to the reactor terminals of a TC11 which has been modified to accept v.f. in addition to d.c. These signals frequency modulate the TC11. The carrier deviation is set to ±2kHz by means of the adaptor deviation control. As the mean modulation frequency is also 2kHz, a deviation ration of unity is established.

(3) Since the receiver R210 has no f.m. facilities, a 460kHz limiter and discriminator is provided in the adaptor. This accepts the i.f. output from the receiver (via SKTA) and demodulates the f.m. signal to give v.f. The v.f. thus produced is then processed in the manner already described (para 24).

(4) This f.m. system for telegraphy permits the use, with simple filters, of a.m. voice modulation simultaneously on the SRC11/R210 installation.

b. F.M. voice

(1) The application of speech signals to the modified TC11 reactor and the availability of a 460kHz discriminator in the adaptor, make it possible to frequency modulate the TC11 with voice signals and to receive these voice signals on an R210. The advantages of using f.m. with the SRC11/R210 are:-

(a) F.M. voice modulation of the TC11 gives improved range compared with a.m. voice modulation.

(b) The f.m. facility enables the SRC11/R210 to interwork with SRC13 equipments.

c. c. C.F.S. telegraphy

(1) This facility is provided to enable the SRC11/R210 to work with other equipments but is not the preferred system for interworking between two SRC11/R210 stations.

(2) For C.F.S. mode, the adaptor provides the TC11, reactor with d.c. instead of tone signals, the d.c. being applied via an attenuator box (Applique unit A) fitted between the adaptor output socket and the reactor input socket (CFS INPUT) on the TC11.

(3) The shift of the signal is adjusted as required by means of the adaptor DEVIATION control and panel meter. This is achieved by back tuning the R210 receiver to the TC11 transmitter frequency with the deviation control set fully anti-clockwise. The b.f.o. on the receiver is then adjusted until the meter reads zero (indicating a 2kHz tone). Shift is then applied by turning the deviation control until the meter reading 200 is obtained.

(4) Since the meter readings are not sufficiently accurate to adjust for drift, use is made of the neon on-traffic indicators. When tuning is correct, both indicators should flicker alternately as mark and space signals are received. If one indicator only is operating, the b.f.o. control of the receiver is adjusted to re-centre the signal at the discriminator. There is reasonable margin between the drift that will extinguish one of the indicators and the drift that will cause corruption of the printing.

TELEPRINTER SYSTEMS

4-Wire teleprinter without local record or break-in facilities (Fig 2002)

Transmission section

28. The start-stop code signals are taken from the teleprinter and applied to the mark/space sequence detector via the line circuits. The signals are then passed through the shaper circuit for squaring and then applied, via an active low-pass filter and adder, to key the voltage controlled oscillator. This produces a v.f. two-tone output which, when applied to a further low-pass filter, is converted to sine wave form. The v.f. signal is available at PLD/A for application to the microphone input of the radio transmitter.

Reception section

29. The v.f. signal being received is fed (via PLD/M) to a band-pass filter and a limiter before being passed to a v.f.-to-d.c. discriminator. It is then fed via a low-pass filter and adder, a shaper, an output shaper and optional inverter and an electronic telegraph relay to the line circuits to operate the teleprinter.

4-Wire teleprinter with local record and break-in facilities

30. These circuits are identical with those described in paras 28 and 29 with the exception of an additional unit, the local record logic circuit which monitors the local transmission.

31. When a teleprinter receiver is printing local record it clearly cannot print a received message also. If this message is admitted to its receiver it will corrupt its local record.

32. In practice the distant operator sends a continuous space (by pressing his Line Break Key) and breaks their rhythm giving audible as well as visual indication.

2-Wire teleprinter
(Fig 2003)

33. As may be seen from Fig 4, only one pair of wires connects to the adaptor. Hence on this form of working it is necessary to switch from send to receive using the Applique unit B, which is described in para 90.

Data operation
(Fig 2004)

34. During transmit conditions, data signals are applied directly from terminal 1 to the mark space detector and shaper circuit after which they are converted to two-tone v.f. signals (±425Hz) and fed (via PLD/A) to the transmitter.

35. Incoming v.f. data signals from the receiver (via PLD/M) are fed to the 750 baud discriminator, converted to ±6V and passed out of the adaptor at terminal 4.

CIRCUIT DESCRIPTION
(Fig 2006)

Mark/space sequence detector (board G)

36. This circuit is used only on teleprinter working and consists of a simple adder (VT21), the output of which is arranged to give a nominal ±6V signal when the correct inputs are applied to pins 6 and 8. The output drives VT22 and VT23 in the mark/space shaper circuit. The input to VT21 is -12V plus teleprinter signals on 4-wire and teleprinter signals plus send/receive pressel switch potential on 2-wire.

Mark/space shaper and divider (board G)

37. VT22 and VT23 consists of a complementary p.n.p./n.p.n. pair which are switched alternately dependant upon either the output of VT21, or the data input polarity.

38. The ±6V nominal signals are applied to the common base connection of VT22 and VT23. A mark (+ve) signal switches VT22 on and VT23 off, driving the slider of RV6 negative. Conversely, the slider of RV6 goes positive when a space (-ve) signal is applied to the base of VT22 and VT23.

39. RV6 is preset to give a symmetrical output from VT22 and VT23. RV7 and RV8 are used to control the level of the d.c. signals which are passed to the d.c. amplifier and low-pass filter.

D.C. amplifier and low-pass filter (board G)

40. This circuit comprises an adder, inverter and active low-pass filter. The signals from RV7 and RV8 are added via R54 to a steady d.c. potential from RV9, via SC1 and R53, producing a two-level signal whose mean level may be varied by RV9.

41. This signal is inverted by the amplifier VT24 and VT26, which in conjunction with RC networks and VT27 to VT29 forms an active low-pass filter with a turnover at either

150Hz or 1500Hz for 50/75 baud telegraphy or 750 baud data respectively. The output passes either to the voltage controlled oscillator or, via RV2a, to the CFS OUTPUT socket (SKTB).

Voltage controlled oscillator (board E)

42. VT44, 46, 47, 48, 49 and VT51 form a free-running voltage controlled multi-vibrator. The d.c. potential at the input determines the discharge time of a resistance-capacitance network and hence the repetition frequencies. As this potential changes (with mark and space signals) from positive to negative and vice-versa, the v.f. output frequency will change in sympathy.

43. VT46 and VT48 are the basic multi-vibrator transistors. VT44 and VT51 are emitter followers to drive both the output and switching transistors VT47 and VT49 which charge the timing circuits C21, R106, C22 and R111. These transistors ensure that C21 and C22 charge rapidly and that the transition from one frequency to the other is almost instantaneous.

Low-pass filter (unit B)

44. The filter is a simple M-derived low-pass section which reduces the harmonic content of the multi-vibrator output until it is reasonably sinusoidal. This output passes either to the reactor amplifier or to PLD/A (via SC2 and SA1).

Reactor amplifier (board G)

45. VT31 is an audio amplifier for either v.f. or speech with its input matched to the secondary winding of T2 or to the output of the microphone amplifier. The output level (via SC1 to SKTB) is controlled by RV2b.

Microphone amplifier (board F)

46. The circuit comprises a simple two-stage amplifier VT93 and VT96 with emitter feedback applied to each stage, the frequency response being substantially flat from 300Hz to 3kHz.

47. The output is fed, via a compound emitter follower VT97 and VT99, to the reactor amplifier on f.m. speech only.

I.F. limiter, discriminator stages and headset amplifier (board D)
(Fig 2007)

48. This circuitry is used only on f.m. speech and f.m. telegraphy using, for example, the SRC11/R210 combination.

49. The input stage VT114 is a grounded-base amplifier with the input circuit matched to 80Ω and isolated by C145. Isolation of the input is necessary because in some radio equipments, a d.c. component is present with the i.f. signal.

50. The limiter stage VT112 and VT113 is connected as an emitter coupled pair with its output being substantially a square wave of 5Vp-p amplitude. The output is applied to a double-tuned discriminator via VT111.

51. The output from the discriminator is either a speech signal in the frequency band 300Hz to 3kHz or a two-tone telegraph signal.

52. The first stage of the headset amplifier is a simple class A amplifier, VT109, which acts as an impedance buffer and, at the same time, provides a moderate voltage gain to the second stage, VT108, which is a driver amplifier with a preset a.c. gain control RV41.

53. The amplifier output stage consists of VT106 and VT107 connected as a conventional class B amplifier giving an output of approximately 200mW into a 50Ω load.

54. The f.m. telegraphy output is matched to the selected bandpass filter. For speech the output is taken to SKTC/M (via SC4, SA2).

Band-pass filters (units C and D)

55. Both filters consist of a full prototype band-pass section, an M-derived section and a terminating prototype half-section having a characteristic impedance of 6kΩ and matched to 50Ω by an isolating transformer.

a. Band-pass filter ±100Hz (unit C)

This filter is centred on 2kHz with a nominal bandwidth of ±100Hz and is used for deviation telegraphy at this frequency. The rejection is 40dB outside a bandwidth of ±350Hz.

b. Band-pass filter ±425Hz (unit D)

8 This filter is also centred on 2kHz but has a nominal bandwidth of ±425Hz for deviation telegraphy. The rejection is 40dB outside a bandwidth of ±1kHz.

Limiter (board A)

56. The limiter comprises two identical overdriven emitter-coupled pairs VT67, VT68 and VT64, VT66 connected in tandem. To ensure that the limiting is symmetrical at all operational levels, the bases of the transistors are biased to approximately the same potential.

57. At 2kHz ±1kHz the limiter has a reduction factor of 40dB. An emitter follower VT63 reduces the shunt load on the collector of VT64. An output of approximately 5V p-p is available for input levels of between 70mV and 20V r.m.s.

Teleprinter discriminator ±100Hz and ±425Hz deviation, 50/75 baud (unit A)

58. The teleprinter discriminator circuit essentially consists of a double-tuned discriminator circuit VT86, switched to select:-

a. 2kHz ±100Hz deviation.

b. 2kHz ±425Hz deviation.

59. In position b, two damping resistors are included to reduce the Q factor in order to improve the linearity. The output of the circuit is a two-level d.c. corresponding to the mark and space conditions.

750 baud data discriminator (board B)

60. This circuit is a high speed discriminator, convering a two-tone v.f. signal into digital data at speeds up to 750 bauds.

61. The input waveform is differentiated by C62 and R203 and fed to the base of VT79. The output from VT79 consists of a train of alternate positive and negative pulses which are applied to a full-wave bridge rectifier D21 to D24. The resulting output from the rectifier is a train of wholly negative-going pulses fed to the base of VT78.

62. VT78 is an emitter follower whose output is applied to flip-flop circuit VT76 and VT77. The flip-flop produces rectangular pulses of constant length at a p.r.f. determined by the input signal.

63. The output of VT76 is applied to the emitter follower VT74 which drives an inverting amplifier VT73. The output from VT73 is a variable mark/space ratio rectangular waveform. For mark signals (1575Hz) the ratio is approximately 1.45:1 and for space signals (2425Hz) the ratio is approximately 0.55:1. The d.c. level is obtained through the active low pass filter, adder and shaper (para 66 to 68 inclusive).

64. A d.c. potential is added at the input adding point of the filter, this potential being preset by RV21.

65. When VT72 is cut-off, VT71 is conducting, the duration of conduction being determined by the change-over time of the flip-flop. For a high p.r.f., the change-over time is short and short pulses with a relatively long separation appear at the output. With a low p.r.f., the pulses are much longer and closer together giving a much higher mean d.c. level.

Active low-pass filter and adder (board A)
(Fig 2006)

66. This filter is similar to the low-pass filter described in para 44 but has three stages to increase the attenuation characteristic to 18dB per octave. The adding network consists of two equal resistors R142 and R143.

67. An additional adding input is derived from RV21 and is used to provide a d.c. level for setting the mean level of the output from the data discriminator to the centre of the shaper characteristic.

Shaper (board A)

68. The output from the active low-pass filter is applied to the common emitter shaper circuit VT56, VT57. The output from the shaper consists of a squarewave of an amplitude 10V ±1V.

Output shaper and optional inverter (board C)

69. VT16 and VT17 are connected as an emitter coupled phase splitter fed from the shaper. Since the circuit is symmetrical, anti-phase outputs are available from the collectors and may be selected as required, by SH.

Local record and break-in circuit (board C)

70. This facility is available only in the 4-wire, half duplex mode of operation.

VT14 is basically an OR gate with its 1 inputs equal to -6V and its 0 inputs equal to +6V, the two inputs being derived from both VT21 (board G) and VT18.

71. The ±6V received from VT21 causes VT14 to key VT11, the input gate of the electronic relay which, in turn, causes the teleprinter receiver to print the transmitted signal, whilst VT18 and DZ4 normally maintain R32 at a positive (mark) potential.

72. Should R32 receive a negative (space) potential from the receiver section via VT18, this signal will be fed to VT14 interrupting the electronic relay response (para 73). As soon as the local signal reverts to a steady mark((ceases transmission) the distant station can send.

Electronic telegraph relay (board C)

73. This circuit consists of a blocking oscillator (VT9) which is switched by an AND gate (VT11). Pulses from VT9 are applied to four switching transistors (VT1-VT4) allowing them to conduct during the pulse period. A CR network (part in unit F) integrates these narrow pulses over the much longer telegraph keying periods.

Electronic pressel switch (board C)

74. Operation of the transmit/receive switch is detected by a NOT gate (VT6) followed by an emitter-follower (VT7) acting as a buffer stage to the power switch (VT12), whose load is the electro-magnetic relay in the transmitter. The output of VT12 is then connected to the pressel line of the radio-transmitter.

75. VT8 in conjunction with VT13 changes the d.c. level at pin 17 to the following values:-

a. Pressel line in the receive condition - 0V

b. Pressel line in the transmit condition - -12V

76. Pin 17 is connected (in the 2W/4W simplex mode) to VT11, thus, during transmit conditions, VT11 is held ON and input voltages from the receiver have no effect. On receive, no potential is applied to VT11 and signals from VT14 control VT11.

On-traffic indicators (board E)

77. An emitter follower VT43 is driven by the shaped output of the low-pass filter. Two preset potentiometers RV11 and RV12 are adjusted to operate the two Schmitt triggers VT37, VT38 and VT41, VT42 which, in turn, switch the two fluorescent indicators V1 and V2 (unit G) on and off.

78. The trigger levels are so adjusted that when the d.c. level corresponding to a mark appears at the base of VT43, one indicator glows with the other extinguished. This procedure is reversed when a level corresponding to space is received. During zero input conditions, both indicators are extinguished.

Multi-vibrator muting

79. It is necessary, with some installations, to inhibit the transmit path v.f. tone output when receiving in the simplex mode. The pressel line, which governs whether transmission or reception is taking place, will switch VT13 on or off. When switched

off (receive), VT13 effectively mutes the voltage controlled oscillator multivibrator circuit by applying a large negative voltage to the adding stage of the active low-pass filter of the transmit path via R15 and SE3.

Speech low-pass filter (unit B)
(Fig 2007)

80. When simultaneous a.m. speech and f.m. telegraphy are in use, eg on the C11, some telegraph tone is present in the speech channel. The speech low-pass filter reduces the level of this unwanted telegraph tone.

Metering circuits

81. a. Line current

The line current is controlled by RV1a and RV1b (Fig 2006, grid ref 1B and 8B) and monitored by M1 (Fig 2007, grid ref 4Q). Protection against short circuit is provided by TH406 (Fig 2006, grid ref 8C).

b. Receive level

The limiter input signal to the discriminator is rectified by the diode bridge D11-D14 (Fig 2007 board E) and monitored by M1.

c. Deviation (r.f. deviation, TC11 f.m. telegraphy only)

The output from the i.f. limiter and discriminator stages is a signal with an amplitude corresponding to the r.f. deviation of the TC11 carrier. This signal is monitored by the diode bridge D11-D14 (board E) at the output to the headset amplifier. 2kHz of r.f. deviation produces a deflection of 200μA on M1.

d. Deviation (v.f. deviation, all other systems except f.m. speech)

The d.c. level at the base of VT43 (Fig 2505 board E) is monitored through a shunt whose value is so chosen that a 2kHz signal into the discriminator produces a centre-zero deflection on M1 and a ±425Hz deviation produces a symmetrical deflection of 200μA in each direction.

Simplex-Duplex switch SE
(Fig 2006)

82. The function of this switch is to inhibit the electronic telegraph relay VT1-VT4, during transmission periods, when operating a 4-wire telegraph system over a simplex radio link. This is achieved by feeding an inhibit signal from VT8 to the AND gate VT11 (see para 73 to 76 inclusive) when SE is in the ON SPX position.

Unit H

83. This is a sub-panel, mounted directly above units A and C, and carries the line filter components, R2 and TH10.

Power supplies
(Fig 2005)

84. Alternative a.c. or d.c. power supply units may be fitted to the adaptor.

D.C. power supply unit

85. a. This unit is a d.c. to d.c. converter operating from a nominal 24V secondary battery supply, negative terminal earthed. The converter consists of a push-pull oscillator which uses the square loop hysteresis characteristic of the ferrite core material of transformer T418 in an RL multivibrator circuit. D446 protects the converter against reversal of supply polarity.

b. Two secondary windings provide 80V for the two 60V telegraph supplies, two 16V windings are provided for the stabilised supplies and two 22V windings supply the stabilisers.

c. The telegraph supplies are stabilised and protected against overload by a combination of a thermistor TH407 or TH408 and zener diodes DZ426 or DZ427.

A.C. power supply unit

86. A mains transformer T518 operating at 40-60Hz replaces the switching transistors and the 500Hz transformer used in the d.c. unit. T518 has a mains voltage selected in the primary circuit which enables any voltage in the ranges 90-130V or 200-240V, in 10V increments, to be selected. The rectifiers and smoothing circuits used are identical with those used in the d.c. unit.

Stabiliser units (unit E)

87. Two identical stabiliser units, UE1 and UE2, are used to provide the +12V and -12V supplies used in the adaptor.

88. A reference source DZ36 maintains the emitter of VT126 at a constant potential. Any variation of the output voltage appears across RV46 and R301, and a small proportion is applied to the base of VT126. This varies the current in R298 and R299 and also the base potential of the compound emitter follower VT123 and VT124. The impedance of VT123 and VT124 will change in sympathy with the base potential, resulting in the restoration of the output voltage to its normal value. DZ37 provides a supply for VT126 which is independant of the output voltage and thereby, the stability of the output is improved.

Applique unit A (YL3147)
(Fig 2008)

89. This unit is used for c.f.s. working when the transmitter is remotely situated from the receiver and adaptor terminals. Two applique units A are situated, up to 5 miles apart, one with the transmitter and the other with the adaptor. The inter-connections for this layout are:-

a. Adaptor C11 CFS terminal to first applique unit A SK1, via a co-axial lead.

b. First applique unit A, terminals 1 and 3 to second applique unit A, terminals 2 and 3, via up to 5 miles of D10 line.

c. Second applique unit A SK1 to transmitter c.f.s. terminal, via a co-axial lead.

Applique unit B (YL3148)
(Fig 2008)

90. Applique unit B is used for connecting the teleprinter to the adaptor for either 2 or 4-wire operation. It also contains the remote transmit-receive switch for 2-wire operation.

Applique unit C (YL3149)
(Fig 2008)

91. This unit is used for f.m. speech and f.m. telegraph working to a remote transmitter. It is connected between the C11 CFS output terminal on the adaptor and the D10 line to the remote transmitter position and is used in conjunction with applique unit D.

Applique unit D (YL3150)
(Fig 2008)

92. Applique unit D is similar to applique unit C but it is connected between the D10 line and C11 CFS input to the transmitter (see para 91).

Applique unit E (YL3151)
(Fig 2008)

93. Applique unit E is used for v.f. telegraphy over a 4-wire v.f. line. It is connected between PLD of the adaptor and up to 5 mils of D10 line to the remote transmitter.

Note: The next page is Page 1001

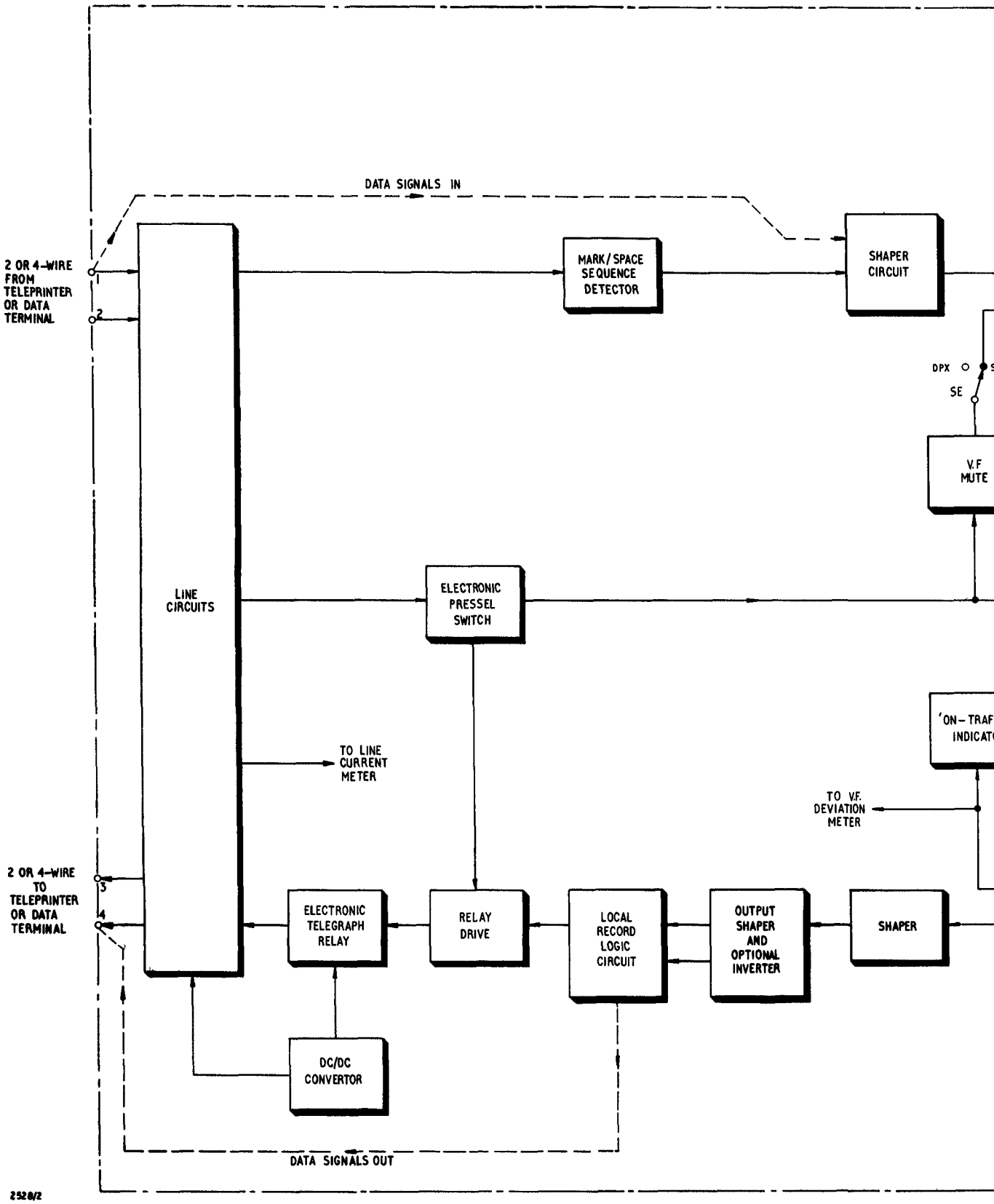
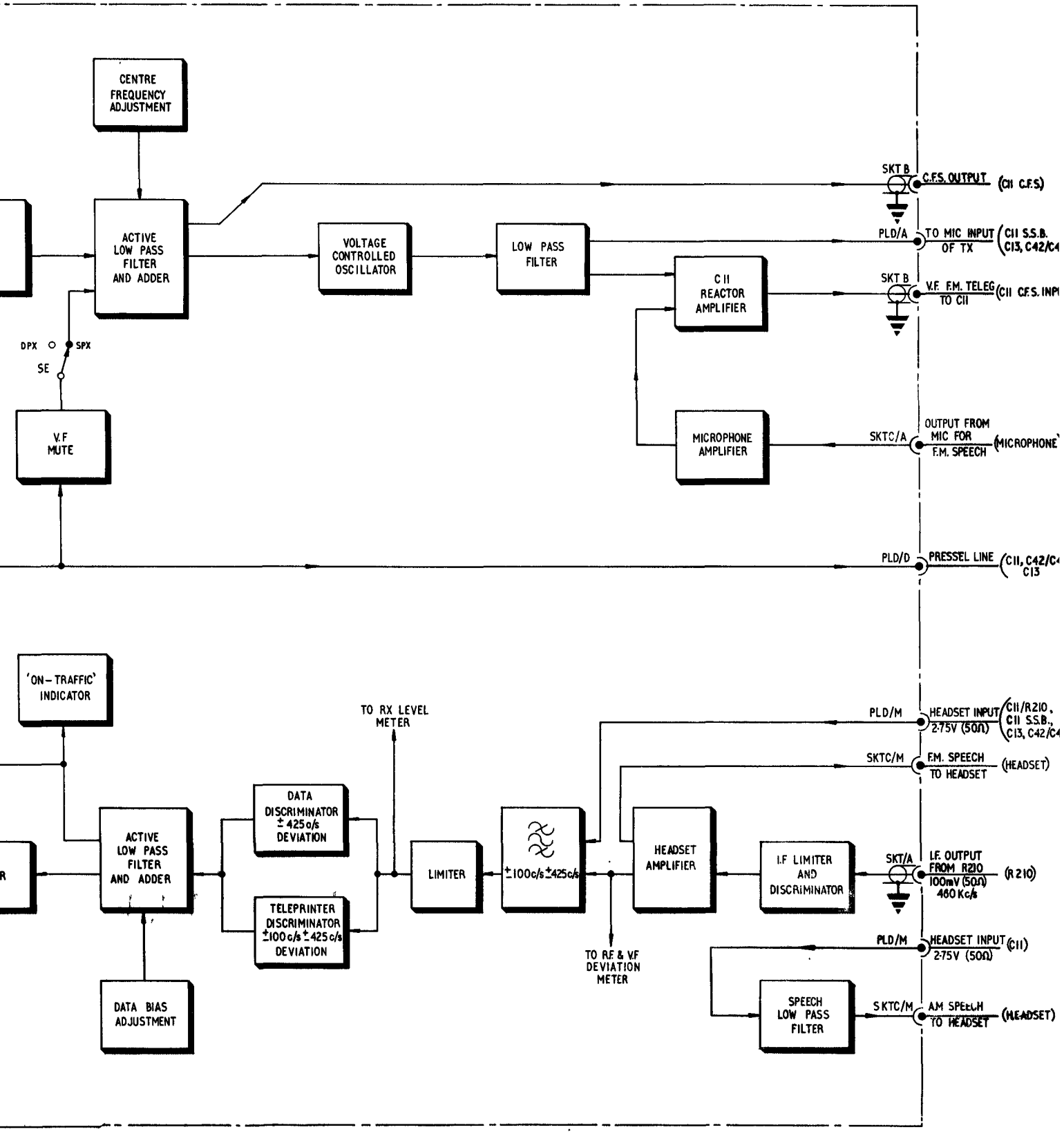


Fig 2001 - Block diagram of radi



of radio telegraph adaptor No 1 and No 2

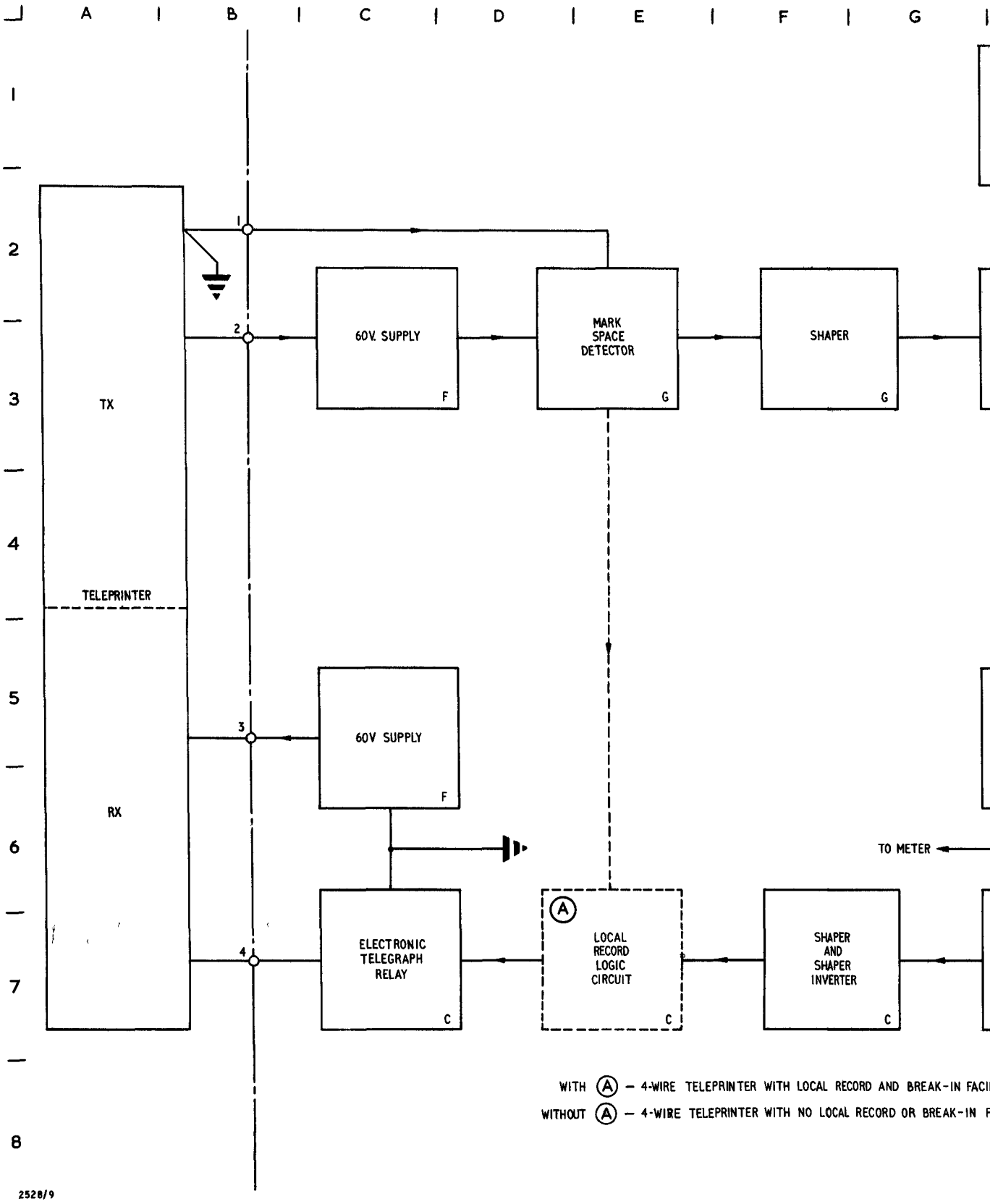
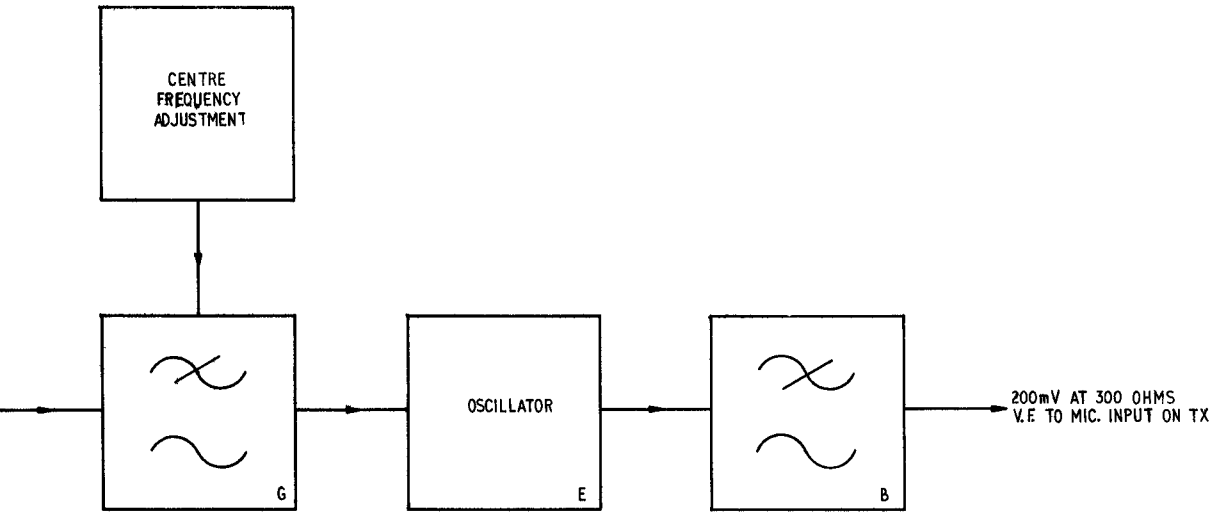
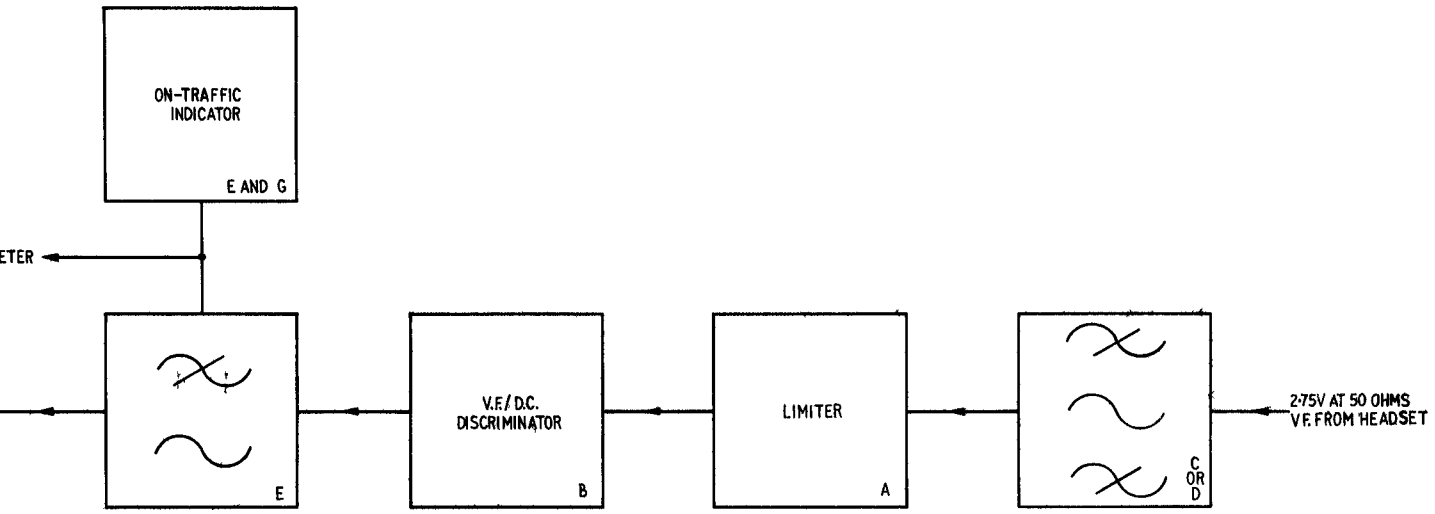


Fig 2002 - Block diagram of adaptor

G | H | J | K | L | M | N | O |



VF WORKING



BREAK-IN FACILITIES (HALF DUPLEX)

OR BREAK-IN FACILITIES (2-WAY SIMPLEX)

adaptor operating in 4-wire teleprinter modes

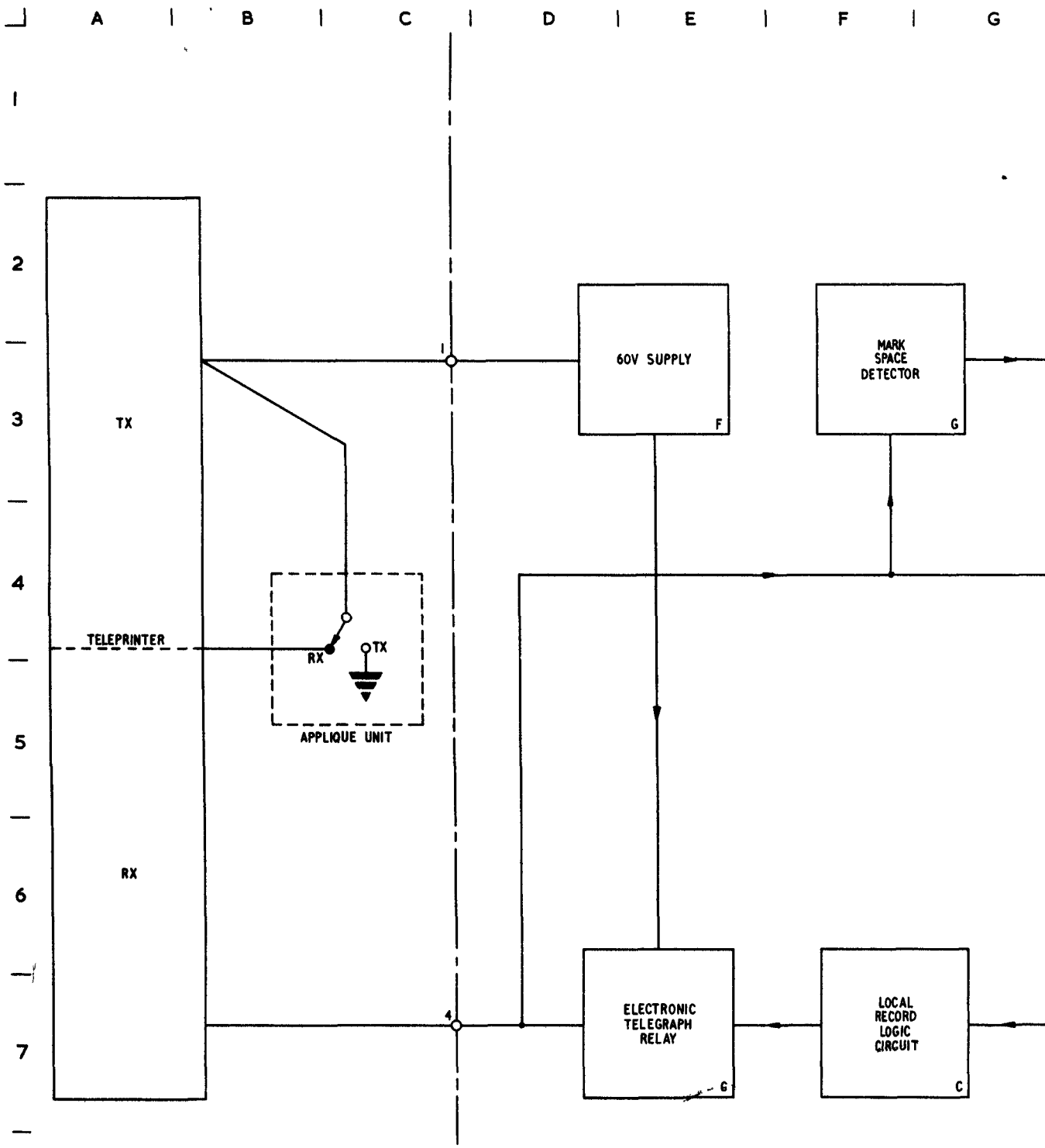
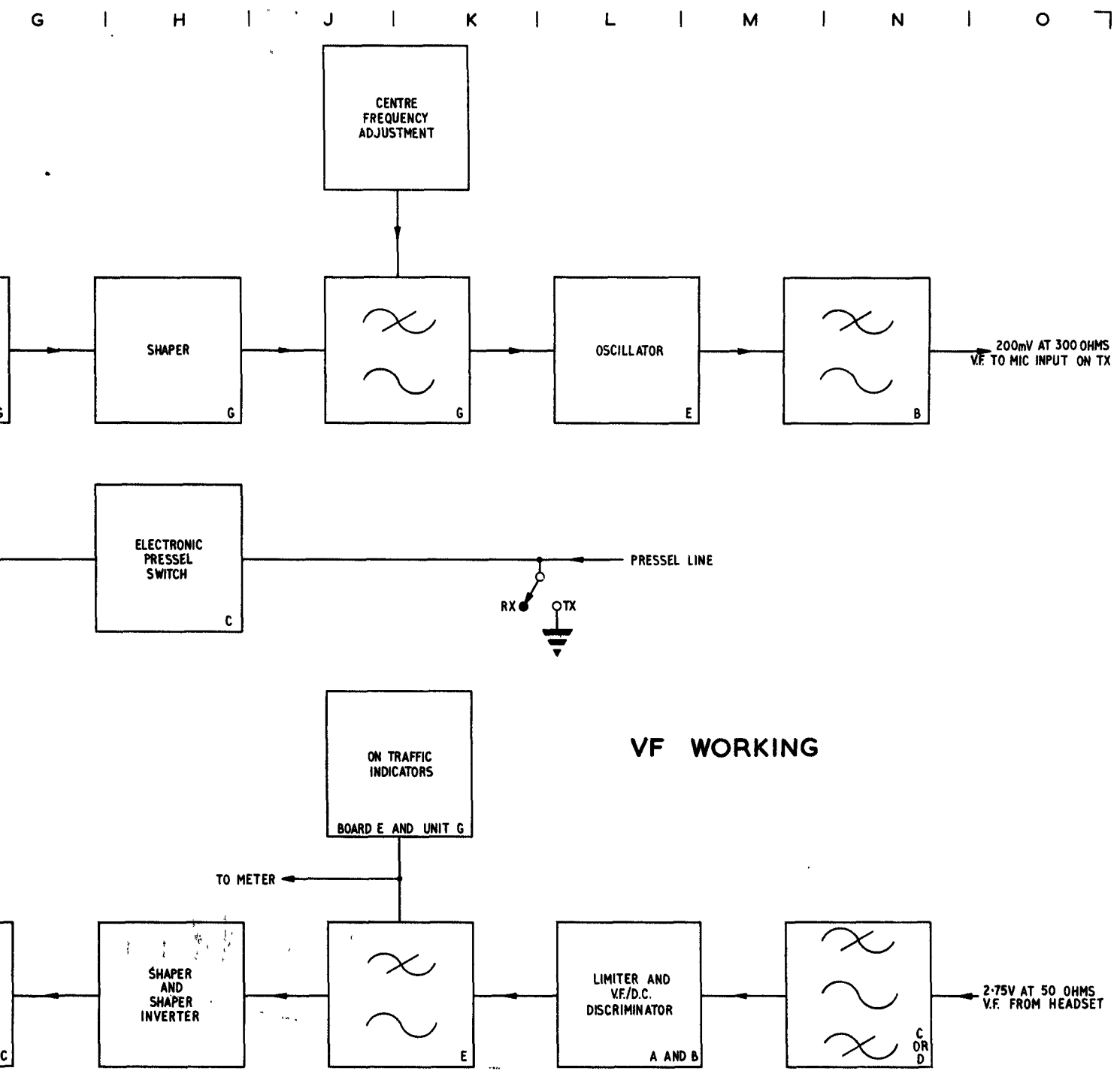
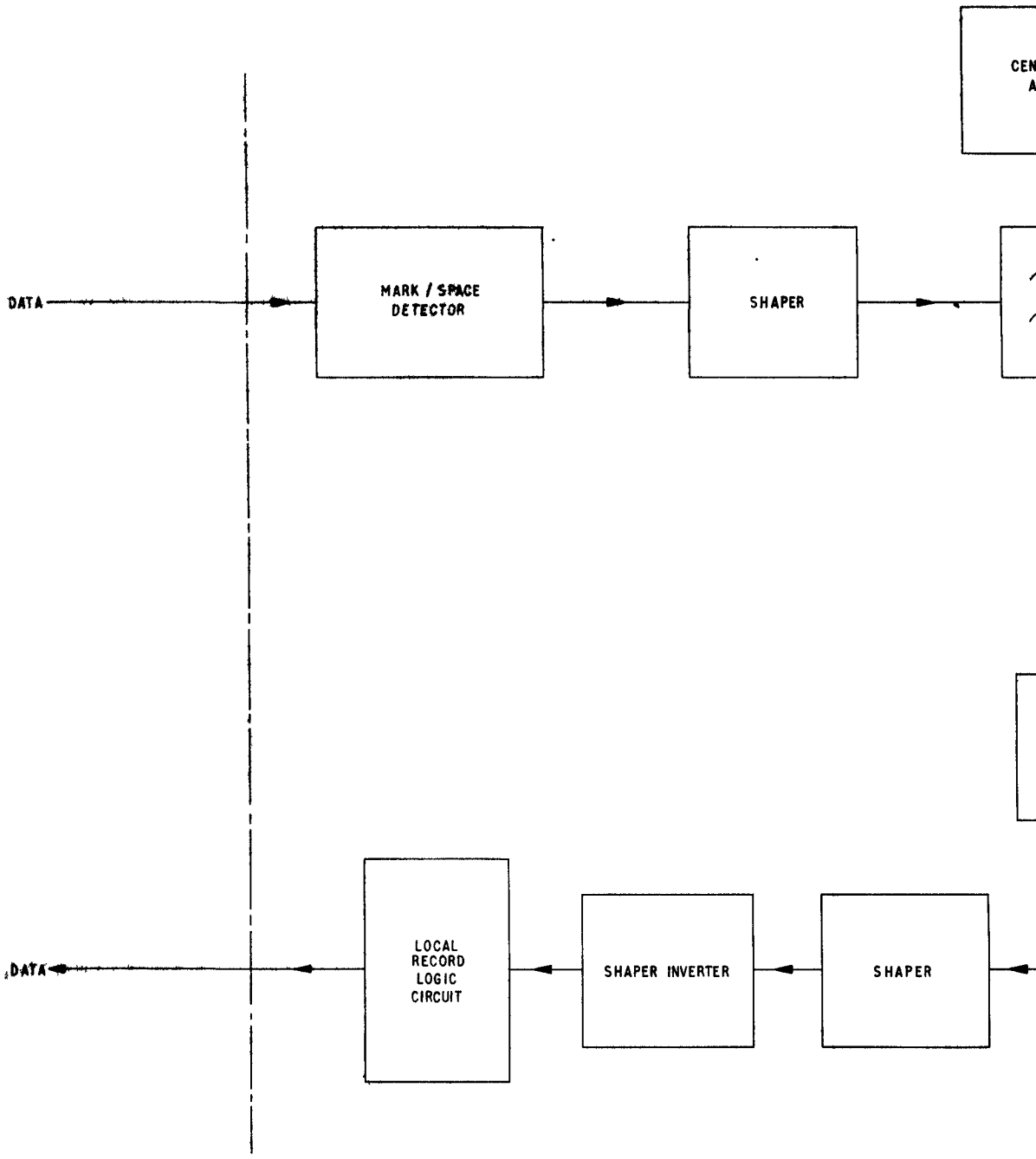


Fig 2003 - Block diagram of adaptor operat

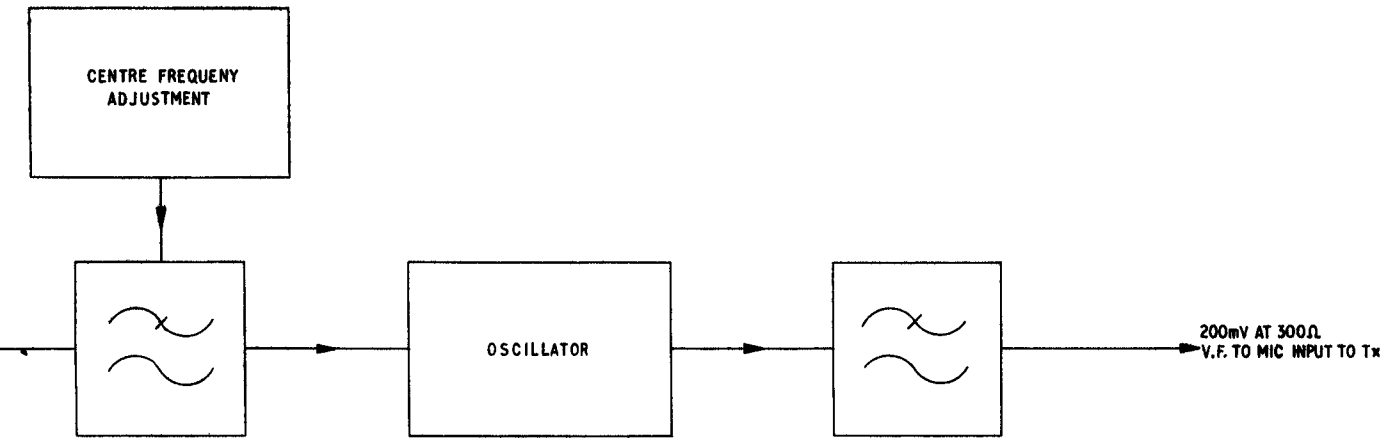


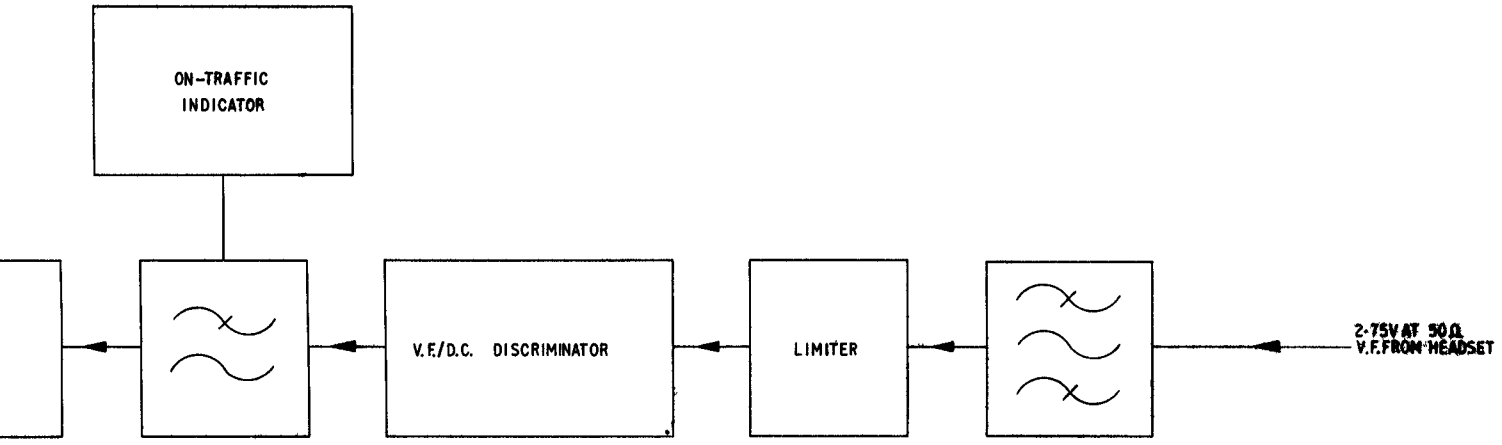
operating in 2-wire teleprinter (Simplex) mode



2528/12

Fig 2004





g 2004 - Date operation

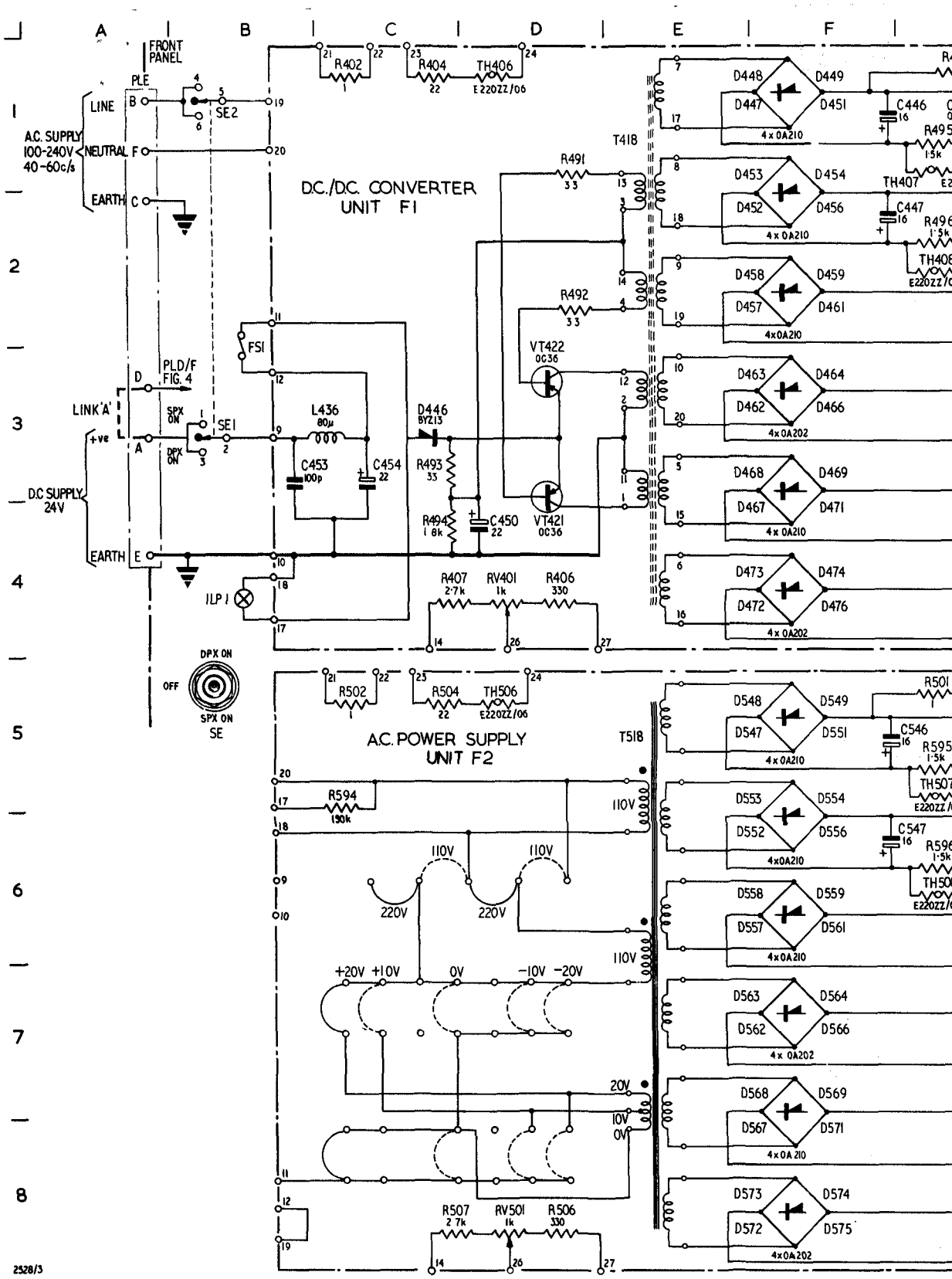
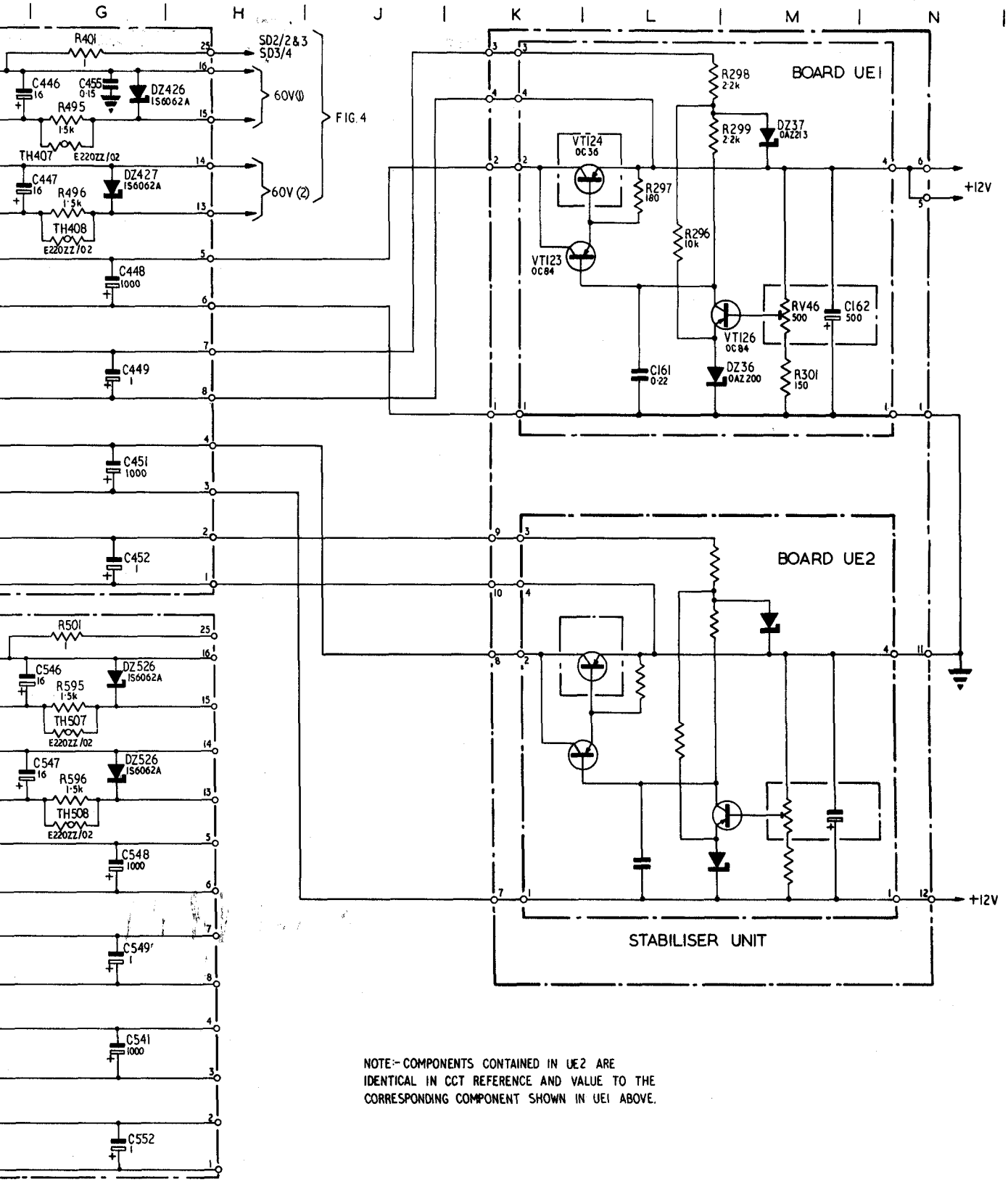


Fig 2005 - Circuit diagram



NOTE:- COMPONENTS CONTAINED IN UE2 ARE IDENTICAL IN CCT REFERENCE AND VALUE TO THE CORRESPONDING COMPONENT SHOWN IN UE1 ABOVE.

diagram of power supplies (a.c./d.c.)

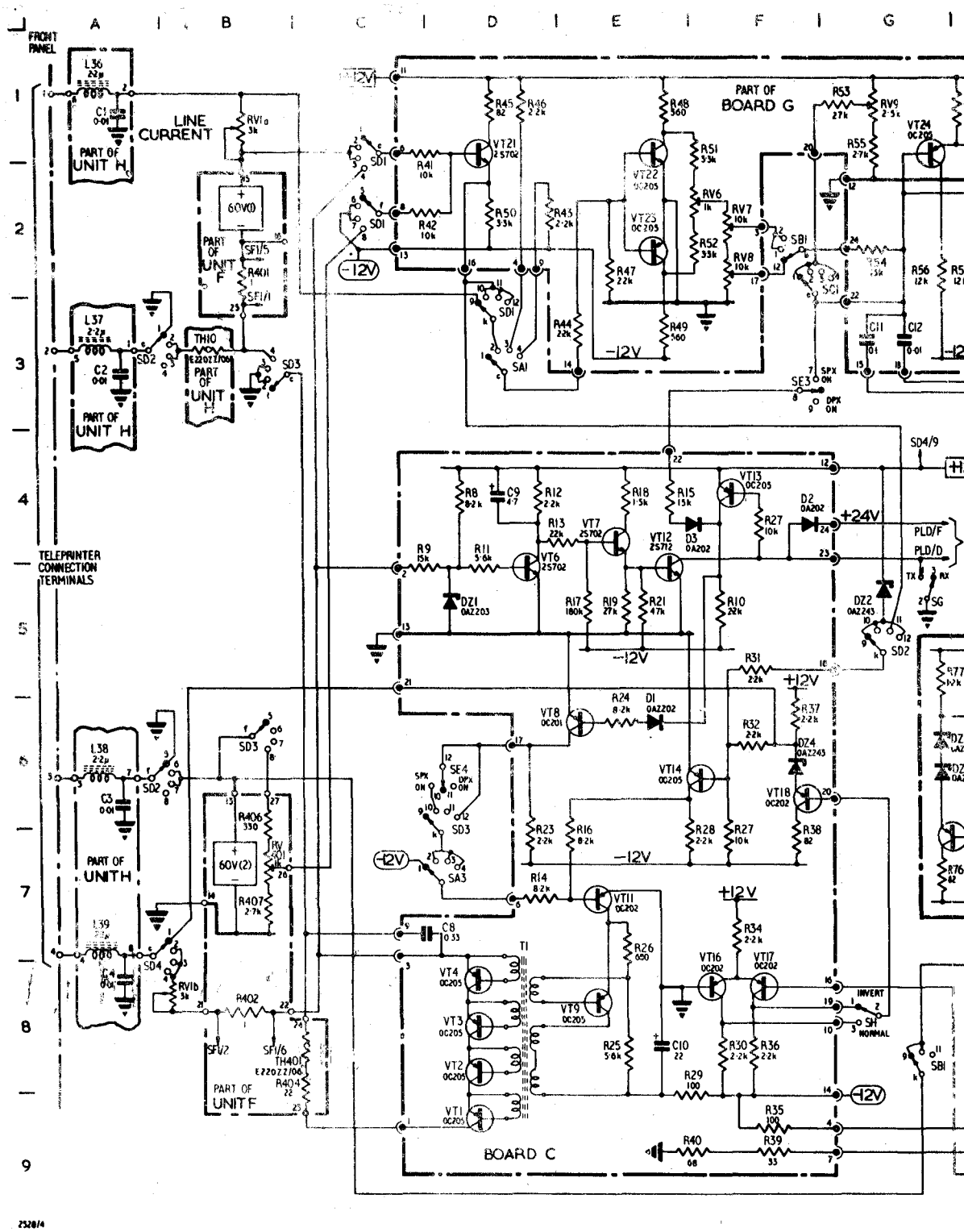
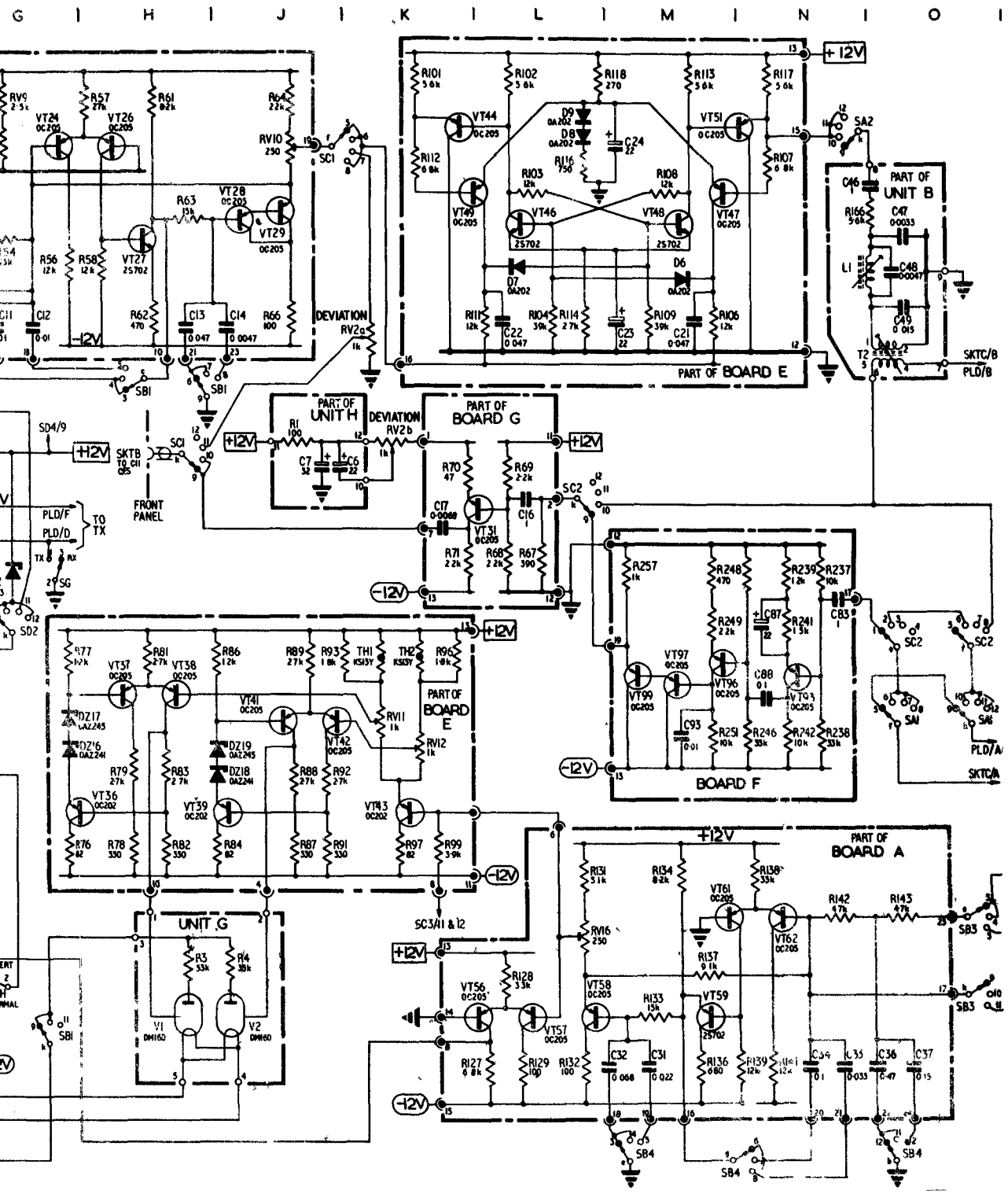
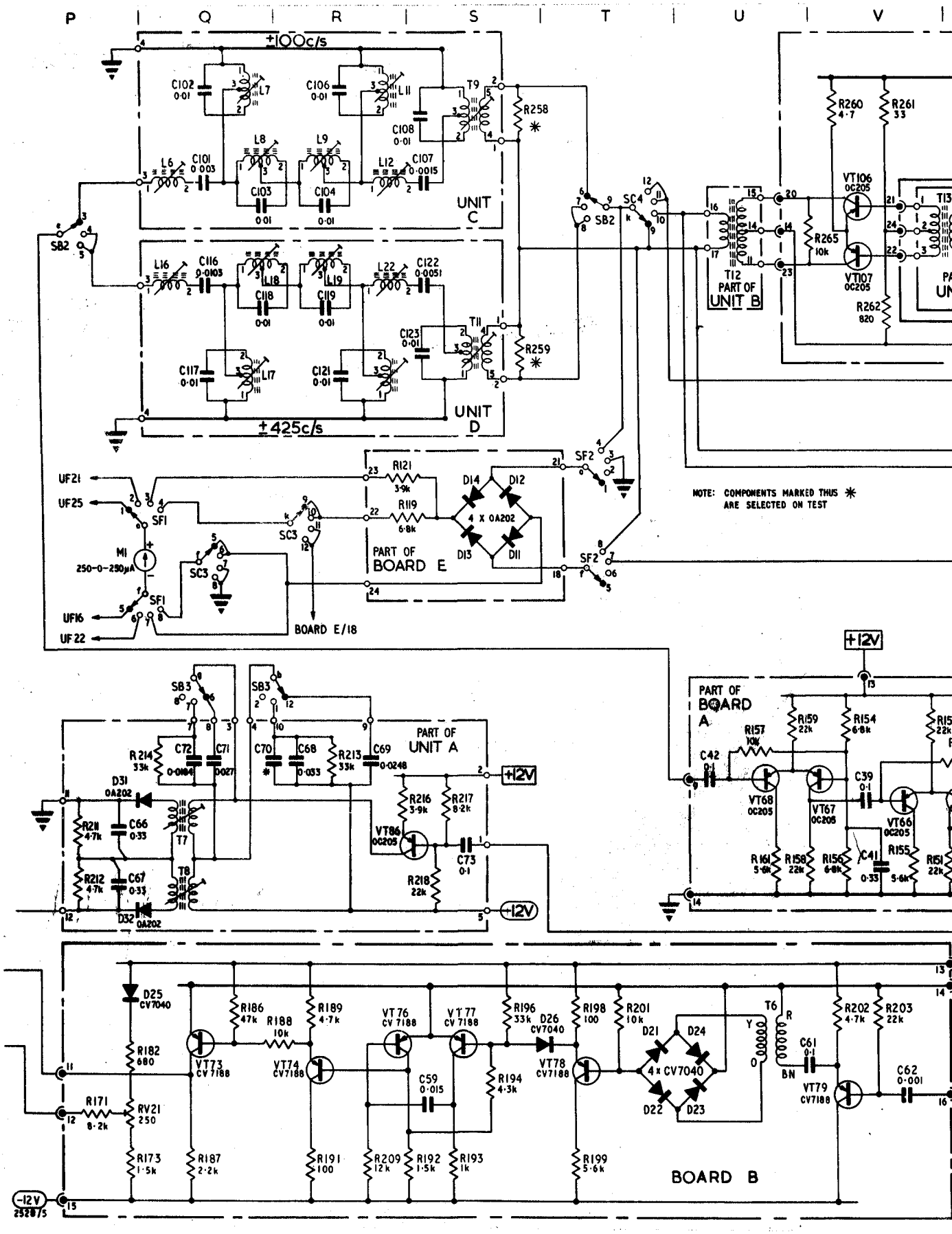
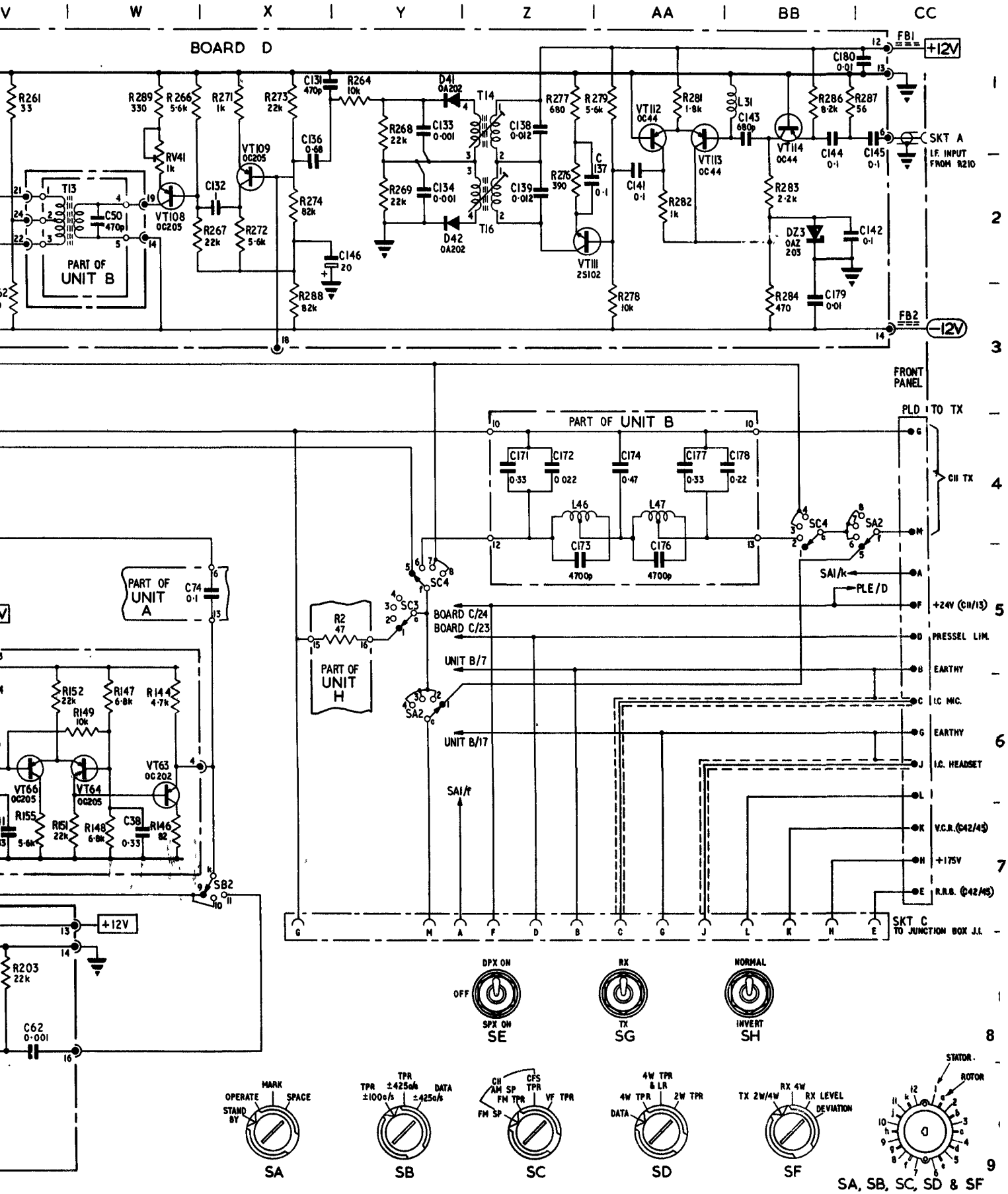


Fig 2006 - Circ



Circuit diagram (a)
Fig 2006
Page 1006


P
Q
R
S
T
U
V
+100c/s
UNIT C
UNIT D
+425c/s
SB2
SC4
T12 PART OF UNIT B
VT106 OC205
VT107 OC205
R260 4·7
R261 33
R265 10k
R262 820
NOTE: COMPONENTS MARKED THUS * ARE SELECTED ON TEST
UF21
UF25
SF1
MI 250-0-250μA
UF16
UF22
SC3
R121 3·9k
R119 6·8k
D14
D12
4 X OA202
D13
D11
PART OF BOARD E
SF2
BOARD E/18
SB3
PART OF UNIT A
R214 33k
C72 0·0184
C71 0·027
C70 *
C68 0·033
R213 33k
C69 0·0248
D31 OA202
D32 OA202
R211 4·7k
C66 0·33
R212 4·7k
C67 0·33
T7
T8
R216 3·9k
R217 8·2k
VT86 OC205
C73 0·1
R218 22k
+12V
PART OF BOARD A
R157 10k
R159 22k
R154 6·8k
C42 0·1
VT68 OC205
VT67 OC205
VT66 OC205
C39 0·1
C41 0·33
R161 5·6k
R158 22k
R156 6·8k
R155 5·6k
R151 22k
D25 CV7040
R182 680
R171 8·2k
RV21 250
R173 1·5k
R186 47k
R188 10k
R189 4·7k
R187 2·2k
R191 100
VT73 CV7188
VT74 CV7188
VT76 CV 7188
VT77 CV 7188
C59 0·015
R209 12k
R192 1·5k
R193 1k
R196 33k
D26 CV7040
R194 4·3k
VT78 CV7188
R198 100
R199 5·6k
R201 10k
D21
D24
4 x CV7040
D22
D23
T6
C61 0·1
VT79 CV7188
R202 4·7k
R203 22k
C62 0·001
-12V 2528/5
BOARD B



- Circuit diagram (b)

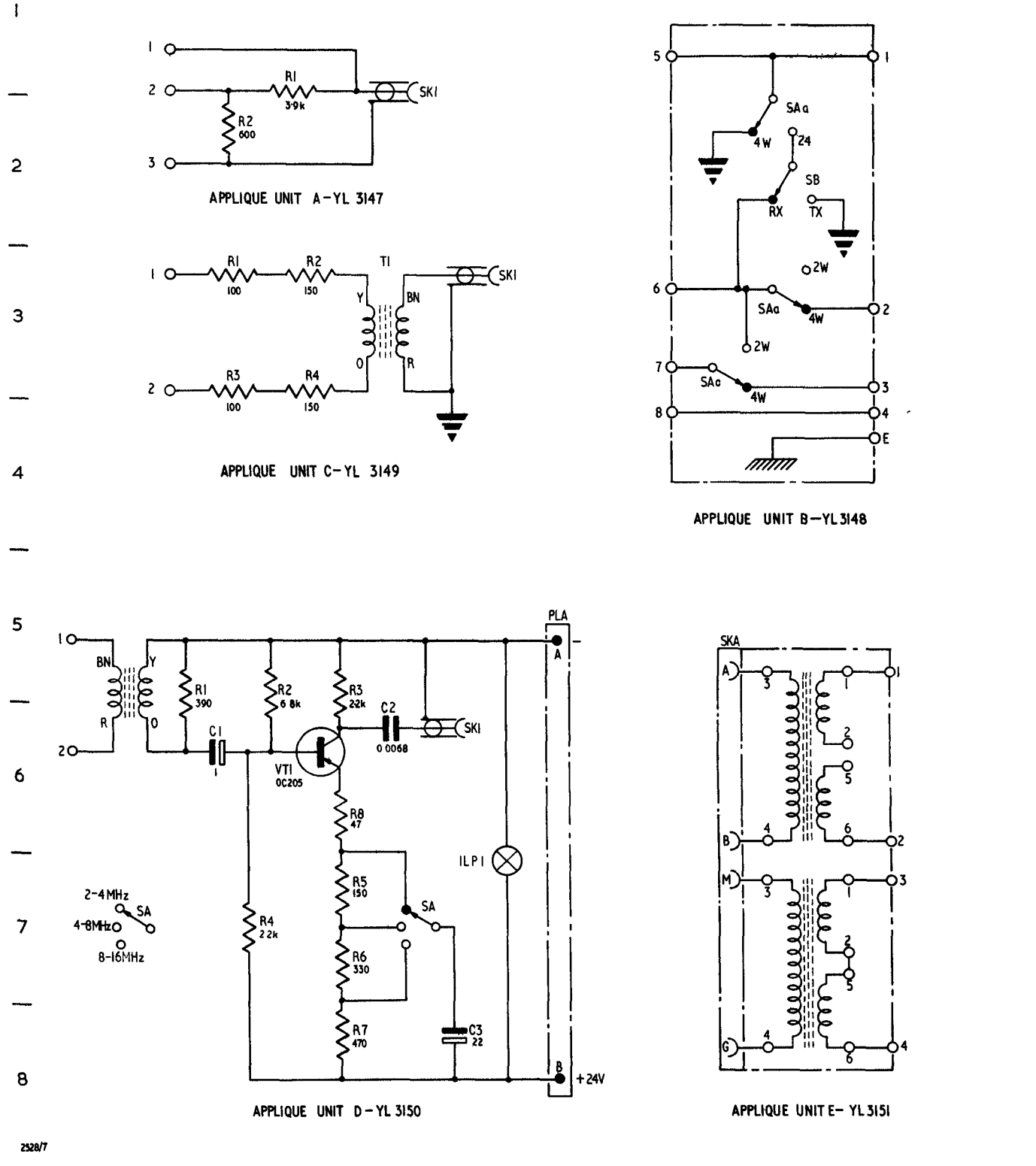


Fig 2008 - Applique units A, B, C, D and E

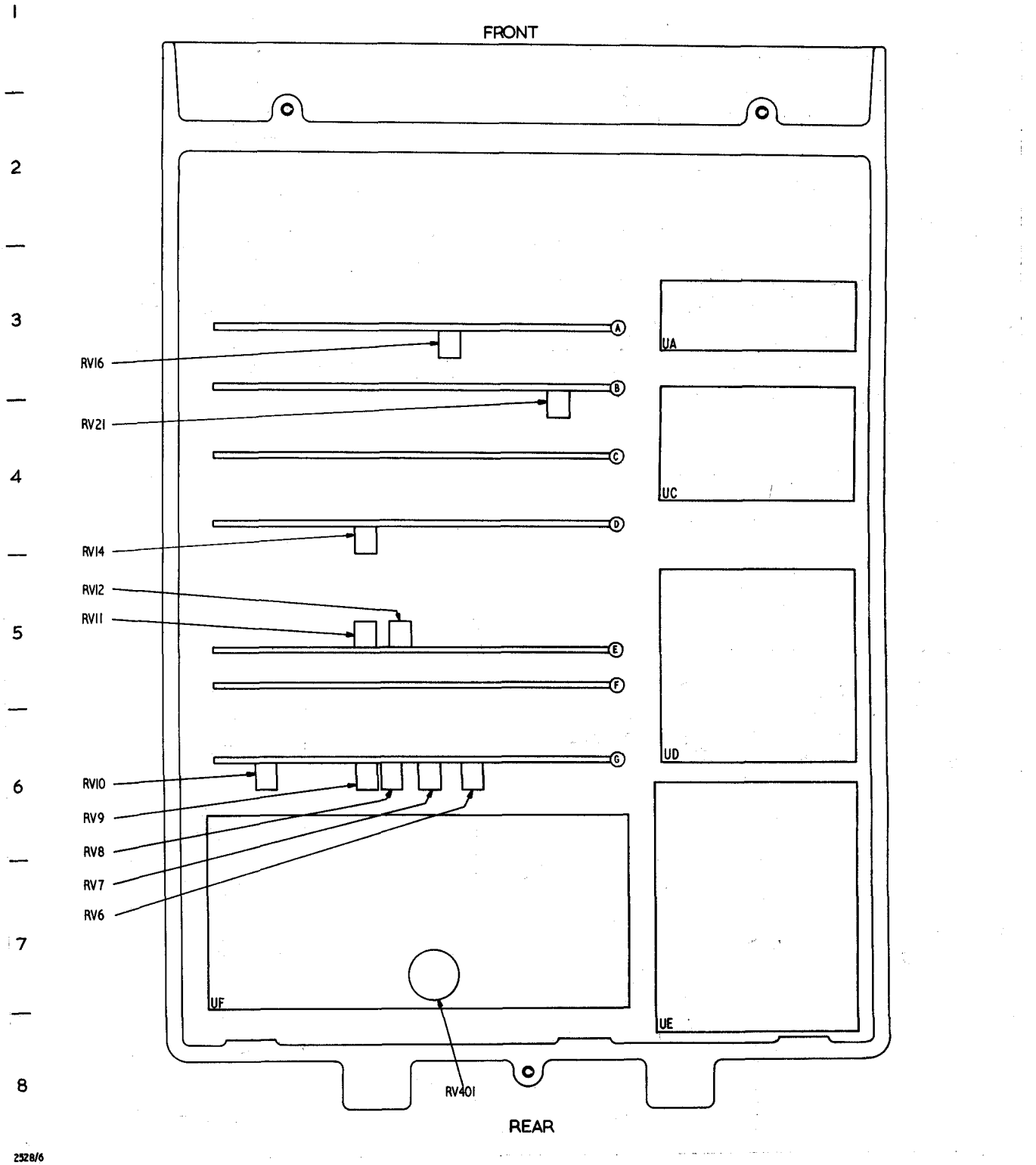


Fig 2009 - Layout of units, boards and potentiometers

Table 2001 - Spares schedule, Field repairs

Catalogue No	Designation	Function and cct ref
Z1/5820-99-198-3802	Unit A	Discriminator
Z1/5820-99-198-3801	Unit B	Low pass filter
Z1/5820-99-198-3799	Unit C	Band pass filter
Z1/5820-99-198-3800	Unit D	Band pass filter
Z1/5820-99-198-3805	Unit E	Stabiliser
Z1/5820-99-198-3796	Unit F	D.C./d.c. converter
Z1/5820-99-198-3821	P.W. board assembly	Board A
Z1/5820-99-198-3816	P.W. board assembly	Board B
Z1/5820-99-198-3819	P.W. board assembly	Board C
Z1/5820-99-198-3815	P.W. board assembly	Board D
Z1/5820-99-198-3820	P.W. board assembly	Board E
Z1/5820-99-298-3817	P.W. board assembly	Board F
Z1/5820-99-198-3818	P.W. board assembly	Board G

Table 2002 - Front panel assembly, spares schedule, Field repairs

Catalogue No	Designation	Function and cct ref
Z32/5920-99-059-0110	Fuse link, cartridge, 2A	F1
X5/6210-99-995-9122	Lamp filament, 28V	ILP1
Z /6210-99-012-0914	Lens, indicator light, red	ILP1
Z /5355-99-097-0186	Knobs	
Z /5355-99-097-0184	Cap, electrical	
Z /5355-99-097-0183	Insert, control knob	
Z1/5935-99-940-8698	Cover, plug/socket, electrical	
Z1/5820-99-198-3803	Indicator, board assembly	
X2/6210-99-955-4955	Light indicator	V1, V2
Y1/5330-99-198-3787	Gasket, base plate	
Z1/4440-99-198-3788	Desiccator unit	
Y1/9905-99-943-8292	Plate, modification record	
Z1/9905-99-198-3793	Plate instruction	
Z1/9905-99-198-3789	Plate identification	

Table 2003 - Front panel assembly, spares schedule, Base repairs

Catalogue No	Designation	Function and cct ref
Z4/6625-99-105-2425	Meter, arbitrary scale	M1
Z /5935-99-013-2533	Plug, electrical, pattern 104	PLE
Z /5935-99-013-1270	Plug, electrical, pattern 104	PLD
Z /5935-99-013-1474	Socket, electrical, pattern 104	SKTC
Z /5930-99-051-0554	Switch, toggle	SG, SH
Z32/5935-99-972-6826	Socket, electrical, coaxial BNC	SKTA, SKTB
Z32/5920-99-012-0231	Fuse holder	F1
Z /6210-99-012-0913	Light, indicator	ILP1
Z32/5930-99-198-3780	Switch toggle	SE
Z37/5940-99-108-6537	Terminal, spring head	1, 2, 3, 4
Z30/5905-99-198-3843	Resistor assembly, variable	RV1a, RV1b
Z1/5330-99-198-3785	Gasket	
Z1/5330-99-198-3784	Gasket	
Z1/5330-99-198-3786	Gasket	
Z32/5930-99-198-3776	Switch, rotary	SA
Z32/5935-99-198-3791	Socket, assembly	SKTD, SKTE
Z32/5920-99-012-0232	Carrier, fuse link	F2
Z32/5930-99-198-3779	Switch rotary	SF
Z32/5930-99-198-3777	Switch rotary	SB
Z32/5930-99-198-3778	Switch rotary	SC, SD
Z30/5905-99-198-3842	Resistor assembly, variable	RV2a, RV2b
Z /5905-99-022-2193	Resistor, fixed comp, 33k	R3, R4
Z37/5940-99-198-3811	Terminal board assembly	
Z1/5910-99-970-6903	Capacitor, fixed, 0.01	C1, C2, C3, C4
Z /5910-99-013-0513	Capacitor, fixed, electrolytic, 22	C6
Z /5910-99-013-0499	Capacitor, fixed, electrolytic, 33	C7
Z37/5950-99-198-3758	Inductor, radio frequency	L36, L37, L38, L39
Z /5905-99-022-1109	Resistor, fixed, comp, 100	R1
Z30/5905-99-198-3840	Resistor, fixed, comp, 47	R2
Z42/5961-99-198-3732	Resistor, thermal	TH10
Z31/5910-99-198-3774	Capacitor, fixed, 0.01	
Z32/5935-99-198-3794	Plug, electrical, 24 pole edge connector	
Z37/5940-99-012-0202	Terminal, lead-through, 1000V	

Table 2004 - Unit A, spares schedule, Base repairs

Catalogue No	Designation	Function and cct ref
Z37/5950-99-198-3750	Transformer	T7
Z37/5950-99-198-3751	Transformer	T8
Z37/5940-99-014-2534	Terminal, lead-through, 350V	
Z /5940-99-012-0203	Terminal, lead-through, 1000V	
Y1/9905-99-942-9495	Plate, modification record	
Z31/5940-99-198-3809	Terminal board assembly	
Z /5905-99-022-2088	Resistor, fixed, comp., 4.7k	R211, R212
Z /5905-99-022-2079	Resistor, fixed, comp., 3.9k	R216
Z /5905-99-022-2121	Resistor, fixed, comp., 8.2k	R217
Z /5905-99-021-6331	Resistor, fixed, film, 33k	R213, R214
Z1/5910-99-519-4895	Capacitor, fixed, 0.33	C66, C67
Z1/5910-99-945-2237	Capacitor, fixed, 0.1	C73, C74
Z31/5910-99-198-3831	Capacitor, fixed, 0.033	C68
Z31/5910-99-198-3833	Capacitor, fixed, 0.0248	C69
Z31/5910-99-198-3832	Capacitor, fixed, 0.027	C71
Z31/5910-99-198-3834	Capacitor, fixed, 0.0184	C72
Z /5960-99-037-2016	Valve, electronic, CV7040	D31, D32
Z /5960-99-037-2529	Valve, electronic, CV7188	VT86

Table 2005 - Unit E, spares schedule, Base repairs

Catalogue No	Designation	Function and cct ref
Z /5960-99-037-2161	Valve, electronic, CV7086	VT124
Z1/5940-99-945-1276	Insulator, set, transistor	
Y1/9905-99-942-9495	Plate, modification record	
Z /5940-99-012-0203	Terminal, lead-through, 1000V	
Z1/5820-99-198-3822	Panel, electronic circuit	
Z /5905-99-022-2130	Resistor, fixed, comp., 10k	R296
Z30/5905-99-022-1142	Resistor, fixed, comp., 180	R297
Z /5905-99-022-2048	Resistor, fixed, comp., 2.2k	R298
Z /5905-99-022-2046	Resistor, fixed, comp., 2.2k	R299
Z /5905-99-021-5440	Resistor, fixed, film, 150	R301
Z30/5905-99-198-3762	Resistor, variable, 500	RV46
Z1/5910-99-580-5739	Capacitor, fixed, 0.22	C161
Z31/5910-99-198-3766	Capacitor, fixed, 500	C162
Z42/5960-99-037-2898	Valve, electronic, CV5815	DZ36
Z /5960-99-037-3225	Valve, electronic, CV5930	DZ37
Z /5960-99-037-2403	Valve, electronic, CV5416	VT123, VT126

Table 2006 - Unit F, spares schedule, Base repairs

Catalogue No	Designation	Function and cct ref
Z1/9905-99-198-3790	Label	
Y1/9905-99-942-9495	Plate, modification record	
Z2/5305-99-198-3847	Ring, retaining	
Z1/5340-99-932-5186	Clamp, loop	
Z /5905-99-022-1025	Resistor, fixed, comp., 22	R404
Z /5905-99-011-3195	Resistor, fixed, wirewound, 1	R401, R402
Z /5905-99-011-3243	Resistor, fixed, wirewound, 330	R406
Z /5905-99-011-3265	Resistor, fixed, wirewound, 2.7k	R407
Z30/5905-99-011-3201	Resistor, fixed, wirewound, 3.3	R491, R492
Z /5905-99-022-1046	Resistor, fixed, comp., 33	R493
Z /5905-99-022-2037	Resistor, fixed, comp., 1.8k	R494
Z /5905-99-011-3259	Resistor, fixed, wirewound, 1.5k	R495, R496
Z42/5961-99-198-3845	Resistor, thermal	TH406
Z30/5905-99-193-3667	Resistor, thermal	TH407, TH408
Z1/5910-99-945-2238	Capacitor, fixed, 11	C449, C452
Z /5910-99-013-0513	Capacitor, fixed, 22	C450, C454
Z31/5910-99-198-3767	Capacitor, fixed, 100p	C453
Z1/5910-99-933-2296	Capacitor, fixed, 0.15	C455
Z37/5950-99-198-3733	Inductor r.f.	L436
Z /5960-99-037-2244	Valve, electronic CV7113	D447, D448, D449, D451, D452, D453, D454, D456, D457, D458, D459, D461, D467, D468, D469, D471.
Z /5960-99-037-2016	Valve, electronic CV7040	D462, D463, D464, D466, D472, D473, D474, D476.
Z30/5905-99-198-3844	Resistor, variable, 1k	RV401
Z /5960-99-037-2719	Valve, electronic, CV7312	D446
Z /5960-99-037-2629	Valve, electronic, CV7222	DZ426, DZ427
Z31/5910-99-198-3829	Capacitor, fixed, 16	C446, C447
Z31/5910-99-198-3830	Capacitor, fixed, 1000	C448
Z1/5970-99-914-8223	Insulator, bushing	
Z1/5940-99-945-1276	Insulator, set, transistor	
Z42/5960-99-198-3804	Heatsink	
Z37/5940-99-012-0202	Terminal, lead-through 1000V	
Z /5960-99-037-2161	Valve, electronic, CV7086	VT421, VT422
Z /5355-99-097-0258	Shaft, lock, electrical component	
Z37/5950-99-198-3733	Transformer assembly	
Z2/5330-99-198-3795	Washer, non-metalic	
Z2/5340-99-198-3782	Cleat assembly	
Z2/5340-99-198-3781	Cleat assembly	
Z2/5340-99-198-3783	Strap retaining	
Z1/5340-99-943-6899	Clamp, loop	
Z37/5940-99-198-3812	Terminal board assembly	
Z37/5940-99-198-3814	Terminal board assembly	
Z37/5940-99-198-3810	Terminal board assembly	

Table 2007 - Board A, spares schedule, Base repairs

Catalogue No	Designation	Function and cct ref
Z42/5961-99-198-3823	Transistor, wire-spacer	
Z42/5960-99-198-3824	Heatsink	
Z1/5910-99-933-2290	Capacitor, fixed, 0.022	C31
Z1/5910-99-933-2293	Capacitor, fixed, 0.068	C32
Z1/5910-99-933-2292	Capacitor, fixed, 0.033	C33
Z1/5910-99-945-2237	Capacitor, fixed, 0.1	C34, C42, C39
Z1/5910-99-580-5743	Capacitor, fixed, 0.47	C36
Z1/5910-99-933-2296	Capacitor, fixed, 0.15	C37
Z1/5910-99-519-4895	Capacitor, fixed, 0.33	C38, C41
Z1/5905-99-947-3665	Resistor, fixed, film, 6.8k	R127, R148, R156, R154, R147
Z1/5905-99-947-3662	Resistor, fixed, film, 3.3k	R128
Z1/5905-99-933-2320	Resistor, fixed, film, 100	R129
Z30/5905-99-933-2320	Resistor, fixed, film, 5.1k	R131
Z /5905-99-021-5400	Resistor, fixed, film 100	R132
Z /5905-99-021-6251	Resistor, fixed, film, 15k	R133
Z /5905-99-021-5860	Resistor, fixed, film, 8.2k	R134
Z /5905-99-021-5600	Resistor, fixed, film, 680	R136
Z /5905-99-021-6331	Resistor, fixed, film, 33k	R138
Z /5905-99-021-6231	Resistor, fixed, film, 12k	R139, R141
Z /5905-99-021-5800	Resistor, fixed, film, 4.7k	R142, R143
Z /5905-99-021-5870	Resistor, fixed, film, 9.1k	R137
Z1/5905-99-947-3666	Resistor, fixed, film, 10k	R149, R157
Z /5905-99-022-2172	Resistor, fixed, comp., 22k	R151, R152, R158, R159
Z30/5905-99-946-4659	Resistor, fixed, film, 5.6k	R153, R161
Z /5905-99-022-2088	Resistor, fixed, comp., 4.7k	R144
Z /5905-99-022-1100	Resistor, fixed, comp., 82	R146
Z30/5905-99-198-3846	Resistor, variable, 250	RV16
Z /5960-99-037-2529	Valve, electronic, CV7188	VT56, VT57, VT58, VT61, VT62, VT64, VT66, VT67, VT68
Z /5960-99-037-2965	Valve, electronic, CV7347	VT63
Z42/5960-99-037-2740	Valve, electronic, CV5792	VT59

Table 2008 - Board B, spares schedule, Base repairs

Catalogue No	Designation	Function and cct ref
Z /5905-99-021-5860	Resistor, fixed, film 8.2k	R171
Z /5905-99-021-5680	Resistor, fixed, film 1.5k	R173
Z /5905-99-021-5600	Resistor, fixed, film 680	R182
Z /5905-99-022-2214	Resistor, fixed, comp 47k	R186
Z /5905-99-022-2046	Resistor, fixed, comp 2.2k	R187
Z /5905-99-022-2130	Resistor, fixed, comp 10k	R188, R201
Z /5905-99-022-2088	Resistor, fixed, comp 4.7k	R189, R202
Z /5905-99-022-1109	Resistor, fixed, comp 100	R1881, R1988
Z /5905-99-022-2025	Resistor, fixed, comp 1.5k	R192
Z /5905-99-022-2004	Resistor, fixed, comp 1k	R193
Z /5905-99-021-5790	Resistor, fixed, film 4.3k	R194
Z /5905-99-021-6331	Resistor, fixed, film 33k	R196
Z /5905-99-022-2100	Resistor, fixed, comp 5.6k	R199
Z /5905-99-021-6291	Resistor, fixed, film 22k	R203
Z /5905-99-013-5900	Resistor, fixed, metal film 12k	R209
Z30/5905-99-198-3846	Resistor, variable, 250	RV21
Z31/5910-99-198-3825	Capacitor, fixed 0.015	C59
Z1/5910-99-945-2237	Capacitor, fixed, 0.1	C61
Z31/5910-99-198-3827	Capacitor, fixed 0.001	C62
Z37/5950-99-198-3755	Transformer	T6
Z /5960-99-037-2016	Valve, electronic, CV7040	D21, D22, D23, D24, D25, D26
Z /5960-99-037-2529	Valve, electronic, CV7188	VT73, VT74, VT76, VT77, VT78, VT79

Table 2009 - Board C, spares schedule, Base repairs

Catalogue No	Designation	Function and cct ref
Z42/5961-99-198-3823	Transistor, wire-spacer	
Z1/5910-99-103-2338	Capacitor, fixed, 0.33	C8
Z31/5910-99-198-3761	Capacitor, fixed, 4.7	C9
Z31/5910-99-198-3760	Capacitor, fixed, 22	C10
Z /5960-99-037-2016	Valve, electronic, CV7040	D1, D2, D3
Z /5960-99-037-2259	Valve, electronic, CV5308	DZ1
Z /5960-99-037-2203	Valve, electronic, CV7103	DZ4
Z /5905-99-012-5860	Resistor, fixed, film, 8.2k	R8
Z /5905-99-021-6251	Resistor, fixed, film, 15k	R9
Z /5905-99-022-2100	Resistor, fixed, comp., 5.6k	R11, R25
Z /5905-99-022-2046	Resistor, fixed, comp., 2.2k	R10, R12, R23, R28 R30, R34, R36, R37
Z /5905-99-022-2172	Resistor, fixed, comp., 22k	R13
Z /5905-99-022-2121	Resistor, fixed, comp., 8.2k	R14, R16, R24
Z /5905-99-022-3070	Resistor, fixed, comp., 180k	R17
Z /5905-99-022-2025	Resistor, fixed, comp., 1.5k	R18
Z /5905-99-022-2184	Resistor, fixed, comp., 27k	R19
Z /5905-99-022-2214	Resistor, fixed, comp, 47k	R21
Z /5905-99-022-1100	Resistor, fixed, comp., 82	R38
Z /5905-99-022-1214	Resistor, fixed, comp., 680	R26
Z /5905-99-022-2130	Resistor, fixed, comp., 10k	R27
Z /5905-99-022-1109	Resistor, fixed, comp., 100	R29
Z /5905-99-022-2152	Resistor, fixed, comp., 15k	R15
Z /5905-99-021-5720	Resistor, fixed, film, 2.2k	R31, R32
Z /5905-99-021-5740	Resistor, fixed, film, 2.7k	R33
Z30/5905-99-198-3759	Resistor, fixed, wirewound, 100	R35
Z /5905-99-011-3219	Resistor, fixed, wirewound, 33	R39
Z /5905-99-011-3227	Resistor, fixed, wirewound, 68	R40
Z37/5950-99-198-3756	Transformer	T1
Z /5960-99-037-2529	Valve, electronic, CV7188	VT1, VT2, VT3, VT4 VT9, VT13, VT14
Z42/5960-99-037-2740	Valve, electronic, CV5792	VT6, VT7
Z /5960-99-037-2028	Valve, electronic, CV7044	VT8
Z /5960-99-037-2965	Valve, electronic, CV7347	VT15, VT16, VT17, VT18
Z /5960-99-037-3883	Valve, electronic CV8613	VT12

Table 2010 - Board D, spares schedule, Base repairs

Catalogue No	Designation	Function and cct ref
Z42/5961-99-198-3798	Transister, wire spacer	
Z31/5910-99-198-3760	Capacitor, fixed, 22	C146
Z31/5910-99-198-3828	Capacitor, fixed, 470p	C131
Z31/5910-99-198-3827	Capacitor, fixed, 0.001	C133, C134
Z31/5910-99-198-3835	Capacitor, fixed, 0.68	C136
Z1/5910-99-945-2237	Capacitor, fixed, 0.1	C137, C141, C142, C144
Z31/5910-99-198-3773	Capacitor, fixed, 0.01	C179, C180
Z37/5950-99-198-3757	Inductor, radio, frequency	L31
Z /5960-99-037-2016	Valve, electronic, CV7040	D41, D42
Z /5960-99-037-2259	Valve, electronic, CV5308	DZ3
Z /5905-99-022-1046	Resistor, fixed, comp., 33	R261
Z /5905-99-022-1226	Resistor, fixed, comp., 820	R262
Z /5905-99-022-2130	Resistor, fixed, comp., 10k	R264, R265, R278
Z /5905-99-022-2100	Resistor, fixed, comp., 5.6k	R266, R272, R279
Z//5905-99-022-2172	Resistor, fixed, comp., 22k	R267, R268, R269, R273
Z/5905-99-011-3203	Resistor, fixed, wirewound, 4.7	R260
Z /5905-99-022-2004	Resistor, fixed, comp., 1k	R271, R282
Z /5905-99-022-3028	Resistor, fixed, comp., 82k	R274
Z /5905-99-022-1184	Resistor, fixed, comp., 390	R276
Z /5905-99-022-1214	Resistor, fixed, comp., 680	R277
Z /5905-99-022-2037	Resistor, fixed, comp., 1.8k	R281
Z /5905-99-022-2046	Resistor, fixed, comp., 2.2k	R283
Z /5905-99-022-1193	Resistor, fixed, comp., 470	R284
Z /5905-99-022-2121	Resistor, fixed, comp., 8.2k	R286
Z /5905-99-022-1079	Resistor, fixed, comp., 56	R287
Z30/5905-99-022-1151	Resistor, fixed, comp., 220	R288
Z /5905-99-022-1172	Resistor, fixed, comp., 330	R289
Z30/5905-99-198-3763	Resistor, variable 1k	RV41
Z37/5950-99-198-3752	Transformer	T14, T16
Z /5960-99-037-2529	Valve, electronic, CV7188	VT106, VT107, VT108, VT109
Z /5960-99-037-3186	Valve, electronic, CV5974	VT111
Z /5960-99-037-2003	Valve, electronic, CV7003	VT112, VT113, VT114
Z1/5910-99-013-0513	Capacitor, fixed, 1	C132
Z1/5910-99-945-2240	Capacitor, fixed, 0.012	C138, C139
Z31/5910-99-198-3826	Capacitor, fixed, 680p	C143
^Z1/5910-99-945-2237	Capacitor, fixed, 0.1	C145

Table 2011 - Board E, spares schedule, Base repairs

Catalogue No	Designation	Function and cct ref
Z42/5961-99-198-3823	Transistor, wire-spacer	
Z31/5910-99-198-3772	Capacitor, fixed, 0.047	C21, C22
Z31/5910-99-198-3760	Capacitor, fixed, 22	C23, C24
Z /5960-99-037-2016	Valve electronic, CV7040	D6, D7, D8, D9, D11 D12, D13, D14
Z /5960-99-037-2201	Valve, electronic, CV7107	DZ16, DZ18
Z /5960-99-037-2204	Valve, electronic, CV7104	DZ17, DZ19
Z /5905-99-022-1100	Resistor, fixed, comp., 82	R76, R84, R97
Z /5905-99-022-2016	Resistor, fixed, comp., 1.2k	R77, R86
Z /5905-99-022-1172	Resistor, fixed, comp., 330	R78, R82, R87, R91
Z /5905-99-022-2058	Resistor, fixed, comp., 2.7k	R79, R81, R83, R88, R89, R92
Z /5905-99-022-2037	Resistor, fixed, comp., 1.8k	R93, R96
Z /5905-99-021-5775	Resistor, fixed, film, 3.9k	R99, R121
Z /5905-99-022-2100	Resistor, fixed, comp., 5.6k	R102, R117
Z /5905-99-022-2142	Resistor, fixed, comp., 12k	R106, R108
Z /5905-99-022-2205	Resistor, fixed, comp., 39k	R104, R109
Z /5905-99-022-2109	Resistor, fixed, comp., 6.8k	R112, R107
Z /5905-99-011-3252	Resistor, fixed, wirewound, 750	R116
Z /5905-99-011-3241	Resistor, fixed, wirewound, 270	R118
Z /5905-99-021-5835	Resistor, fixed, film 6.8k	R119
Z /5905-99-022-3121	Resistor, fixed, comp 470k	R122, R123
Z /5905-99-021-6226	Resistor, fixed, film 12k	R106, R111
Z31/5910-99-198-3841	Resistor, fixed, film 5.6k	R102, R113
Z1/5905-99-955-6411	Resistor, fixed, film 2.7k	R114
Z30/5905-99-198-3763	Resistor, variable 1k	RV11, RV12
Z30/5905-99-198-3792	Resistor, thermal	TH1, TH2
Z /5960-99-037-2965	Valve, electronic, CV7374	VT36, VT39, VT43
Z /5960-99-037-2529	Valve, electronic, CV7188	VT37, VT38, VT41, VT42, VT44, VT47, VT49, VT51
Z42/5960-99-037-2740	Valve, electronic, CV5792	VT46, VT48

Table 2012 - Board F, spares schedule, Base repairs

Catalogue No	Designation	Function and cct ref
Z31/5910-99-198-3760	Capacitor, fixed, 22	C87
Z1/5910-99-945-2238	Capacitor, fixed, 1	C83
Z1/5910-99-945-2237	Capacitor, fixed, 0.1	C88
Z1/5910-99-945-2240	Capacitor, fixed, 0.012	C93
Z1/5905-99-022-2016	Resistor, fixed, comp., 1.2k	R239
Z /5905-99-022-2046	Resistor, fixed, comp., 2.2k	R249
Z /5905-99-022-2025	Resistor, fixed, comp., 1.5k	R241
Z /5905-99-022-2130	Resistor, fixed, comp., 10k	R237, R242, R251
Z /5905-99-022-2193	Resistor, fixed, comp., 33k	R238, R246
Z /5905-99-022-1193	Resistor, fixed, comp., 470	R248
Z /5905-99-022-2004	Resistor, fixed, comp., 1k	R257
Z /5905-99-022-2121	Resistor, fixed, comp., 8.2k	R244
Z /5960-99-037-2529	Valve, electronic, CV7188	VT93, VT96, VT97, VT99

Table 2013 - Board G, spares schedule, Base repairs

Catalogue	Designation	Function and cct ref
Z1/5910-99-945-2237	Capacitor, fixed, 0.1	C11
Z1/5910-99-945-2239	Capacitor, fixed, 0.01	C12
Z1/5910-99-933-0979	Capacitor, fixed, 0.047	C13
Z1/5910-99-104-7233	Capacitor, fixed, 0.0047	C14
Z1/5910-99-945-2238	Capacitor, fixed, 1	C16
Z31/5910-99-198-3826	Capacitor, fixed, 0.0068	C17
Z /5905-99-021-6206	Resistor, fixed, film 10k	R41, R42
Z /5905-99-022-1100	Resistor, fixed, comp., 82	R45
Z /5905-99-021-5580	Resistor, fixed, film 560	R48, R49
Z /5905-99-022-2046	Resistor, fixed, comp., 2.2k	R43, R44, R46, R47, R69, R71, R68
Z /5905-99-021-6311	Resistor, fixed, film 27k	R53, R57
Z /5905-99-022-2067	Resistor, fixed, comp., 3.3k	R50
Z /5905-99-021-6231	Resistor, fixed, film 12k	R56, R58
Z /5905-99-021-6251	Resistor, fixed, film 15k	R54, R59, R63
Z /5905-99-021-5860	Resistor, fixed, film, 8.2k	R61
Z /5905-99-021-5560	Resistor, fixed, film 470	R62 69
Z /5905-99-022-1184	Resistor, fixed, comp 390	R67
Z /5905-99-021-5720	Resistor, fixed, film 2.2k	R64
Z /5905-99-021-5400	Resistor, fixed, film 100	R66
Z /5905-99-021-5760	Resistor, fixed, film 3.3k	R51, R52
Z /5905-99-022-1067	Resistor, fixed, comp., 47	R70
Z /5905-99-021-5740	Resistor, fixed, film 2.7k	R55
Z30/5905-99-198-3763	Resistor, variable, 1k	RV6
Z30/5905-99-198-3765	Resistor, variable, 10k	RV7, RV8
Z30/5905-99-198-3764	Resistor, variable, 2.5k	RV9
Z30/5905-99-198-3846	Resistor, variable, 250	RV10
Z42/5960-99-037-2740	Valve, electronic, CV5792	VT21, VT22, VT27
Z /5960-99-037-2529	Valve, electronic, CV7188	VT23, VT24, VT26, VT28, VT29, VT31
Z42/5961-99-198-3823	Transistor, wire-spacer	

END

RADIO TELEGRAPH ADAPTOR NO 1 AND NO 2

FORWARD CODING

Note: The following list of Assembly Codes must be used in conjunction with EMER Mgmt J 021 Part 4.

Assembly Code	Designation
0001	Radio telegraph adaptor No 1 or No 2
0002	Discriminator (Unit A)
0003	Low-pass filter (Unit B)
0004	Band-pass filter (Unit C)
0005	Band-pass filter (Unit D)
0006	Stabilizer(Unit E)
0007	DC/DC Converter (Unit F1)
0008	AC/DC Converter (Unit F2)
0009	P.W. board assy A
0010	P.W. board assy B
0011	P.W. board assy C
0012	P.W. board assy D
0013	P.W. board assy E
0014	P.W. board assy F
0015	P.W. board assy G
0016	Unit H and front panel assy

6-502 (Data Centre)
EME/8e/2528/Tels

END

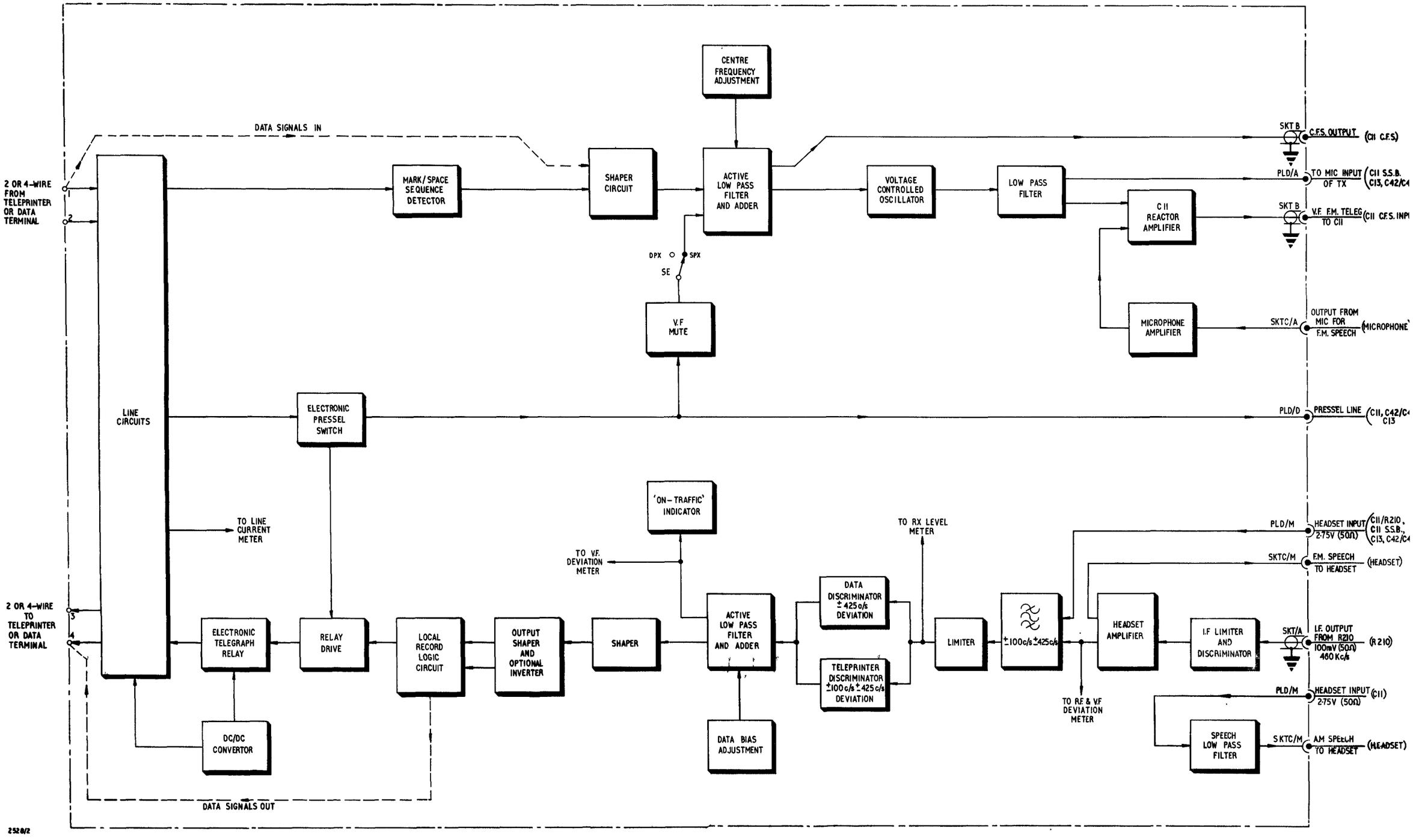


Fig 2001 - Block diagram of radio telegraph adaptor No 1 and No 2

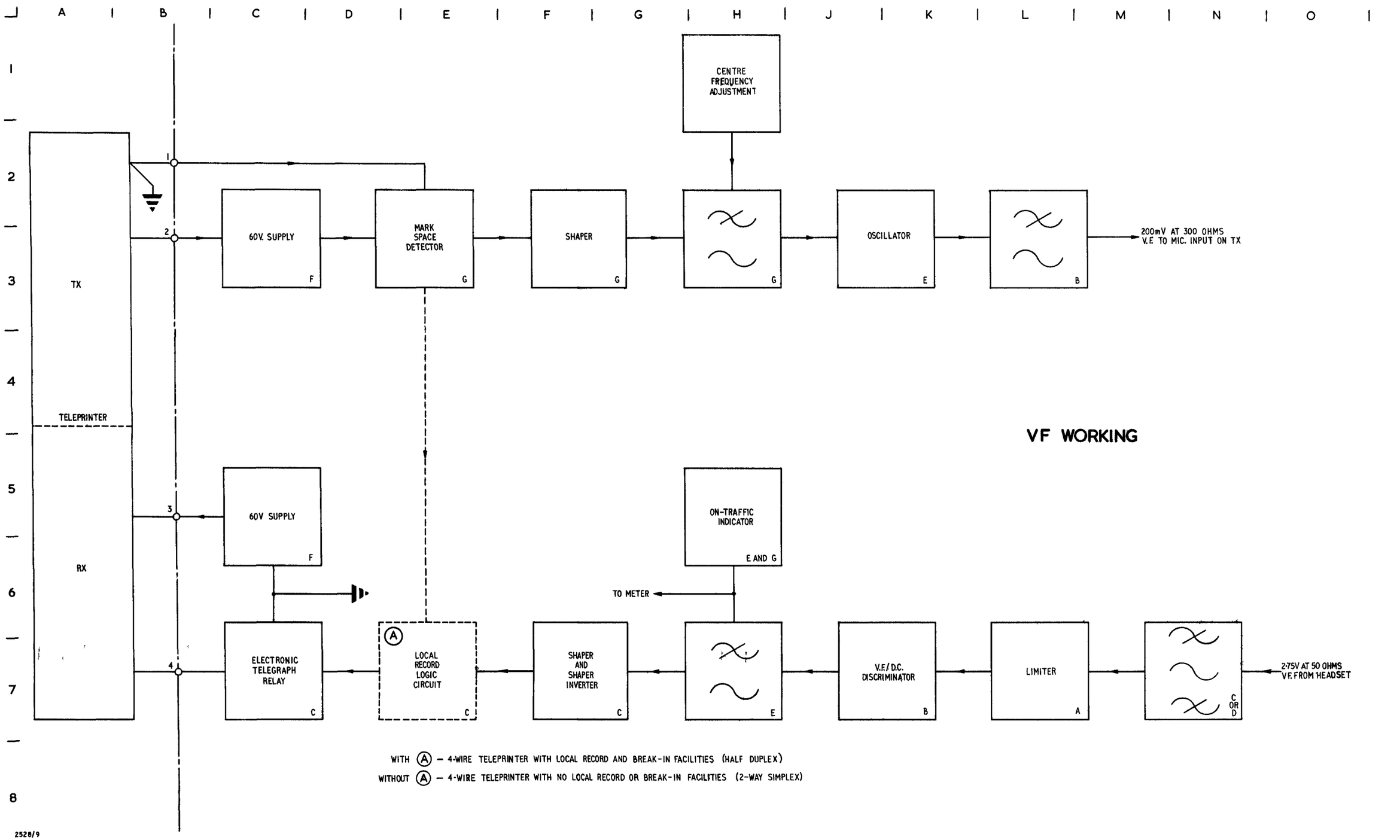


Fig 2002 - Block diagram of adaptor operating in 4-wire teleprinter modes

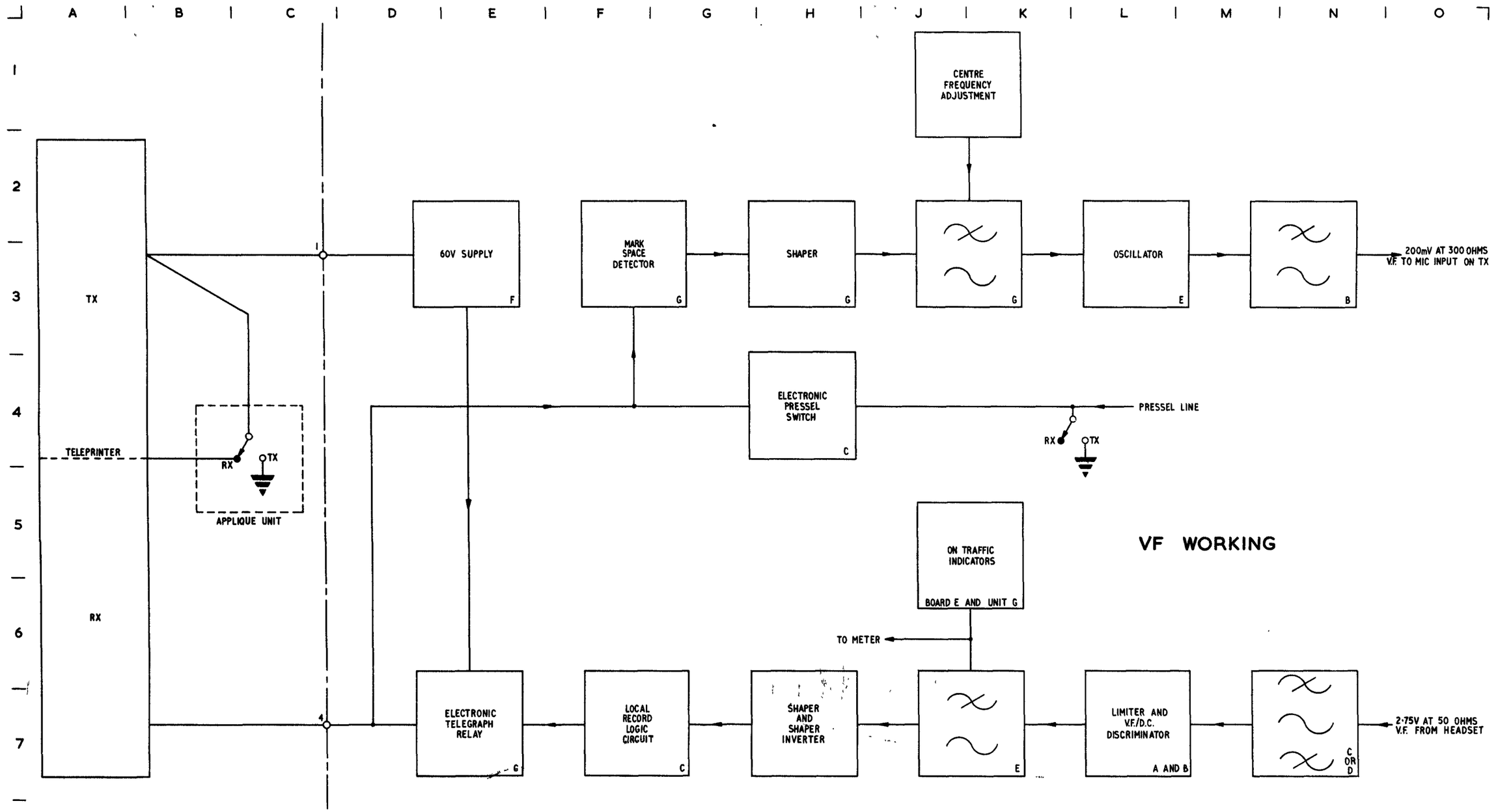


Fig 2003 - Block diagram of adaptor operating in 2-wire teleprinter (Simplex) mode

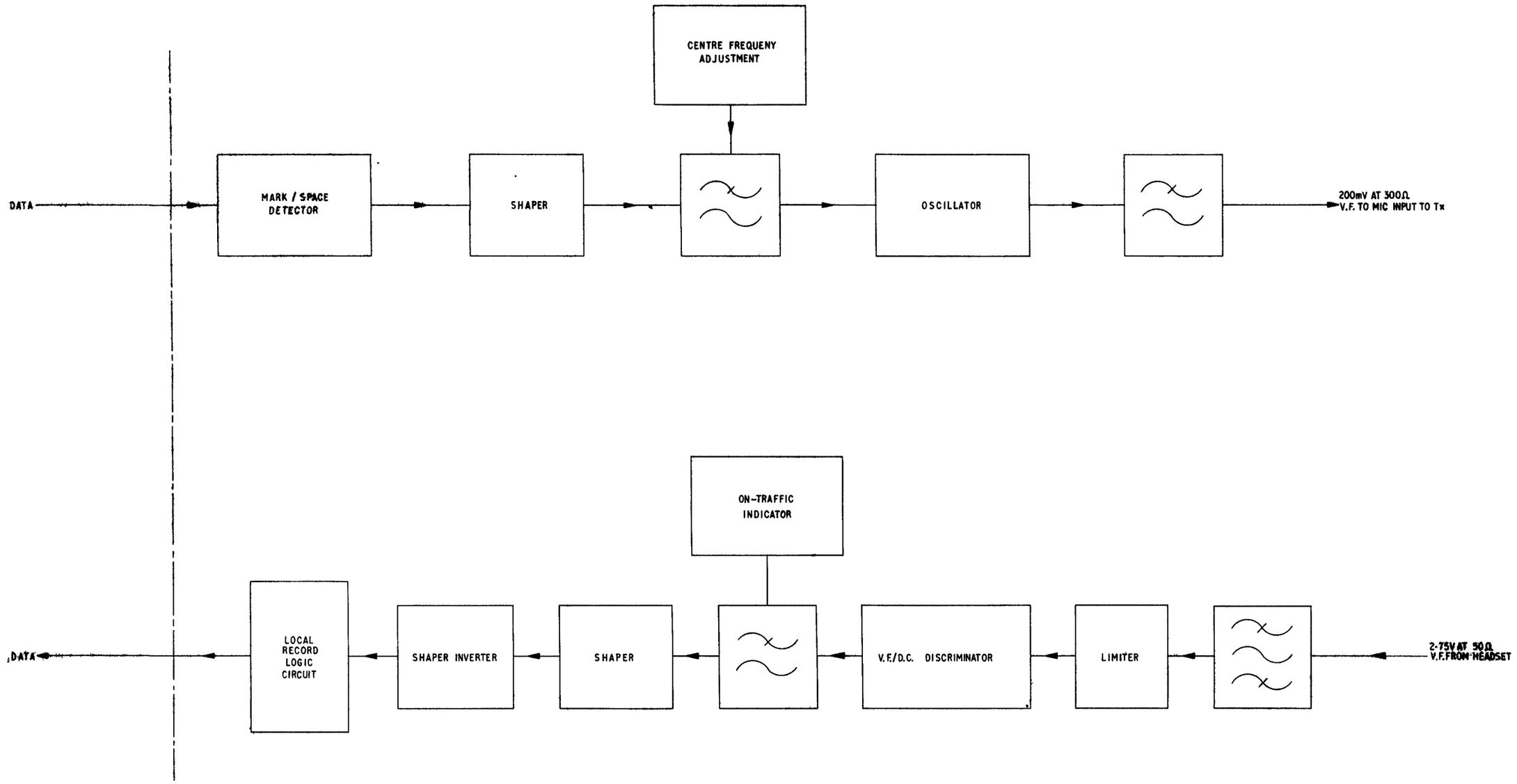


Fig 2004 - Date operation

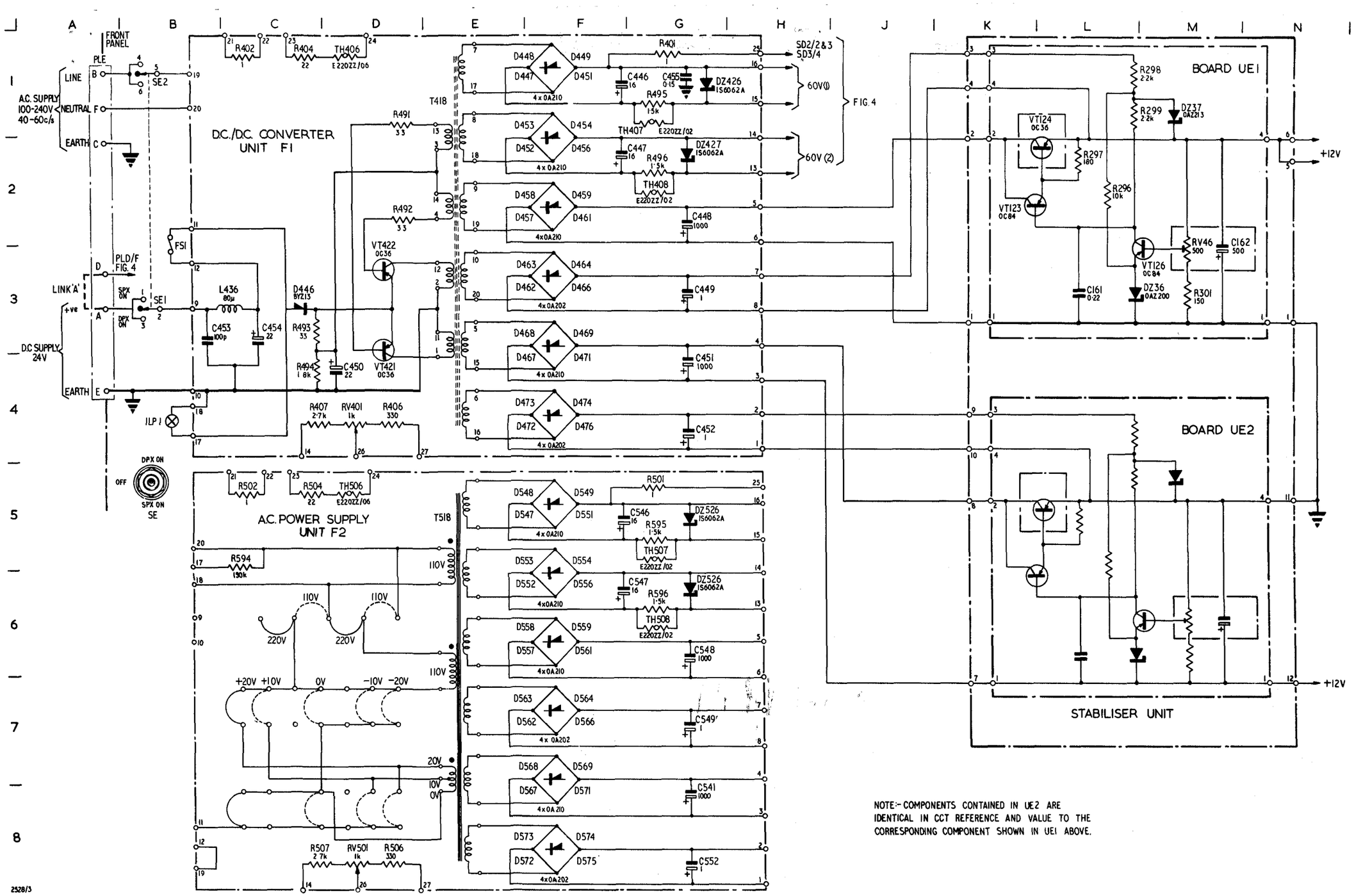


Fig 2005 - Circuit diagram of power supplies (a.c./d.c.)

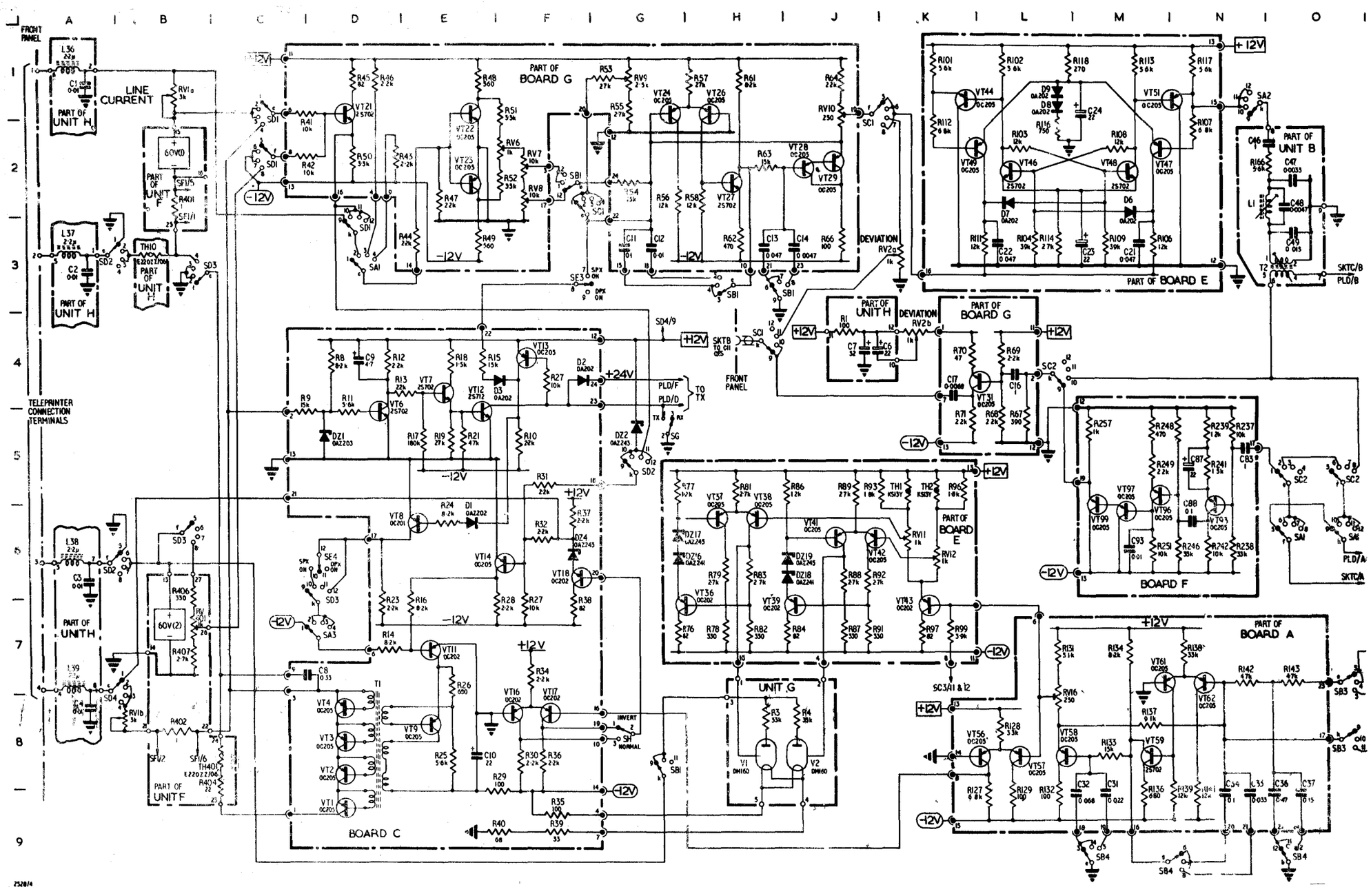
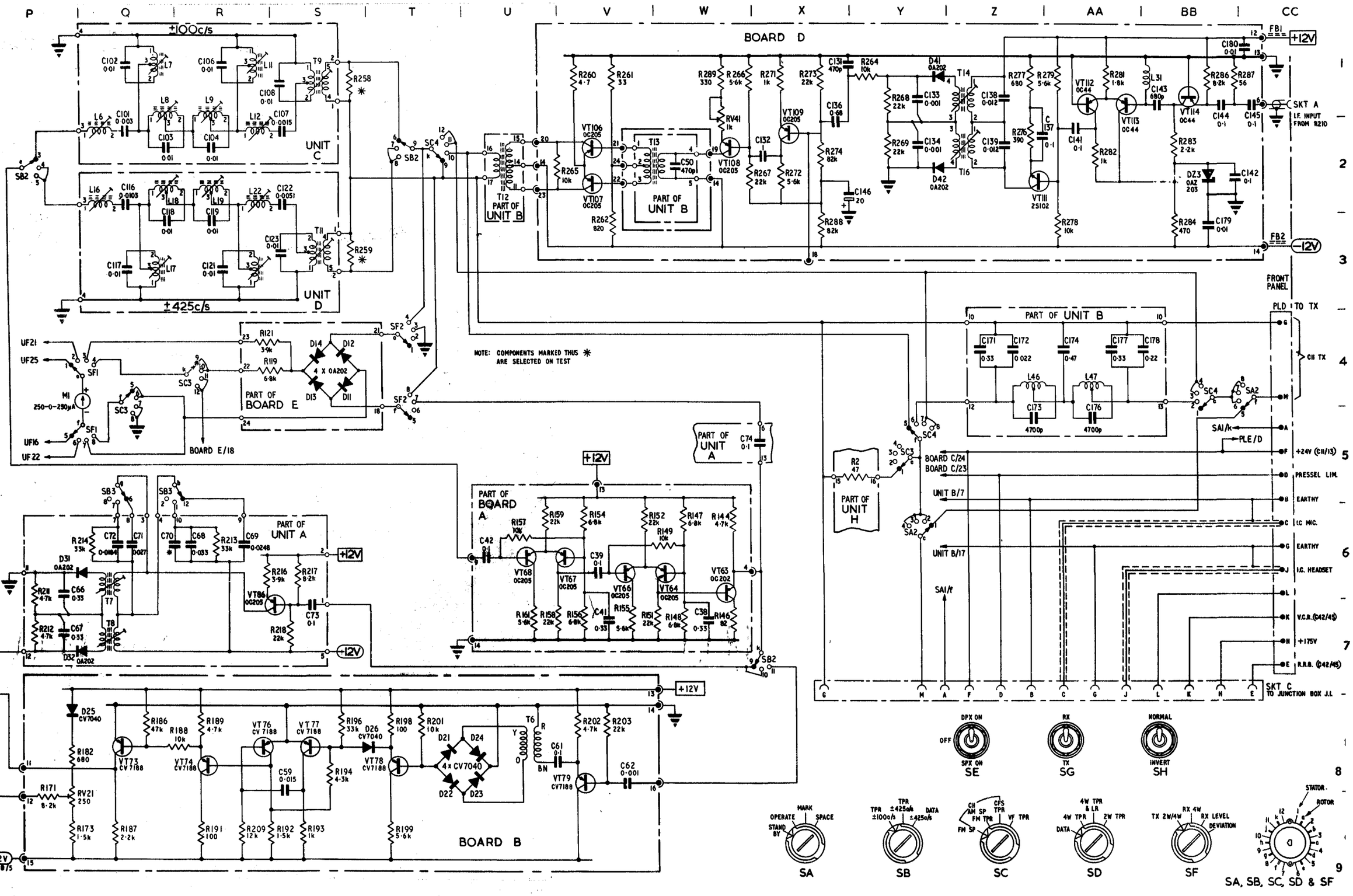


Fig 2006 - Circuit diagram (a)
Fig 2006
Page 1006


BOARD D
UNIT C
UNIT D
±100c/s
±425c/s
PART OF UNIT B
PART OF BOARD E
BOARD E/18
PART OF UNIT A
PART OF BOARD A
PART OF UNIT H
BOARD B
NOTE: COMPONENTS MARKED THUS * ARE SELECTED ON TEST
+12V
-12V
FB1
FB2
SKT A
I.F. INPUT FROM R210
FRONT PANEL
PLD
TO TX
CII TX
SAI/k
PLE/D
+24V (CII/13)
PRESSEL LIM.
EARTHY
I.C. MIC.
EARTHY
I.C. HEADSET
SAI/f
V.C.R.(C42/45)
+175V
R.R.B. (C42/45)
BOARD C/24
BOARD C/23
UNIT B/7
UNIT B/17
SKT C
TO JUNCTION BOX J.1.
DPX ON
OFF
SPX ON
SE
RX
TX
SG
NORMAL
INVERT
SH
MARK
OPERATE
SPACE
STAND BY
SA
TPR ±100c/s
DATA ±425c/s
SB
CH AM SP
CFS TPR
FM TPR
VF TPR
FM SP
SC
4W TPR & LR
4W TPR
2W TPR
DATA
SD
RX 4W
TX 2W/4W
RX LEVEL DEVIATION
SF
STATOR
ROTOR
SA, SB, SC, SD & SF