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.

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.

Printing the document on A4 paper

You should note first that virtually all original documents are in double-sided format, i.e. printed on both sides of the paper. Accordingly, our copies are similarly double-sided., and the best results are obtained if the document is printed double-sided. You can print out on one side only, but you will find that you get a number of blank sheets (which can just be removed and reused), and where margins vary in width between left-hand and right-hand pages, there is a danger of the text disappearing into the binding of your printed copy.

This document is of fairly simple format in that it can be made to print out using an A4 format printer (this is the common paper size available in UK and Europe, which measures 29.7cm by 21.0cm). By "simple" I mean that there are no large diagrams on fold out sheets, which will require multiple A4 pages to print out at full size.

Original document sizes do vary a lot – from the small manuals, which approximate to A5 size (21.0 x 14.8 cm) up to the now obsolete foolscap size (21.6 x 33.0 cm). US documents tend to use their "letter" size paper (21.6 x 27.9 cm). All these sizes can be printed on A4 paper by simply getting Acrobat to shrink or enlarge the pages as necessary. This is done as follows:

1. Select "File – Print" or click on the printer icon. This will bring up the print dialog box.
2. Select the correct printer if necessary.
3. Select the pages you want to print – even if you want to print all of the document, you will probably not want to print this notice and help page, so start the printing at page 3.
4. 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 4).

Any other problems?

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

Richard Hankins, VMARS Archivist, Summer 2004

UK/PRC-316

TECHNICAL HANDBOOK - TECHNICAL DESCRIPTION

This EMER must be read in conjunction with Tels F 202 Part 2 which contains figures and tables to which reference is made.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Role and purpose

1. UK/PRC316 comprises the RT316 and its associated station items. RT316 is a lightweight h.f. manpack transmitter/receiver for use by infantry and special forces employed in an infantry role in counter-insurgency operations in forward areas in all theatres under primitive conditions subject to rough handling. The set is designed primarily for use at the halt, using a simple type of antenna.

2. Two sets, types A and B, are in service, but they differ only in their operating frequencies. The types are identified by a label on the key. Other types may be employed at a later date:- if so, details of their frequencies will be added.

Main parameters

3. a. Operational Range: Key - skywave day and night - several hundred miles.

Voice - skywave under favourable conditions - several hundred miles.

Groundwave - short range for ground to air working.

Climatic: operational - 10°C to +55°C, 100% r.h.
storage - 40°C to +65°C, 100% r.h.

b. Physical: 7.9 in x 4.4 in x 3.5 in., weight - 4lb 14 oz.

c. Electrical: Basic frequencies (MHz)

Type A	Type B
2.215	2.290
2.520	2.700
3.170	3.280
3.710	3.710
4.590	4.510
4.875	4.875
5.130	5.305
5.270	6.350
5.895	6.940

The set can be operated on the basic frequency or on this frequency offset by ±1.3kHz or ±2.5kHz giving 45 channels on each set.

Intermediate frequencies: 8MHz and 455kHz.
(either type)

Bandwidth: **Wide:** 6kHz for operation to equipment having less stable and accurate transmitted frequency

Narrow: 300Hz.

Sensitivity: Input for $\frac{S + N}{N}$ of 10dB.- - - Voice - - - - - 4.5μV
c.w.wide - - - 1.7μV
c.w.narrow - - 0.45μV

Power output: 3 watts p.e.p. on both key and voice into either a 50Ω or 100Ω antenna system.

d. Power supplies: (1) Battery dry 12V 1.6Ah (Manganese alkaline) Y3/6135-99-106-1769 - Life - approx 20 hrs.

(2) Battery dry 15V (Leclanche) Y3/6135-99-106-3304 Life - approx 10 hrs.

(3) Any d.c. source from 10-16.5V with the aid of Remote battery adaptor (a protection device).

e. Scaling: Components are provided only for those repairable sub units listed in para 7 to 9.

Identification data

4. The sub-units are identified by a letter (or letter and figure where further sub divided), which in most cases is on the printed circuit board (p.c.b). This identification is listed below and will be found on Fig 2501. Individual components on these boards will be prefixed by the appropriate letter e.g. F1R1 is R1 on board F1, A1ML1 is module ML1 on board A1.

A	Tuned r.f. amplifier assembly
A1	Tuned r.f. amplifier p.c.b.
A2	Terminal trough
B	Second mixer p.c.b.
C	I.F. assembly
C1	1st i.f. stage and detector p.c.b.
C2	2nd to 4th stage p.c.b.
D	Offset unit
D1	455kHz and offset oscillator p.c.b.
D2	L.O. distribution p.c.b.
D3	Voltage generator p.c.b.
E	Receiver a.f. p.c.b.
F	Transmitter assembly
F1	Driver p.c.b.
F2	P.A. assembly
F3	Metering and a.l.c. board
F4	Antenna changeover p.c.b.
G	Control panel assembly
H1	Chassis
H2	Battery box assembly
J	Crystal cassette
J1	Oscillator p.c.b.

Testing and repair facilities

5. Test points are identified by red or yellow circles round pins on the p.c.b. Other pins are used for interconnection. Owing to space limitations, only a minority of test points and pins bear an identification number. Fig 2501 and 2502 shows the interconnecting points between boards but their location must be identified from the drawings of individual units and boards.

6. Test kit, RT316 (Z4/6625-99-193-3720) is provided at Field and Base workshops. This kit enables the necessary test equipment to be connected to a set under test so that the correct test conditions can be set up easily. A jig is included which allows the set to be worked on in an open condition. Details of the kit will be found in EMER Tels M 360-369.

7. The following sub-units are to be replaced at Field level and sent back for repair:

A, C, D, F1, F2, J.

a. Sub-unit C is to be repaired at Base by replacing faulty boards C1, C2 or external components, faulty items being then discarded.

b. Sub-unit D is to be repaired at Base by replacing faulty boards D1, D2, D3, external components or crystals, faulty items being then discarded.

c. Sub-unit J is to be repaired at Base by replacing faulty board J1, external components or crystals, faulty items being then discarded.

8. The following items when faulty are to be replaced at Field level and discarded:

sub-units B, F3, F4 and components on front panel, sockets, meter etc.

9. Board E is to be replaced at Field level when faulty and discarded unless only the switching diodes are faulty. These may be replaced at Field level.

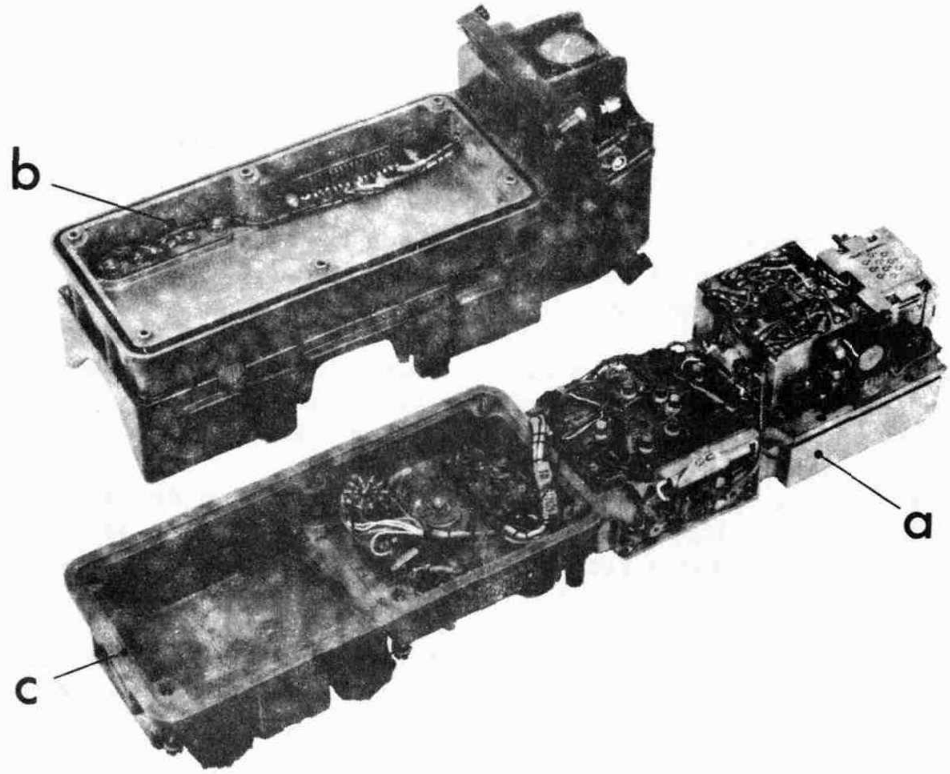


Fig 1 - Arrangement of units

BRIEF DESCRIPTION

Construction

(Fig 1)

10. The RT316 consists of three units:

a. A chassis assembly on which is mounted the receiver circuits and circuits common to the receiver and transmitter.

b. A fabricated light alloy battery housing, at one end of which is a sealed cast alloy case housing the transmitter, the meter and antennae connections.

c. A moulded thermoplastic - resin control panel which houses the controls, the key and the audio sockets. The panel is plated to provide a continuous r.f. screen.

11. Unit a. plugs in to unit b. by means of a 16 way plug and socket. Unit C (connected to unit a. by a cableform) then fits over the top of this assembly and is bolted to unit b. The battery is secured by clips underneath the set.

Ancillaries

12. A dipole antenna is provided which is adjustable in length to suit the basic frequency of the channel in use. The halves of the dipole are secured directly to terminals on the radio and the use of insulated wire allows the antenna to function when draped over wet vegetation. A throwing cord is provided with each half of the antenna so that the remote ends can be raised in trees. Each half of the antenna and its throwing cord are wound on a reel.

13. The headset normally used has a single magnetic transducer and a pressel switch. It thus acts as both microphone and receiver as required. It is hand held but for continuous listening, an adjustable headband is provided.

14. For base station use, a headset with a boom microphone is used. This, together with a remote battery adaptor and connector for connecting any 12V (nominal) source to the set and a co-axial cable for connecting a dipole remotely are supplied in an ancillary kit as required.

15. An adaptor can be fitted in place of the battery (the battery being placed then underneath the adaptor) to transmit high speed morse (300 w.p.m.) with suitable equipment.

Outline of working

16. The receiver (Fig 2) is a double superhet having a first i.f. of approx 8MHz dependent on the offset channel selected, and a second i.f. of 455kHz. Two r.f. amplifiers are used, low band for operation on channels between 2 and 3.75MHz and high band for channels between 3.75 and 7MHz. After amplification, the signal is fed, together with an output (LO1) from one of the basic channel crystals, to the first mixer to produce a first i.f. output at approx 8MHz. This output is fed, together with an output (LO2) from one of the offset crystals, to the second mixer to produce a second i.f. output at 455kHz.

17. On KEY, the second i.f. signal is routed through a narrow band filter (300Hz wide) and on BATT or VOICE through a wide band filter (6kHz wide) to the i.f. amplifier. After amplification, the signal is detected and passed via an a.f. amplifier to the phones.

18. On c.w. operation, at KEY or BATT, the output from a 456kHz crystal oscillator is fed into the detector to beat with the 455kHz signal to produce a 1kHz beat note in the phones.

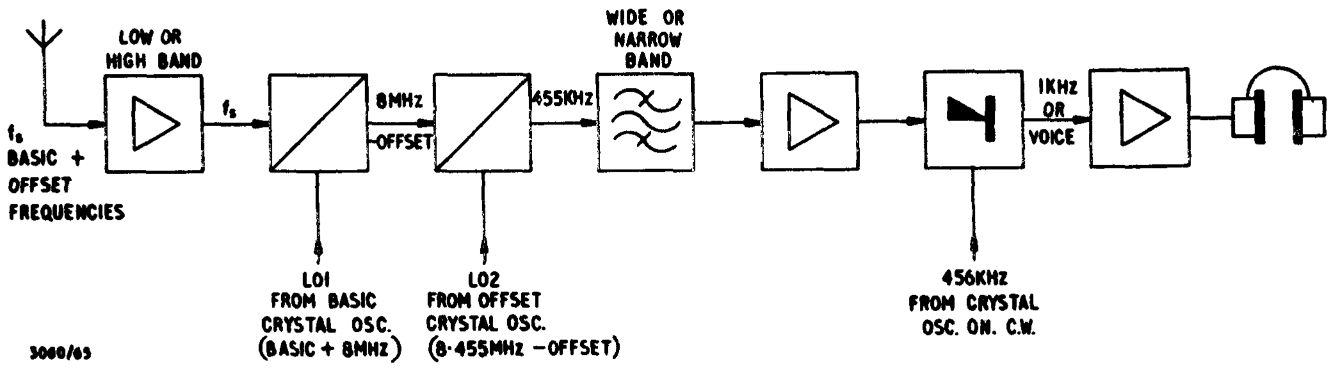


Fig 2 - Receiver block diagram

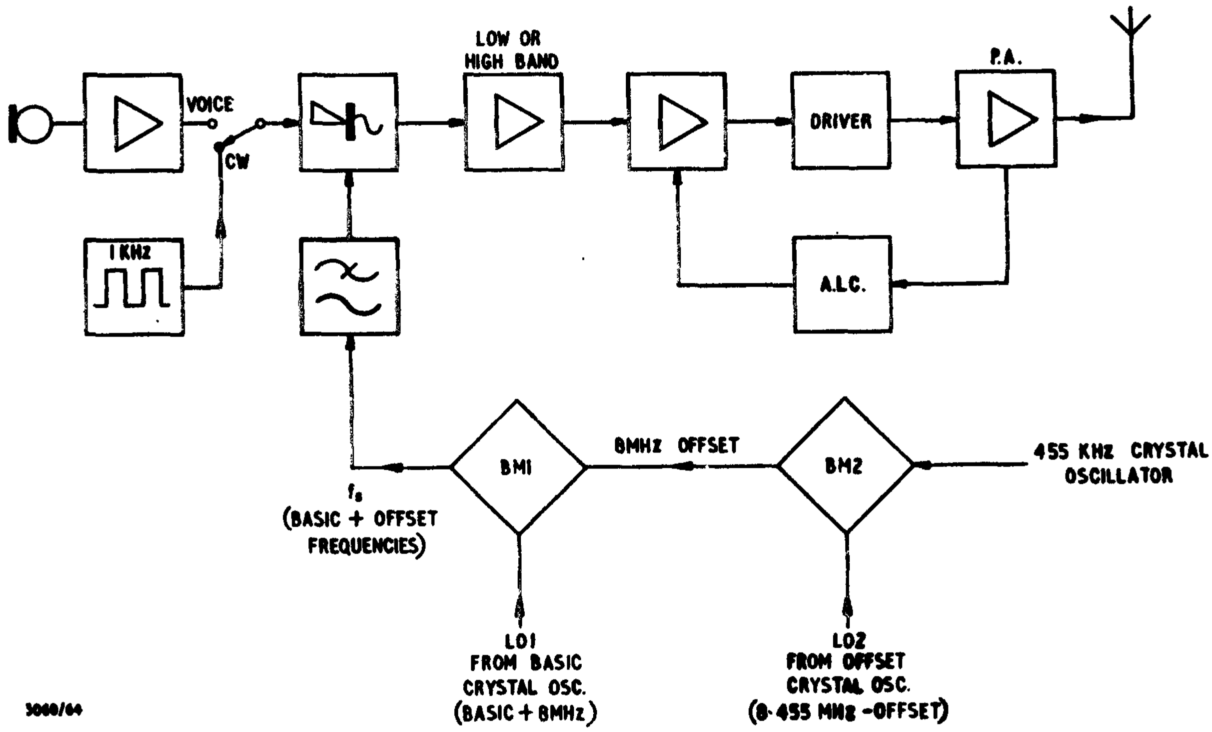


Fig 3 - Transmitter block diagram

19. On transmit (Fig 3), the mixing process is reversed. A 455kHz crystal oscillator signal is mixed with the output from one of the offset oscillators to produce the first i.f. The actual frequency produced is dependent on the offset selected but lies in the range 8MHz ±2.5kHz. This i.f. is then fed together with the LO1 signal from the basic channel oscillator to a balanced mixer to produce the signal frequency f_s. The i.f. and unwanted mixing products are removed by passing the signal through a low pass filter and the receiver r.f. amplifier (via the modulator) before amplification in the transmitter, a wide band amplifier with no tuning controls, consisting of a class A amplifier, a phase splitter, two drivers and a push-pull output stage.

20. On VOICE, modulation takes place between the low pass filter and the receiver r.f. amplifier in the low level collector modulated stage. Audio output from the microphone is fed to the modulator after amplification and clipping in the microphone amplifier. Sidetone is obtained by feeding a portion of the microphone amplifier output to the receive a.f. amplifier when headset and microphone are used.

21. On c.w. (BATT and KEY) the microphone amplifier is switched off, sidetone being obtained from a keyed 1kHz multivibrator feeding the receiver a.f. amplifier.

Controls

22. The front panel controls are shown in Fig 4 and details are given in Table 1.

Table 1 - Front panel controls

Item	Function	
System switch SC	OFF.	Battery disconnected.
	KEY	This position provides c.w. narrow band (300Hz) reception and is used when working with another RT-316 or with SRC14, C15 or D11 or other radios of high frequency stability and accuracy. A 1kHz ±300Hz beat note is heard on an accurately tuned received signal. A 1kHz sidetone is heard and the meter reads antenna current when the key is depressed.
	BATT	This position provides c.w. wide band (6kHz) reception and may be used with radios having frequency stability similar to SRA13, C11, C13 or A510 should it be impossible to receive signals from these sets within the narrow band available in the KEY position. Though communication will be inferior to that in the KEY position. The meter reads battery voltage on transmit or receive on a non-linear scale. Three marks are indicated. The intermediate one is 10 volts and a reading less than this on transmit indicates a spent battery. A 1kHz beat note is heard on an accurate received signal and a 1kHz sidetone is heard when the key is depressed.

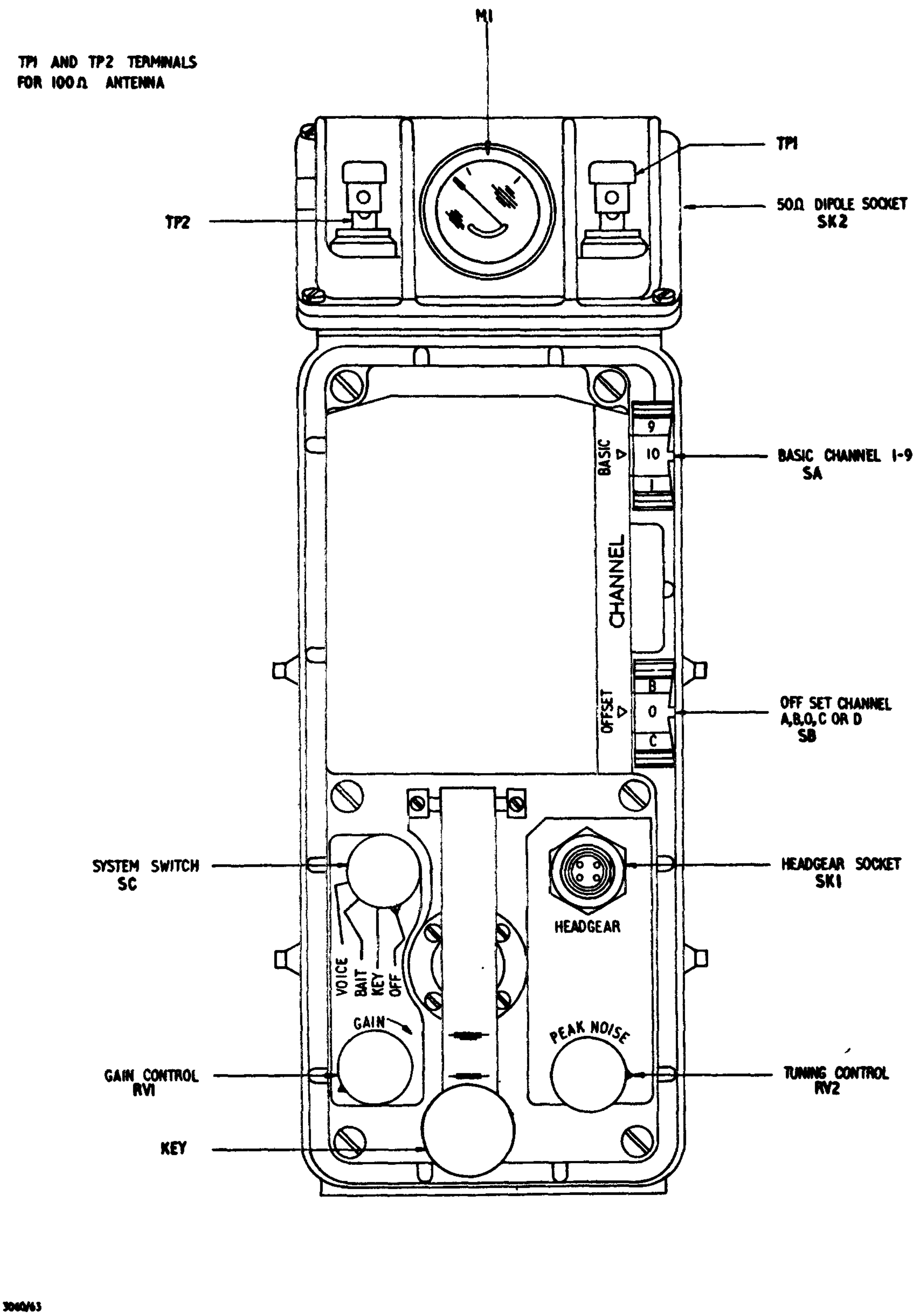


Fig 4 - Front panel controls

Table 1 - (cont)

Item	Function
	VOICE — This position provides double sideband a.m. voice operation with a 6kHz transmitted and received bandwidth, when working with another RT-316, with SRC14, C15, D11, A13, C11, C13, or A510 or with certain airborne radios. Transmission is made by either depressing the key or the pressel on the headgear where it exists. Sidetone comes from microphone to phones via an amplifier.
PEAK NOISE RV2	This controls tunes circuits which are common to both receiver and transmitter. The correct tuning is indicated on receiver, by maximum noise in the headgear. With the correct antenna connected, tuning should be carried out with the GAIN control turned down to the minimum acceptable receiver level.
GAIN RV1	This control enables the loudness and clarity of the received signal to be adjusted. It varies the overall gain of the receiver and needs careful setting as automatic gain control is not provided in the receiver.
BASIC CHANNEL SA 1-9	This switch selects the appropriate crystal for the required channel.
OFFSET CHANNEL SB	This switch selects the crystal for the required offset frequency A, B, O, C or D.

DETAILED DESCRIPTION

Note: Designations in brackets denote module identification as para 4.

Receiver

(Fig 2501 and 2502)

23. The signal of frequency f_s + (f offset) is fed in either from the 100Ω dipole direct on TP1 and 2 or from the 50Ω sockets SK2 when an 8 ft rod or end fed antenna with the SRA13 Tuner r.f. antenna, or remote dipole with feeder is used. Thence the signal is fed via F4 RLA1 and 2 to the tuned r.f. amplifier module (A) where the input tuned circuits, the r.f. amplifier and bandpass circuits are separately provided for low (2-3.75MHz) and high (3.75-7MHz) bands, the switching being carried out by the d.c. supply switch JSA which also selects the required basic crystal.

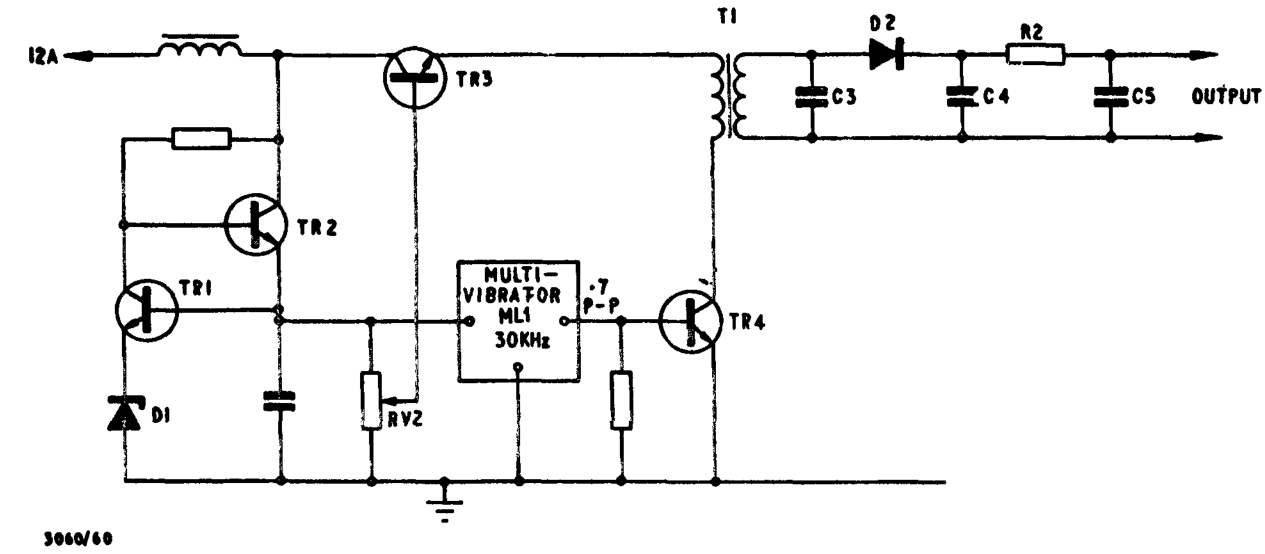


Fig 5 - Voltage generator (D3), simplified circuit

24. Variable capacitance diodes (varactors) are used in each tuned circuit across a conventional trimming capacitor. When a d.c. supply is applied to the varactor, its capacitance is changed and the resonant frequency of the tuned circuit changes. This voltage is derived from the voltage generator (D3) whose output is controlled by a potentiometer (PEAK NOISE on the front panel). For precision tuning the set to a particular frequency this control is adjusted for maximum noise in the phones on receive. The trimmer is used for circuit alignment in the usual way.

25. The voltage generator (D3) (Fig 5) consists of a multivibrator ML1 giving a 30kHz squarewave signal of sufficient amplitude to drive TR4 into oscillation. The output of the circuit T1 secondary, C3, is rectified by D2, smoothed by R2 C4, C5 and fed to the varactors. The supply to the multivibrator is stablized at 8 volts by D1, TR1, TR2 and across this is the PEAK NOISE control GRV2. This control varies the supply to TR4 and hence the varactor voltage.

26. After leaving the bandpass circuit (A), the signal is fed to the appropriate mixer into which the first local oscillator LO1 (8MHz $+f_s$) is also fed. The resultant first i.f. 8MHz - (f offset) is passed through a double tuned circuit and fed into either the wide or narrow band second mixer (B) where it is mixed with the second local oscillator LO2. The frequency of LO2 depends on the offset channel selected but will be 8.455MHz, 8.455MHz ±1.3kHz or 8.455MHz ± 2.5kHz. The resulting second i.f. of 455kHz is then passed through a narrow band filter 300Hz wide on KEY and a wideband filter 6kHz wide on BATT or VOICE, thence through four stages of i.f. amplification (C) to an a.m. detector (C). For c.w. working, a 456kHz crystal oscillator (C) is fed into the detector to produce a 1kHz beat note. After detection, the a.f. or c.w. tone is passed via an a.f. amplifier (E) to the headphone.

27. The gain control varies both r.f. and i.f. amplification by varying a d.c. potential supplied to diode attenuators in the r.f. and i.f. amplifiers (Fig 6). The distribution of gain control is such as to optimise the signal/noise, blocking and cross-modulation performance.

28. Anti-clockwise rotation of the gain control (reducing gain) progressively increases the voltage applied to the r.f. and i.f. attenuators. The r.f. diode attenuator is supplied with a delay potential (via 12A) which prevents the r.f. gain reducing until a potential of about 3.5V is fed from the gain control slider, at which point the i.f. gain has been reduced by about 15dB. As the potential is increased further, the gain of both the r.f. and i.f. stages is progressively reduced by the action of their respective diode attenuators and the bottoming of C2TR1 in the 2nd i.f. amplifier.

29. Under minimum gain conditions, with the gain control slider at maximum voltage, ML4D2 in the r.f. amplifier (A) is forward biased from the 12 volt line (12R) via the gain control slider, ML4R1 and ML3R2, ML4D1 is reverse biased by the potential developed across ML3D1 and ML4D2.

30. Under maximum gain conditions, with the gain control slider at earth, ML4D1 is now forward biased by current from 12A via ML3R1, L4, ML4R1 to earth. ML4D2 is reverse biased from the potentiometer formed by ML3R1, ML3D1 and ML3R2.

31. These component references refer to the high band amplifier. The operation of the low band amplifier is the same but module ML2 is used in place of ML4.

32. In the i.f. amplifiers, under minimum gain conditions, diode-connected C1TR4 has a very low impedance (reducing the input to C2) and the base of TR1 (C2) is supplied with sufficient current for the collector volts to drop to zero ie the transistor bottoms. As the gain control is rotated, the impedance of TR4 increases and normal bias conditions of TR1 are approached and it works as a linear amplifier. Further rotation increases the amplification of TR1 circuit.

Transmitter

(Fig 2501 and 2502)

33. There is no master oscillator as such, the frequency to be transmitted being derived by reversing the mixing process. For the chosen offset channel eg offset '0' at 8.455MHz the appropriate crystal and trimming capacitor are selected by switch SB1 on the offset unit (D) and connected to the offset oscillator (D1). The signal is fed into an amplifier (D2) and thence into the balanced mixer D2BM2 into which is also connected the output from the 455kHz oscillator (D1) which has been amplified in the keyed amplifier and phase splitter, D2ML2 (Fig 2512). The resultant 8MHz output passes through a tuned circuit consisting of D2T3 and D2C7, and enters balanced mixer D2BM1 to be joined by the f_s + 8MHz signal from the crystal cassette (J) via D2RLB1, energised when the pressel switch or key is made. Note that this is the same signal as LO1 in the receive condition (para 23) and that the 8.455MHz signal described above is LO2 in the receive condition.

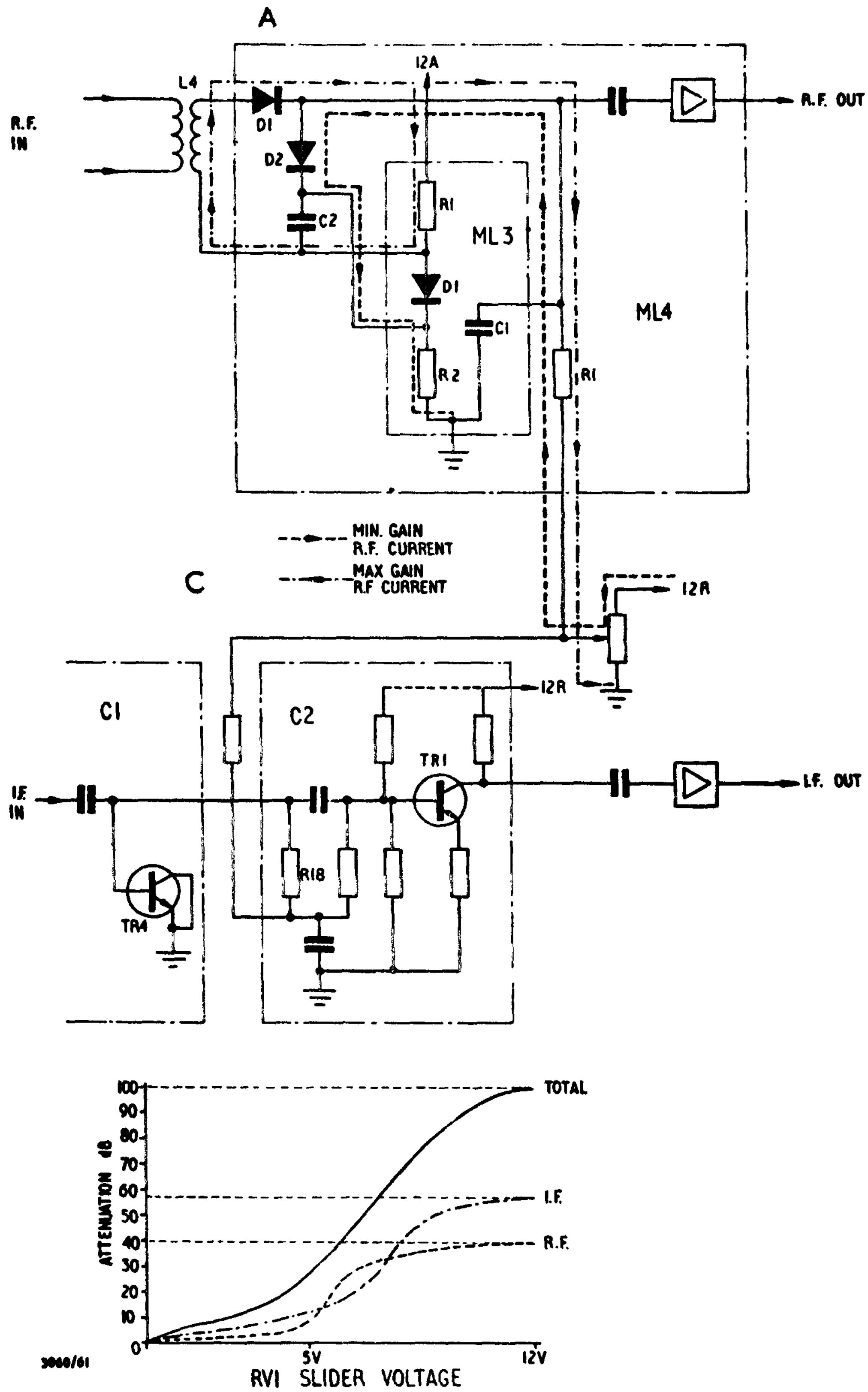


Fig 6 - Gain control operation

34. The resultant output from D2BM1 is at signal frequency f_s and this is fed to the modulator A1AML1 via the low pass filter A1ML6 and thence through the same r.f. amplifier and tuned circuits as used in the receive path to the first mixer. Now however, there is no LO1 signal and the modulated f_s is passed through into an a.l.c. amplifier, (F1), then via a phase splitter TR3 to the push-pull driver F1TR4 and 5, and p.a. stages F2TR1 and 2.

35. The output is taken to a broad-band transformer F2T1 which feeds the dipole or 50Ω antenna. In these feeds are two transformers F3T1 and F3T2, one of which is used for antenna current metering and the other feeds the a.l.c. board (F3) to produce the a.l.c. signal which controls the transmitter power to protect the p.a. from being over-run.

Modulation

(Fig 2515)

36. On a.m. (VOICE) the microphone input is amplified by ETR1 and 2 and is passed through a peak clipping circuit D2 and D3, so that positive and negative peaks are limited to 3 volts. Zenor diode D4 keeps the current through TR4 steady so that the steady state voltage across R12 is constant at 3 volts and the modulation voltage limits vary from zero to 6 volts. This provides the modulator h.t. (A1ML1) and r.f. is modulated by collector modulation.

37. The output from TR4 is also fed via C14 to the a.f. amplifier and phones for sidetone.

38. On c.w. (KEY and BATT), a square wave oscillator TR5 and TR6 is operated by the key and the output is fed into the a.f. amplifier and headset as sidetone. The microphone input is blocked on c.w. as the 12 volts applied via D1, saturates TR1 and cuts it off.

Automatic level control (a.l.c.)

(Fig 2520)

39. The transmitter a.l.c. circuit (F3) has three functions:-

a. To prevent distortion of the r.f. waveform when the transmitter is feeding a mismatched antenna of high impedance - it prevents the push-pull output circuit (F3 Fig 2519) from clipping.

b. To prevent excessive battery drain when the 100Ω output is mismatched into a low impedance antenna.

c. To enable the transmitter to give a constant output for a wide range of drive levels.

40. Two peak detector diodes are used, F3D4 connected across the 50Ω output winding of T1, and F3D5 fed from the antenna current transformer T2, the voltage across T2 secondary being proportional to the r.f. current flowing from the 100Ω output. The voltage developed across C7 is therefore proportional to the peak r.f. output voltage when the transmitter is lightly loaded or proportional to the r.f. output current when the 100Ω output is heavily loaded.

41. A portion of the voltage developed across C7 is fed via current amplifiers TR3 and TR2 to the control transistor F1TR1. As the voltage fed to TR1 rises above 4.5 volts approx (set by D1 in TR1 emitter), the collector/emitter impedance of TR1 decreases, attenuating the amplifier input. (Fig 2518).

42. With a modulated input, the action of the a.l.c. circuit is to maintain the peak r.f. output power at the same level as c.w. working, so that the average power output when modulated is less than on c.w. The discharge time constant of network C7, R8, R9 prevents the a.l.c. following and thus cancelling the modulation envelope.

Metering

(Fig 2520)

43. The meter indicates antenna current when the system switch is to KEY or VOICE, and battery voltage when switched to BATT.

44. To measure antenna current both the 100Ω and 50Ω outputs are fed via primary windings on current transformer F3T1. The voltage developed across C2 is proportional to the transmitter r.f. output current, peak detector diode D3 being fed from T1 secondary, meter M1 forming part of the detector load. The network formed by D2 and R3 reduces meter sensitivity at the high end of the scale as a safety factor.

45. To measure battery voltage, 12M is connected via the system switch at BATT biasing F3TR1 to low impedance, effectively shorting T1 output ie the transmitter r.f. output. Meter M1 then acts as a voltmeter, zenor diode D1 providing a false zero point at about 9 volts. R2 is selected so that with a 10 volt supply the meter pointer is at the intermediate 10 volt mark. Network R3 and D2 reduces meter sensitivity at the top end of the scale to prevent readings beyond the full scale deflection with high battery voltages.

Pressel delay

(Fig 2521)

46. To ensure that the set does not return to the receive condition during keying, a delay is used in the circuit of the send/receive relay F4RLA. When the pressel is made, 12 volts is applied to the base of TR2 which conducts causing TR1 to conduct and operate RLA quickly with capacitor C1 charging up from the supply. When the pressel is released, the voltage is removed, the charge on C1 must leak away through R3 until TR1 cuts off and releases RLA.

Band switching

(Fig 2502)

47. The frequency range 2 to 7MHz is achieved in two bands 2-3.75MHz and 3.75 to 7MHz approximately. The change is made by switching 12 volts to the low band circuits in the r.f. stages (A) on positions 1-4 of the basic channel switch JSA. In positions 5-9 of this switch, the 12 volts is removed from the low band circuits and applied to the high band circuits.

System switching

48. To switch the set to narrow band (KEY), wide band (BATT) or RT working (VOICE), a system using diode switches is used and is shown in Fig 7. All common circuits are energised via system switch SC2.

With SC1 to KEY all narrow band c.w. circuits are energised.
With SC1 to BATT all wide band c.w. circuits are energised, and the battery voltage is read on the meter.
With SC1 to VOICE, all wide band circuits, and the microphone amplifier on transmit are energised.

A detailed analysis of the switching is given in Table 2513.

High speed morse operation

(Fig 8)

49. This takes place by inserting an interface unit between battery and set with leads to the set headset socket, to the headset and to the AN/GRA-71 tape equipment. The latter is normally stowed in the battery section for transit.

50. With any battery input voltage between 9 and 16.5 volts, the switching mode regulator in the interface unit gives a substantially constant output of approximately 7.8 volts. A push-pull inverter operates from this supply, and is followed by full wave rectification and smoothing to give approximately -6V d.c. with respect to earth. This feeds the switching transistor TR9 which has an 11kΩ collector load and is normally turned hard on. The voltage across this load, a nominal -4 volts, is used to over-ride the +3.9 volts forward bias to the p.a. transistors in the set. The two 22kΩ resistors in parallel forming the load are H2R1 and F1R20 in the RT316.

51. In the keying unit of the AN/GRA-71 a silicon control rectifier (when turned on by signals from the tape) provides a low impedance path which is connected between the base of the switching transistor TR9 and the -6V supply from the inverter. TR9 is turned off and the negative bias voltage applied to the set is removed, allowing the set to transmit. Thus the set will transmit the information from the tape as long as the switch is pressed. The send/receive relay F4RLA will remain operated during this period and is not required to follow the high speed operation.

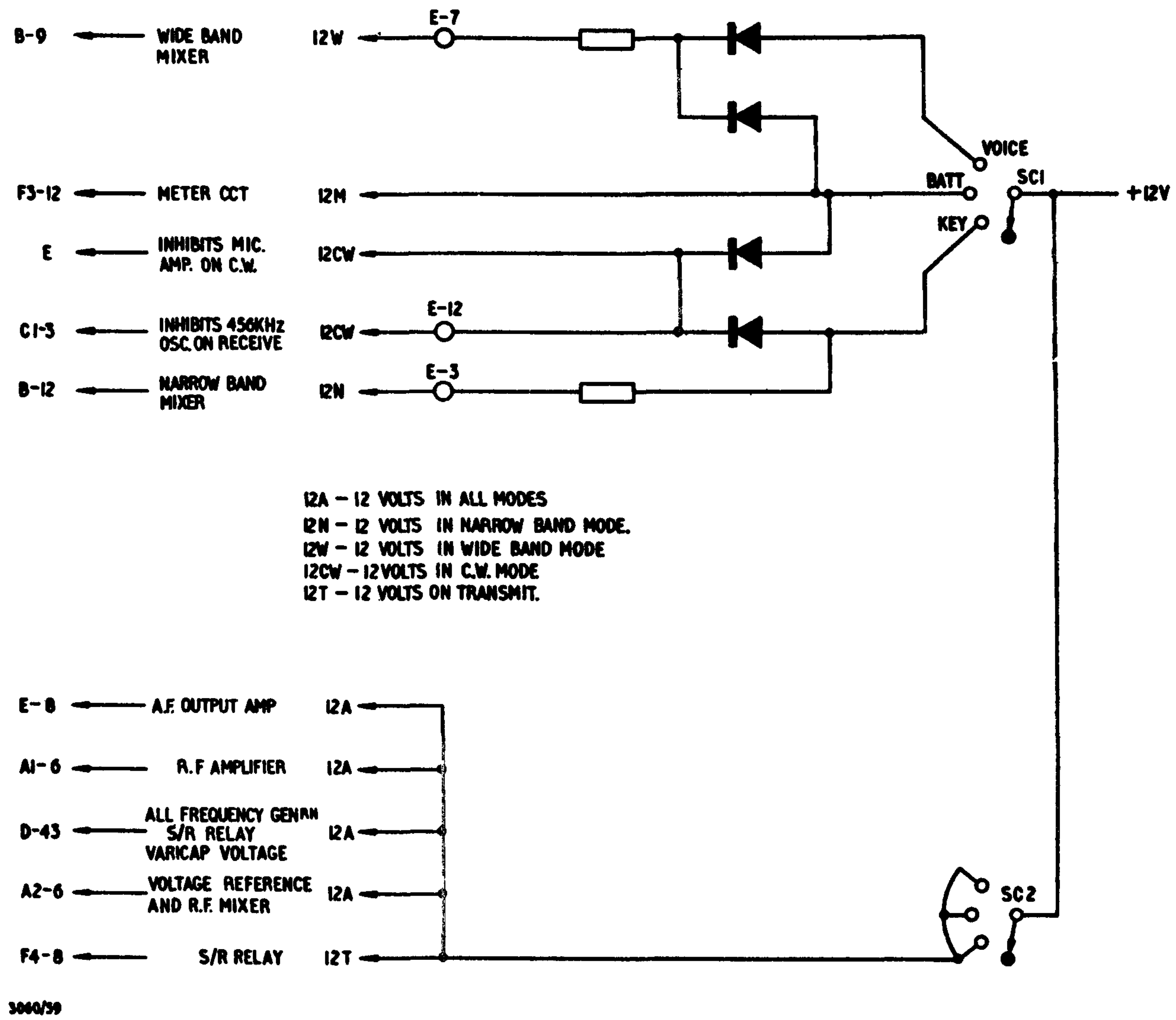
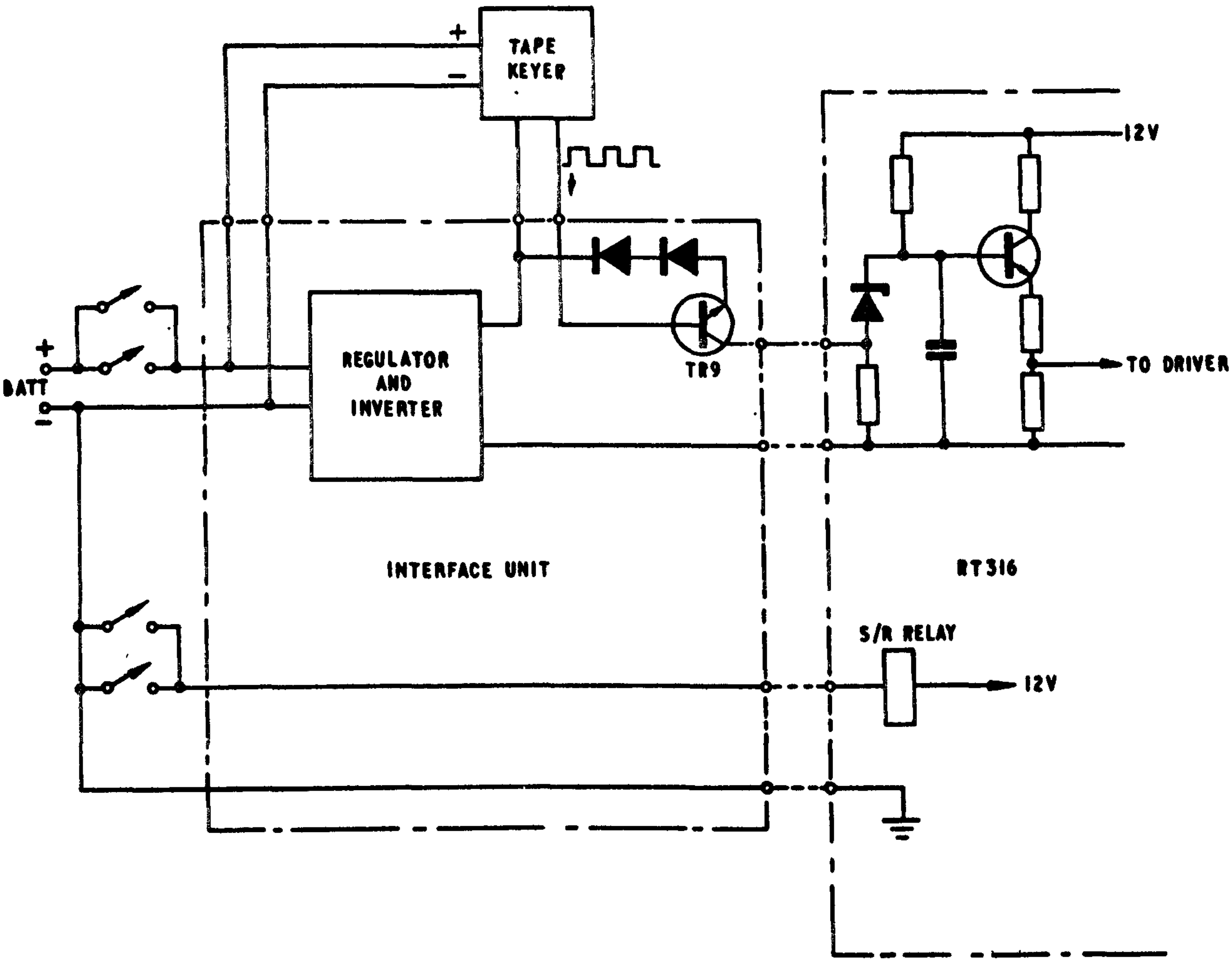


Fig 7 – System switching



3060/62

Fig 8 - High speed morse operation, simplified

End of Part 1

EME8c/3060/Tels