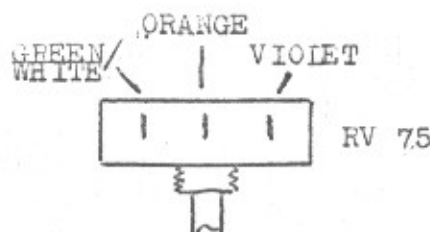


### **KW 2000 SERIES AFTERMARKET FACTORY MODS**

DIAL	KW2000/A Replace VFO DRIVE
MOD 10	KW 2000A Zener Diode
MOD 11	KW 2000A DC PSU Reverse Polarity
MOD 12	KW 2000 Function Switch
MOD 13	ALC
MOD 14	?
MOD 15	IFT Change
MOD 16	RF gain
MOD 17	4.2 MHZ Trap
MOD 18	?
MOD 19	AGC
MOD 20	Change PA valves to 6146B

MODIFICATION SHEET R.F. GAIN POTENTIOMETER.EQUIPMENT: KW 2000A & KW 2000.PURPOSE: To enable the receiver section of the transceiver to operate with full AGC, when the RF GAIN control is turned down.EXPLANATION: With the existing RF GAIN control, turning the control anticlockwise, applies a negative bias to the RF amplifier and two IF amplifiers, this bias will be higher than the negative voltage obtained from the AGC line, thereby making the AGC inoperative. The new RF GAIN control is wired as an attenuator in the receiver antenna line, and reduces the signal applied to the grid of the RF amplifier, leaving the AGC to operate normally.

- PROCEDURE:
- (1) Unsolder the three wires from existing RF GAIN pot, solder ORANGE and GREEN/WHITE wires together insulate, insulate the end of the VIOLET wire, coil wires up.
  - (2) Remove 50 Kohm RF GAIN pot, put in its place new 5 Kohm LIN pot.
  - (3) Unsolder RG I74U coaxial cable from PTFE feedthrough on RX RF AMP screen, pull coax through cable form and push it up through VFO gap, so that it will reach new pot. Solder inner of coax to centre tag of pot, and braid to body of pot.
  - (4) Solder a new length of RG I74U inner to PTFE feedthrough on RX RF AMP screen, solder braid to earth.
  - (5) Run this new length of coax up to the new pot, solder inner to left hand tag of pot, outer to body of pot.
  - (6) Solder right hand tag of pot to body. Note: Left and right looking from front panel with tags at top.
  - (7) On some KW 2000s the colour of the wires on the 50 Kohm pot may not be as in (1) to identify the wires refer to FIG I.

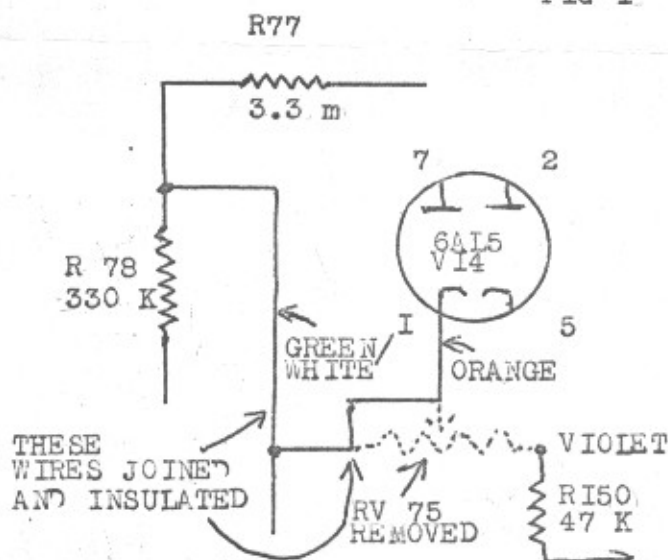
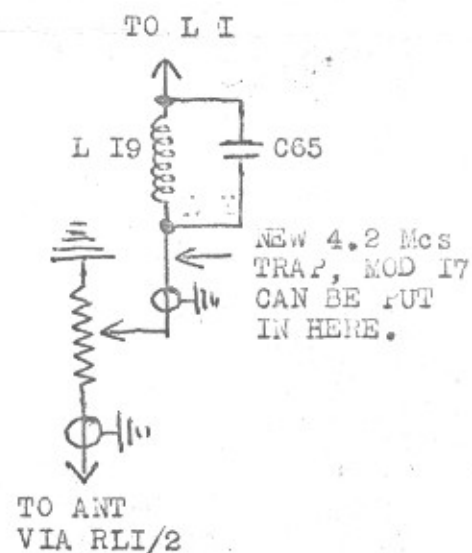
PARTS LIST

1 5K ohm pot 1" shaft  
 12" RGI74U coax

PRICE 9/6d.

MOD TO CIRCUIT

FIG. I

NEW RF GAIN CIRCUIT

MOD 16

MODIFICATION SHEET R.F. GAIN POTENTIOMETER

EQUIPMENT: KW 2000A & KW 2000B

PURPOSE: To enable the receiver section of the transceiver to operate with full AGC, when the RF GAIN control is turned down.

EXPLANATION: With the existing RF GAIN control, turning the control anti-clockwise, applies a negative bias to the RF amplifier and two IF amplifiers, this bias will be higher than the negative voltage obtained from the AGC line, thereby making the AGC inoperative. The new RF GAIN control is wired as an attenuator in the receiver antenna line, and reduces the signal applied to the grid of the RF amplifier, leaving the AGC to operate normally.

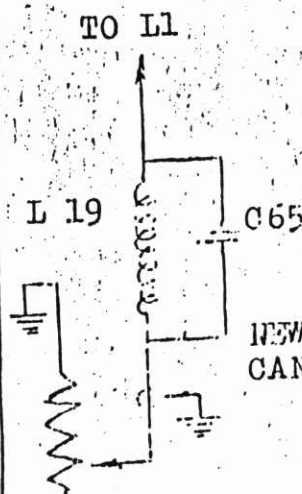
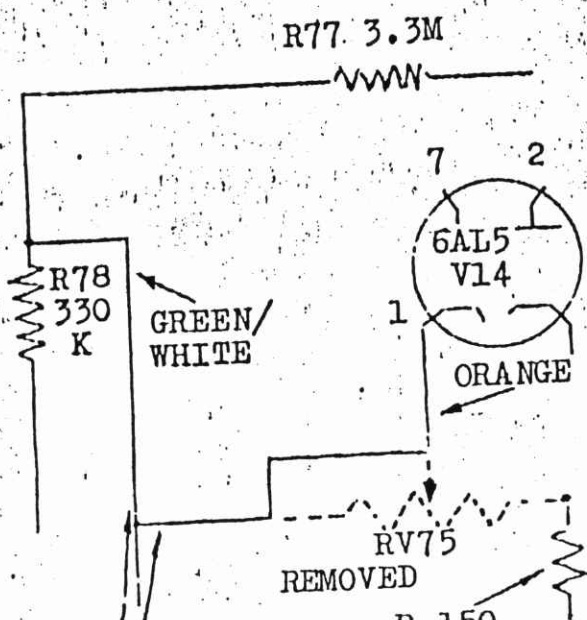
- PROCEDURE:
- (1) Unsolder the three wires from existing RF GAIN pot, solder ORANGE and GREEN/WHITE wires together insulate, insulate the end of the VIOLET wire, coil wires up.
  - (2) Remove 50 Kohm RF GAIN pot, put in its place new 5 Kohm LIN pot.
  - (3) Unsolder RG 174U co-axial cable from PTFE feed through on RX RF AMP screen, pull coax through cable form and push it up through VFO gap, so that it will reach new pot. Solder inner of coax to centre tag of pot, and braid to body of pot.
  - (4) Solder a new length of RG 174U inner to PTFE feed through on RX RF AMP screen, solder braid to earth.
  - (5) Run this new length of coax up to the new pot, solder inner to left hand tag of pot, outer to body of pot.
  - (6) Solder right hand tag of pot to body. Note: Left and right looking from front panel with tag at top.
  - (7) On some KW 2000s the colour of the wires on the 50 Kohm pot may not be as in (1) to identify the wires refer to FIG 1.

PARTS LIST 1 5K ohm pot 1" shaft, 12" RG174U coax. cable.

MOD TO CIRCUIT

FIG 1

NEW RF GAIN CIRCUIT



NEW 4.2MHz TRAP. MOD17  
CAN BE PUT IN HERE.

Revised 15th November 1967

Mod 13 - KW 2000 A

MODIFICATION SHEET ALC KIT

EQUIPMENT: All KW 2000 A units not fitted with ALC.

PURPOSE: To minimise flat topping in the PA stage.

EXPLANATION: Detected audio from the Power Amplifier grid circuit is rectified by D6 and D7, the negative DC output is fed to the grid of the 455 Kc/s amplifier V3. A fast attack slow release time constant is used to prevent overdriving on initial syllables, and to hold gain constant between words. Diode D8 is used to prevent the transmitter muting bias changing the ALC circuit when on receive.

- PROCEDURE:
- (1) Remove the KW 2000 A from its cabinet, by easing the plugs from the front feet, and unscrewing the front and rear feet.
  - (2) Fit the ALC board on underside of chassis using the PA compartment screen fixing bolt located near the base of V20 the OA2 stabiliser. The rear of the ALC board should face the PA screen.
  - (3) Remove the VIOLET wire from C185 (the 1000 pf feed through soldered to the PA screen and nearest to the chassis see fig. 1.).
  - (4) Locate the short PINK and VIOLET wires on the ALC board, solder the PINK wire to C185, join the VIOLET wire to the VIOLET wire removed from C185, insulate the joint.
  - (5) Run the long VIOLET and PINK wires from the ALC Board, along the cable form to the FUNCTION switch S5, clip wires to the cable form using clips provided.
  - (6) Locate the spare switch contacts on S5, these are not shown on the KW 2000 A circuit diagram, but will now be numbered S5f, see fig. 2 for location.
  - (7) Solder the VIOLET wire to the wiper contact 2 of S5f and the PINK wire to contact 5.
  - (8) Locate R17 on pin 2 of V3 (EF183 TX IF Amp) clip R17 away from the junction of R23, R27.
  - (9) Solder the remaining VIOLET lead on the ALC board, to the junction R23, R27
  - (10) Solder the BLUE lead on the ALC board to the free end of R17 (100k ohm  $\frac{1}{2}$ w).

TESTING ALC

BOARD: Load the KW 2000 A into a dummy load as per operating instructions, switch to SSB send and while speaking into the microphone, measure the voltage at the junction of R17 and the BLUE wire, a negative voltage should be obtained, the level of which will depend on how loud you speak and the setting of the mic gain control.

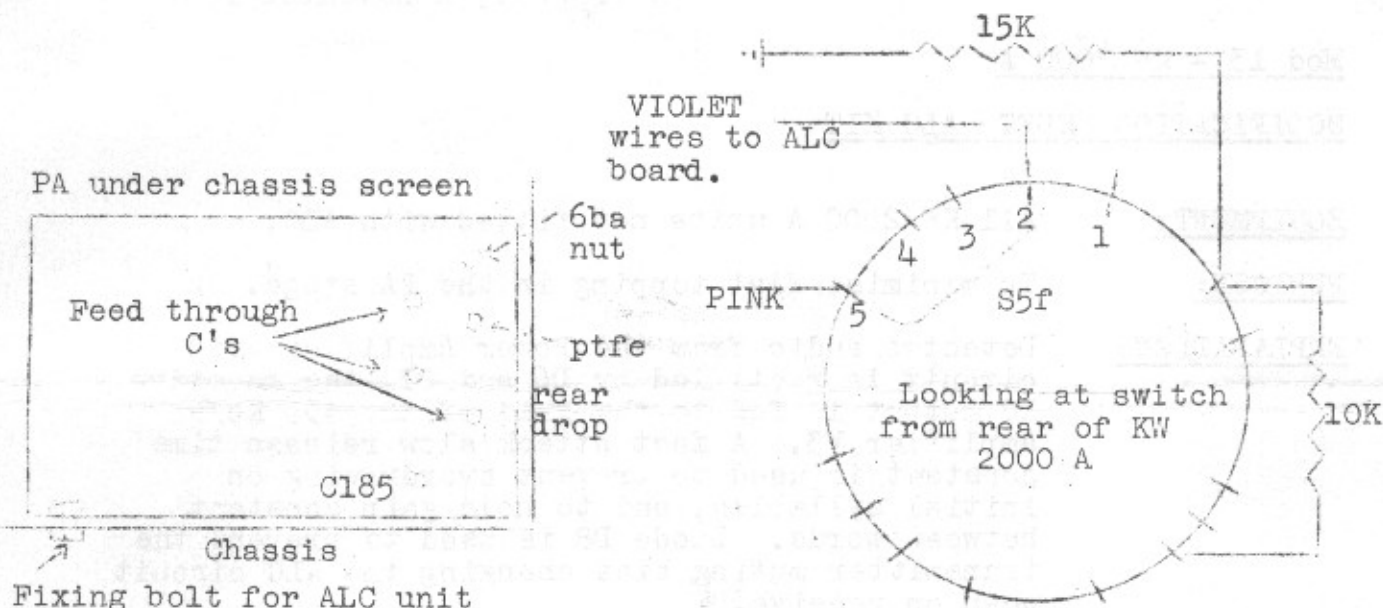


fig. 1.

fig. 2.

- KIT OF PARTS:**
- 1 ALC board PC9 complete with fixing bracket and hook up wire
  - 3 Cable clips
  - 1 Set of instructions
  - 1 ALC circuit diagram.

PRICE £2. 0. 0d.

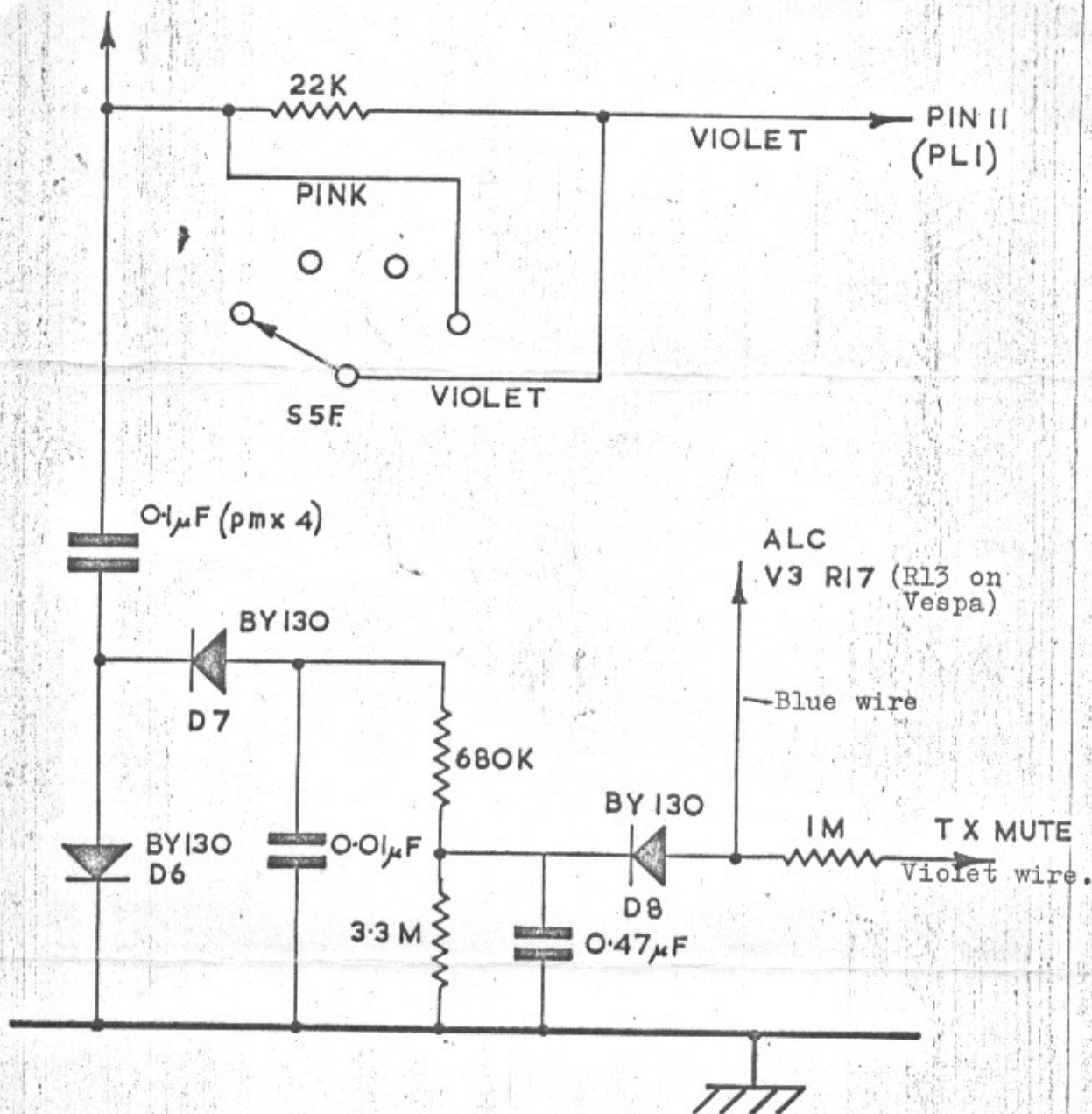
OTHER MODIFICATION SHEETS FOR THE KW 2000 A

- Mod. 10 Zener modification to stabilise the heater voltage of the VFO when operating mobile.
- Mod. 11 Converting 2000 A DC P.S.U. from positive earth to negative earth.
- Mod. 15 Modification to L27 to improve signal to noise ratio.



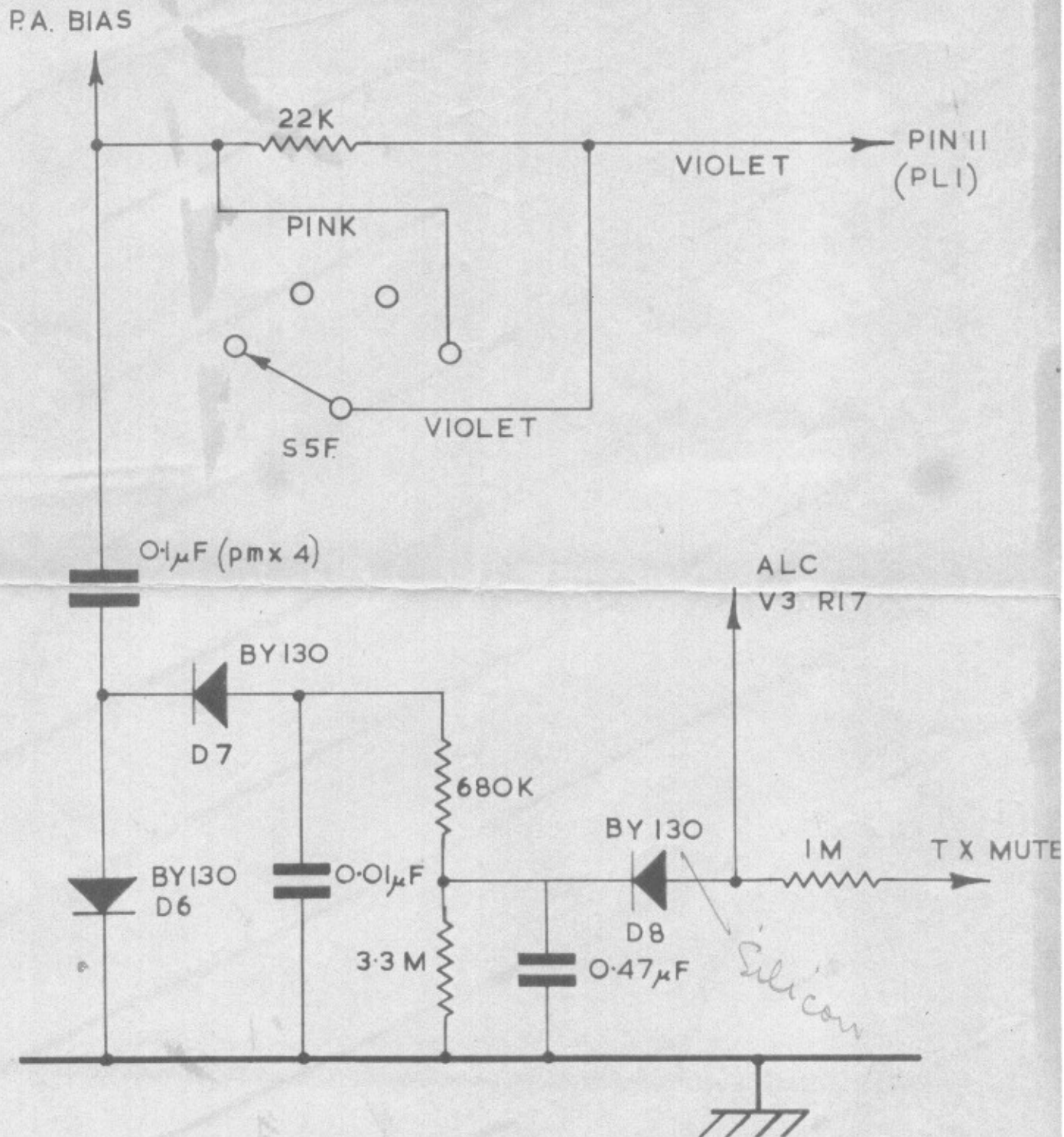
# ALC MODIFICATION

PA. BIAS

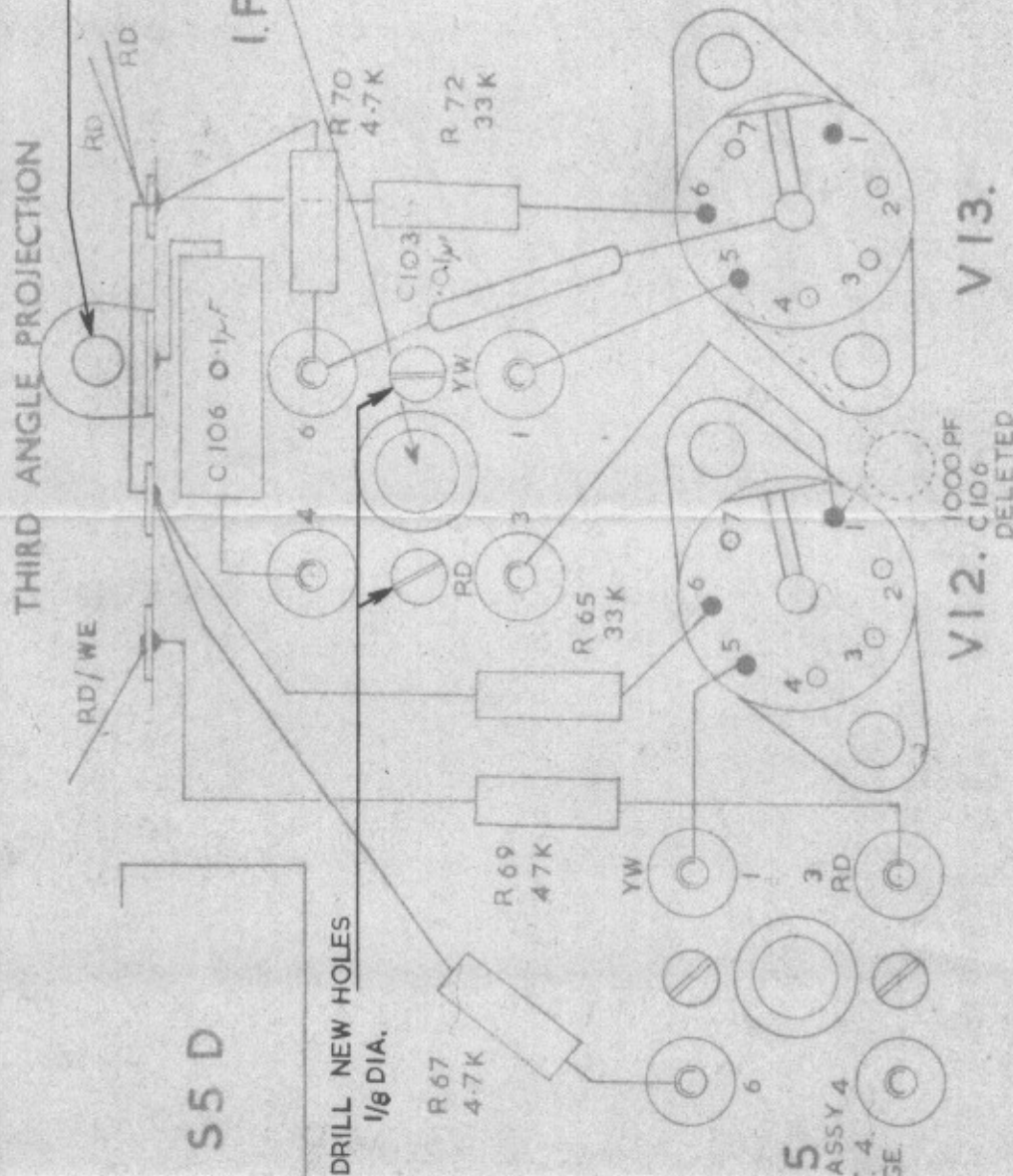


INCLUDED IN 2000A FROM SERIAL No. 455 TO

2000 A  
ALC MODIFICATION



INCLUDED IN 2000A FROM SERIAL No. 455 TO



I.F.T. 5  
A 1003 AS  
WAS I.F.T. 4  
NO CHANGE

I.F.T.4. A1003.ASSY  
(WAS L27 A 5)

WETZ

L27 COIL A 576 ——— | OFF  
1000 PF CERAMIC DISC ——— | OFF  
C106 ——— | OFF

ADD

I.F.T. COIL ASSY  
A1003 OFF

CAPACITOR 0.1 $\pm$ 10% 160VW  
POLYESTER MULLARD  
OR LEMCO 21 \_\_\_\_\_ 1 OFF

RADIO SPARES MOUNTING  
TAG STRIP 1+E+2 — 1 OFF  
NO 4X $\frac{1}{4}$  PANHEAD SELF TAPPING

SCREW. — OFF

PEAK TOP AND BOTTOM CORE  
OF I.F.T. 4, USING 100Kc/s  
SIGNAL ON 14.1Mc/s

**PRICE 15/- PLUS POSTAGE**

						TOLERANCES		K. W. ELECTRONICS DARTFORD KENT		
						MATERIAL			DRG. NO.	
						FINISH		L27 TO I.F.T.4. CHANGE. 2000A	SK.6087.	
ISSUE	DATE					SCALE	2:1	DIMENSIONS IN INCHES		

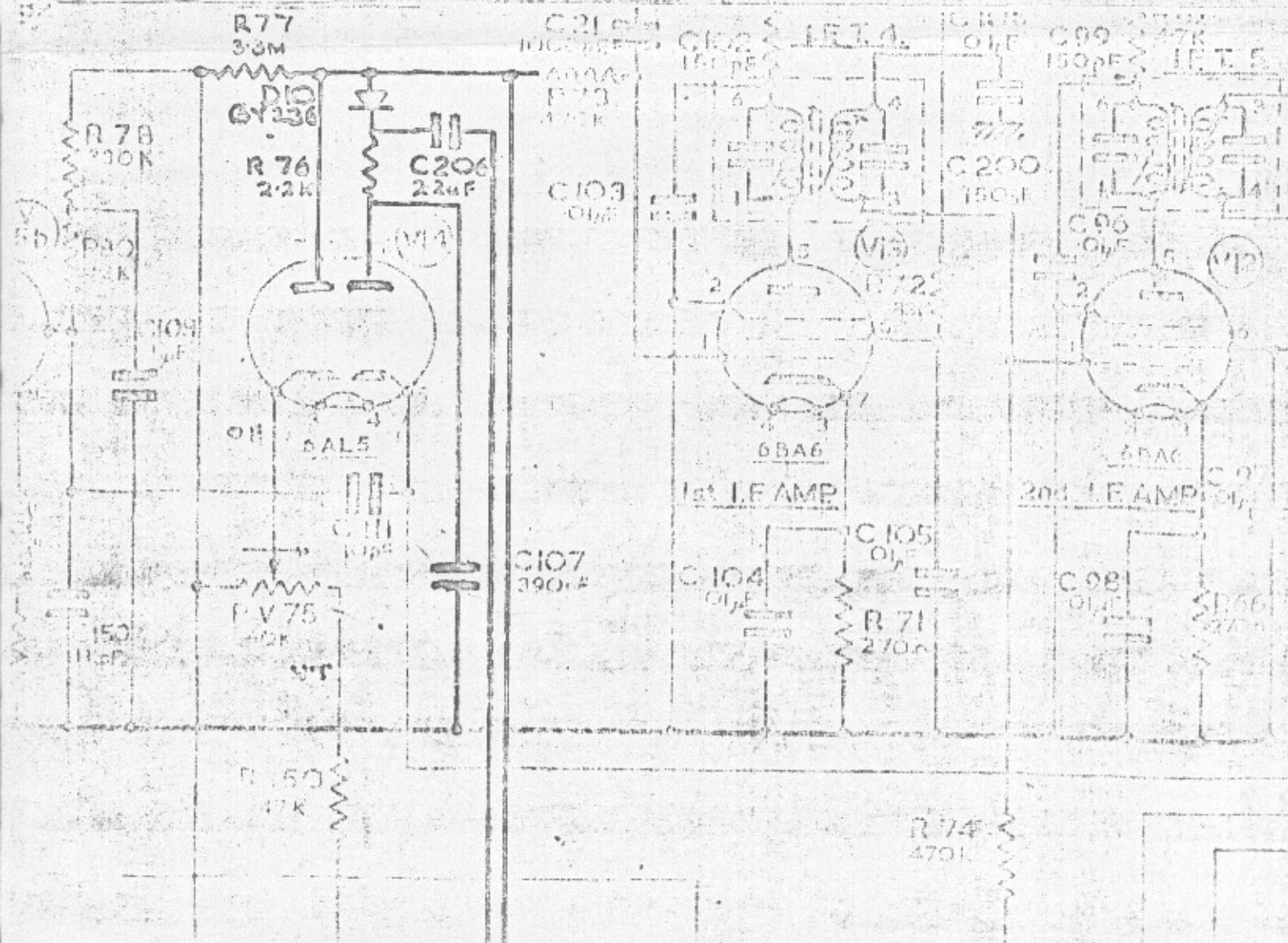


# MODIFICATION TO SHORTEN A.V.C. DELAY WHEN RETURNING TO RECEIVE

1. Disconnect 2.2K (R76) from pin 7 of 6AL5 (V14).
2. Disconnect 3.3M (R77) from pin 2 of 6AL5 and resolder to pin 7.
3. Solder anode end of BY236 to pin 7 of V14.
4. Solder free end of BY236 to free end of 2.2K (R76) and from this junction connect a 2.2 mfd 250 volt to RX Bias Lim, pin 2 RI2.
5. Remove 014 1mfd 160v which is located between pin 12 of RI2 and earth, this is discarded.
6. Remove 3 blue/yellow leads from pin 4 of RI2 solder them together and insulate.

## Components Required

- 1 - 2.2 mfd 250 volt
- 1 - BY236 diode
- 4 inches gn/we 7-0076 wire.



MOD. 21 IN. 2000 SERIES  
VERIFICATION OF FREQUENCY

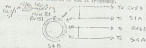
FOR INPUT: E.W. 2000, 2000A, 2000B.

PURPOSE:

To correct any divergence of frequency between "TRANSMIT" and "RECEIVE".

PROCEDURE:

- 1) Remove Orange/Black Wire from IFT Switch S4B (located at front panel).
- 2) Wire 1 Kilo Potentiometer in series with Orange/Black Wire and S4A.
- 3) Tune Transmitter to 3600 KHz on "Broadcast". Listen for WFO Signal at 3600 KHz on spare Receiver with IFP switched ON.
- 4) Switch E.W. 2000B to "IFT MEAS". Adjust Potentiometer until no difference between TX and RX frequency.



NOTE: Free on application quoting serial number.

FROM E.W. DESCRIPTIONS FOR E.W. 2000'S SERIES OF TRANSMITTERS:

- MOD 10 - E.W. 2000's Series Block.
- 11 - E.W. 2000A DC PWR Reverse Polarity.
  - 12 - E.W. 2000 Function Switch.
  - 13 - 450
  - 14 - IFT
  - 15 - 450
  - 16 - 450
  - 17 - 450
  - 18 - 450
  - 19 - 450
  - 20 - 450

METHOD OF REPLACING V.F.O. DRIVE  
ON KW 2000A SERIES UNITS.

PLACE A SUITABLE ADHESIVE TAPE SECURELY ALONG TOP EDGE OF DRUM BEHIND DIAL. THIS WILL ENABLE DRIVE CORD TO BE MANIPULATED WITHOUT LOSING SPRING TENSION.

REMOVE KNOB (LOWER CENTRAL POSITION ON FRONT PANEL), FROM SPINDLE. THROUGH HOLE IN FRONT PANEL RELEASE TWO SCREWS SECURING DRIVE UNIT. UNWIND DRIVE CORD & REMOVE DRIVE UNIT.

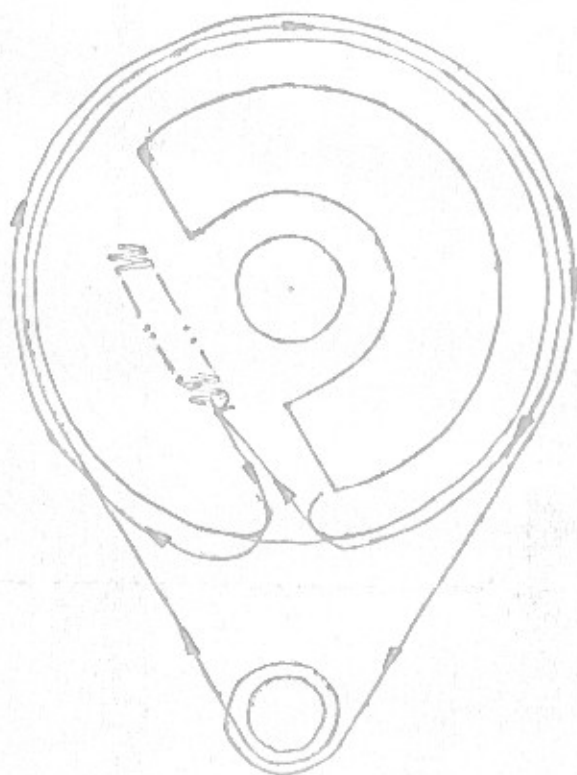
FIT NEW DRIVE UNIT USING REVERSE PROCEDURE.

NB do not allow cord to slip or all is lost!

To fix bracket:-  
after sizing vernier drive,  
Place bracket over spindle  
and rotate until there is  
sufficient metal on the front  
panel to drill two holes  
and affix the two P.K.  
supplied.

73

68FSA



METHOD OF LOADING DRIVE CORD.

VIEW SHOWN FROM REAR OF DIAL.

# MODIFICATIONS FOR THE KW-2000 TRANSCEIVER SERIES

## PSU IMPROVEMENTS FOR BETTER FREQUENCY STABILITY

S. SCANNELL (G3ZSU) and P. PERKINS (G3OUV)

THE KW-2000 transceiver and its successors the '2000A and the '2000B have been very popular in the U.K. since their introduction in the mid 1960's. The main reasons for their popularity are compact appearance, the availability of both AC and DC power supplies and, of course, the inclusion of 160-metre coverage (a bonus most other transceivers of that period lacked).

However, as with most budget-priced amateur equipment it has some drawbacks. Some of these would involve a considerable amount of work to overcome, but others may be reduced to a couple of evenings' effort and a very satisfactory improvement can be obtained. One criticism that is often levelled at the KW range is its inability to maintain good frequency stability over long periods. This was noticed on the '2000A at G3ZSU, and enquiries were made of other owners in order to find a cure for the problem. Several ideas were accumulated, but perhaps the most effective was put forward by G3OUV, to whom all credit for the main part of these notes must go.

Tests made at both stations showed that the drift at the VFO was due to fairly small changes in mains supply voltage, and the following descriptions give details of a cheap, simple but effective solution. Although the basis of the article refers to the KW-2000A in particular, there are notes at the end regarding the earlier '2000 and the later '2000B.

The modifications are in two steps: The first part is relevant to the heater chain to the VFO and HF oscillator which in itself gives much improved stability under most conditions, and may well suffice for home-station use. The second part gives details of stabilisation to the 245-volt HF rail which in turn feeds 150 volts to the VFO and HFO. This provides almost complete stability of supply to the frequency-controlling components within the transceiver.

TABLE OF VALUES (Fig. 1)

OLD COMPONENT	VALUE	NEW COMPONENT	VALUE
R9	9 ohm	R9A	22 ohm
		R9B	100 ohm
C7	100 $\mu$ F	C7(a)	6400 $\mu$ F 16 v.w.
C8	100 $\mu$ F	C8(a)	0.01 $\mu$ F
		VR	LM309K

## Procedure

It is best if the modifications to the heater line are described in step-by-step form.

(1) Take the PSU from its cabinet by removing the cabinet feet retaining screws and sliding the chassis from the rear of the cabinet. Note that the speaker leads are still connected and should be unsoldered prior to walking the PSU away from the cabinet.

(2) With the aid of the circuit diagram identify the following components:

(a) 9-ohm resistor R9; (b) 100  $\mu$ F capacitors C7/C8, mounted near centre of chassis directly under T1; (c) D13/14 rectifier diode type 1K2 mounted to tag board between HT and E.H.T. rectifiers.

(3) Remove C7 and C8.

(4) Cut grey wire on R9 and leave *in situ*.

(5) Cut yellow wire at R9 and remove from cable form.

(6) Remove D13/14 and the pink wire which goes to it and pull it from cable form.

(7) Disconnect blue/white wire from D13/14 and extract from cable form.

(8) Remove R9, 9-ohm resistor, and its mounting screw.

(9) Drill a 6 BA clearance hole between T1 and T2

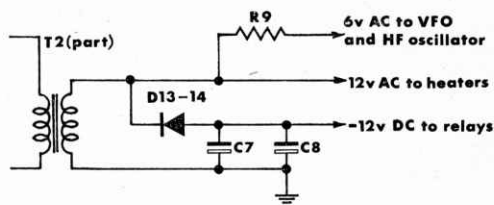


Fig 1(A)

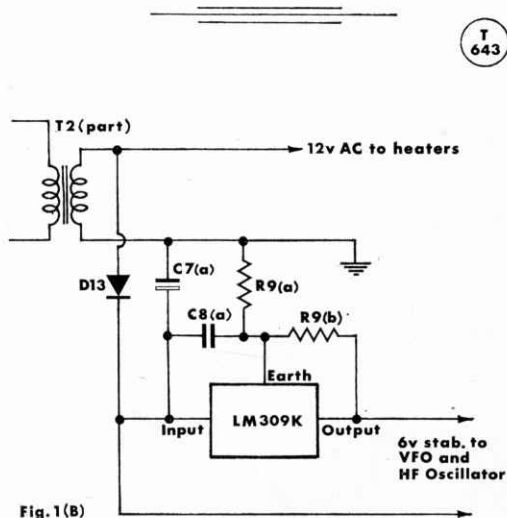


Fig. 1(B)

Fig. 1(A). Simplified diagram of existing KW-2000A PSU showing the low-voltage outputs. Fig. 1(B). Showing modifications to the low-voltage outputs.



and mount the capacitor clip for C7A.

(10) Using the original hole for R9 as a starting point, mark out and mount the monolithic stabiliser LM309. It is necessary to insulate this from the chassis, and two "top hat" nylon insulating bushes are required for this together with a TO3 type mica washer. Also prior to mounting the LM309 coat the mica washer with a liberal amount of MS4 silicone grease; this aids heat conduction. Ensure that all parts of the LM309 are insulated from chassis.

(11) Connect BYX42/300 anode to the outgoing 12 volt AC lead from T2.

(12) Take BYX42/300 cathode to the positive terminal of C7A.

(13) Connect the short pink wire which was originally on the old C7/C8 to the positive terminal of C7A. This feeds the relay supply.

(14) Feed the long pink wire which was on D13/14 round the chassis to the LM309.

(15) Connect this wire to the input terminal of the LM309 and connect a 0.1  $\mu$ F disc ceramic capacitor with short leads between the input and negative terminals of the LM309.

(16) Between output and negative of LM309 connect a 100-ohm resistor.

(17) Between LM309 negative and chassis connect a 22-ohm resistor.

(18) Earth the negative terminal of C7A.

(19) Connect grey wire to output of LM309.

This completes the first part of the modifications. The circuits both before and after are shown in Figs. 1(A) and 1(B) respectively. The connections to the LM309 are as in Fig. 2 and the method of mounting is shown in Fig. 2(B). It will be noted that there lay supply has been changed from negative to positive supply. This does not entail any changes to the transceiver, and further no apparent reasons could be found for the supply being negative.

### The LM309

This is an integrated circuit monolithic voltage regulator. Designed for logic power supply units (5 volt) it can supply an output current of 1.2 amps. It is overload, short circuit and thermally protected and is available from major component suppliers including R. S. Components. Other integrated circuit voltage regulators are available which will directly deliver 6 volts, but these tend to be rather more expensive than the 5-volt types. (7806KC—LM340k-6).

One problem which is sometimes encountered with this type of regulator is oscillation. Two types may occur, one is low frequency oscillation often at audio or sub audio frequencies, in much the same way as neon relaxation oscillators function; the other is a very high frequency oscillation (which for some reason often appears to be in the order of 50 to 60 MHz). However, both types can be eliminated by adjustment of decoupling components.

### Appraisalment

The preceding notes give details of the first part of the power supply regulation procedure. Following the installation of the first part, objective tests were made and the results were very surprising. First of all stability

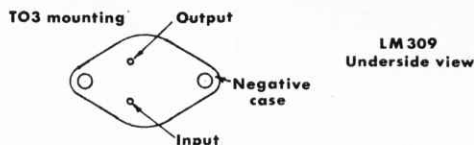


Fig. 2 (A) LM309 identification diagram

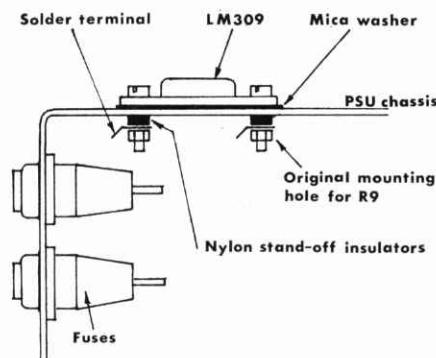


Fig. 2 (B) LM309 Mounting diagram

T  
644

was checked using ship-to-shore Coast Stations as a stability reference. Initial checks over several hours showed that the VFO would stay within audible zero beat. This was taken to be satisfactory as QSO's from G3ZSU seldom last much more than 30 minutes at any one time. Of course the transceiver must be allowed to reach its normal operating temperature before any checks can be carried out.

However, further checks were made under heavy mains load and unload. This was achieved by switching some 15 kW on and off (night-storage heaters) and some frequency change was still present. As it is intended to use the transceiver for portable work, and is likely to be run from a generator not renowned for its constant output, the next step was to regulate the 245-volt HT line.

### Stabilising the 245-Volt Rail

Once the heater line modifications have been completed the 245-volt rail can be stabilised if required (and if the transceiver is to be used portable, this is recommended). The circuit is shown in Fig. 3. It is fairly usual type of series-regulator circuit. The circuit is referred back to the newly regulated heater supply. Most of the components are mounted on an etched circuit board, a recommended layout being shown in Fig. 4. The only component not mounted on this board is the series regulator transistor 2N3739. This is fitted on a matt black, finned, heat sink, which is cut to the same length as the existing HT choke L1.

The choke is removed and the two HT smoothing capacitors C5 and C6 are connected in parallel. The heat sink can be drilled and tapped to take the original holes that the HT choke was mounted through, or alternatively two small aluminium brackets could be

completed job look neat. The circuits are basically similar but reference to Fig. 1 and the table should help clarify matters.

### TVI From the KW-2000 Series

At G3ZSU some TVI has been caused on BBC-1 Ch. 1 when operating on 14 MHz. Running the Tx into a dummy load, with a receiver in the shack tuned to the third harmonic of the transmission, showed that a high level of the third harmonic was present. Tests indicated that much of this was coming from the cabinet direct and also on the power cable back to the PSU. In the first place additional bonding from the chassis to the cabinet was attained by making up a brass contact spring, as shown in Fig. 5A. This ensures an improved bond between chassis and cabinet. Further, the lid of the cabinet was drilled and tapped over the front lid so that there is additional bonding of the lid. This was found to be particularly helpful (Fig. 5B).

The circuit diagram shows that there is a distinct lack of decoupling of the power leads to the PSU. This was tackled by removing each lead in turn from the male plug on the rear drop of the transceiver and placing a *Mullard* FX.1115 ferrite bead over each lead, close to the socket and a  $.01\mu\text{F}$  disc ceramic capacitor from each lead to earth. This resulted in about 80% reduction of the level of the third harmonic! The PA HT lead is de-coupled in this manner as standard. Be sure that the capacitors are capable of handling the applied voltage and that the ferrite beads cannot come into contact with each other. A piece of p.t.f.e. sleeving slipped over each bead will help to insulate them.

These notes are not intended to be "followed blindly" but it is hoped to stimulate the generation of other ideas for additional improvements to the excellent KW range of transceivers.

Drill and tap cabinet lid and support and fit 2BA brass screws

Inspection cover

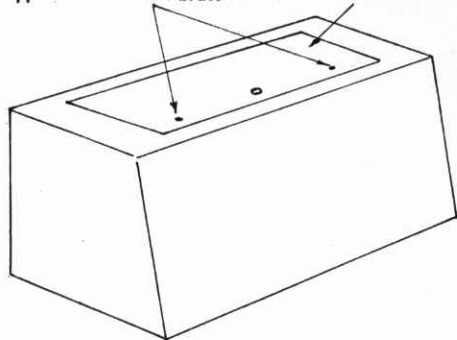


Fig. 5 (B) Improvement of cabinet lid earthing

Brass contact spring screwed to cabinet. PA compartment earthed to cabinet when chassis is pushed home

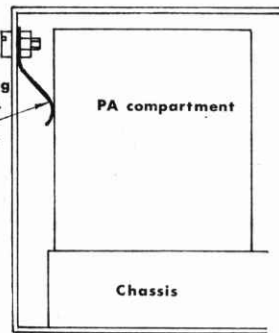


Fig. 5 (A)