852

Service Manual

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852
V.H.F./U.H.F. Calibrator

Technical Manual

RACAL
THE ELECTRONICS GROUP

RACAL INSTRUMENTS LIMITED

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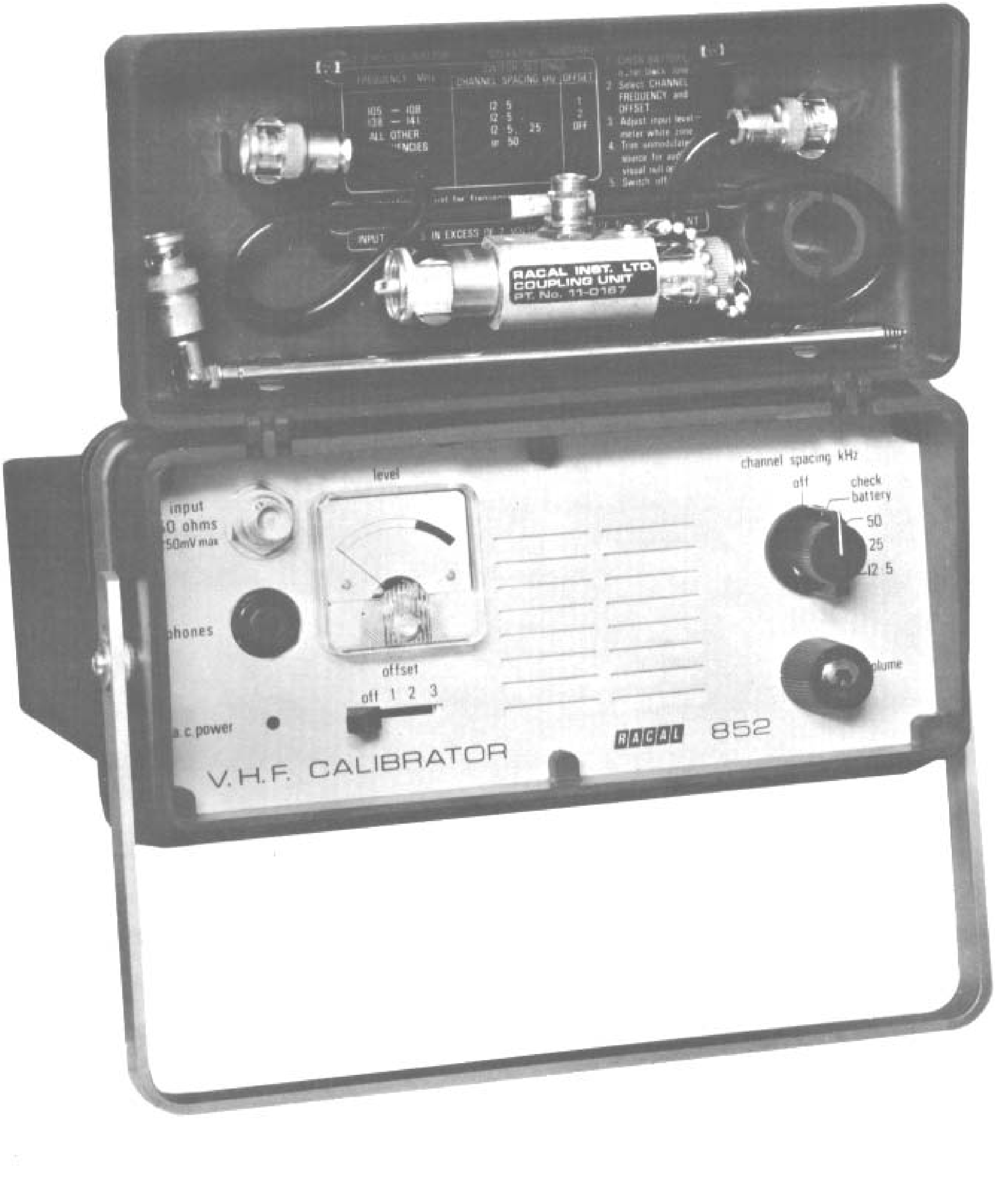


V.H.F./U.H.F. Calibrator Type 852

CONTENTS

TECHNICAL SPECIFICATION

Sensitivity:	Nominal 100 mV from 100 kHz to 500 MHz.
Channel Spacing:	12.5 kHz, 25 kHz and 50 kHz.
Offset Frequency:	For measurements in the band 105-108 and 138-141 MHz where the frequency to be measured is offset from a multiple of the channel spacing in use, an offset of ±6.25 kHz is available.
Frequency Stability	Function of temperature: Typically ±5 parts in 10^9 per °C Function of supply voltage: ±2 parts in 10^7 over battery life or permissible mains variation. Average ageing rate: +2 parts in 10^8 per day.
Warm-up Accuracy :	Better than 1 part in 10^6 in 1 min. Better than 1 part in 10^7 in 3 mins.
Signal & Null Indicators:	Panel meter and loudspeaker; the use of headphones OPTION 03 is an alternative to the loudspeaker.
Ambient Temperature Ranges:	Operating: With Battery Pack: -10 to +40°C With Mains Pack: -10 to +55°C Storage: Basic 852 unit: -25 to +70°C Battery Pack: -25 to +40°C Mains Pack: -25 to +70°C
Power:	Battery pack accommodates nine I.E.C. and B.S. 'R20' or A.S.A. 'D' size cells, e.g. HP2 cells typically provide a total of 50 hrs. service at +20°C, 25 hours at 0°C.

80 mA draw approx

Mains pack is available for operation from 110 or 220 volt ±12% 45-400 Hz source.

Dimensions: $4\frac{1}{4} \times 9 \times 11\frac{3}{4}$ ins. overall
108 x 229 x 298 mm overall

Weight: 8 lbs, with battery pack.

Accessories: Telescopic Antenna
83 U.H.F. Coupling Unit
Extender Lead

Optional Accessories

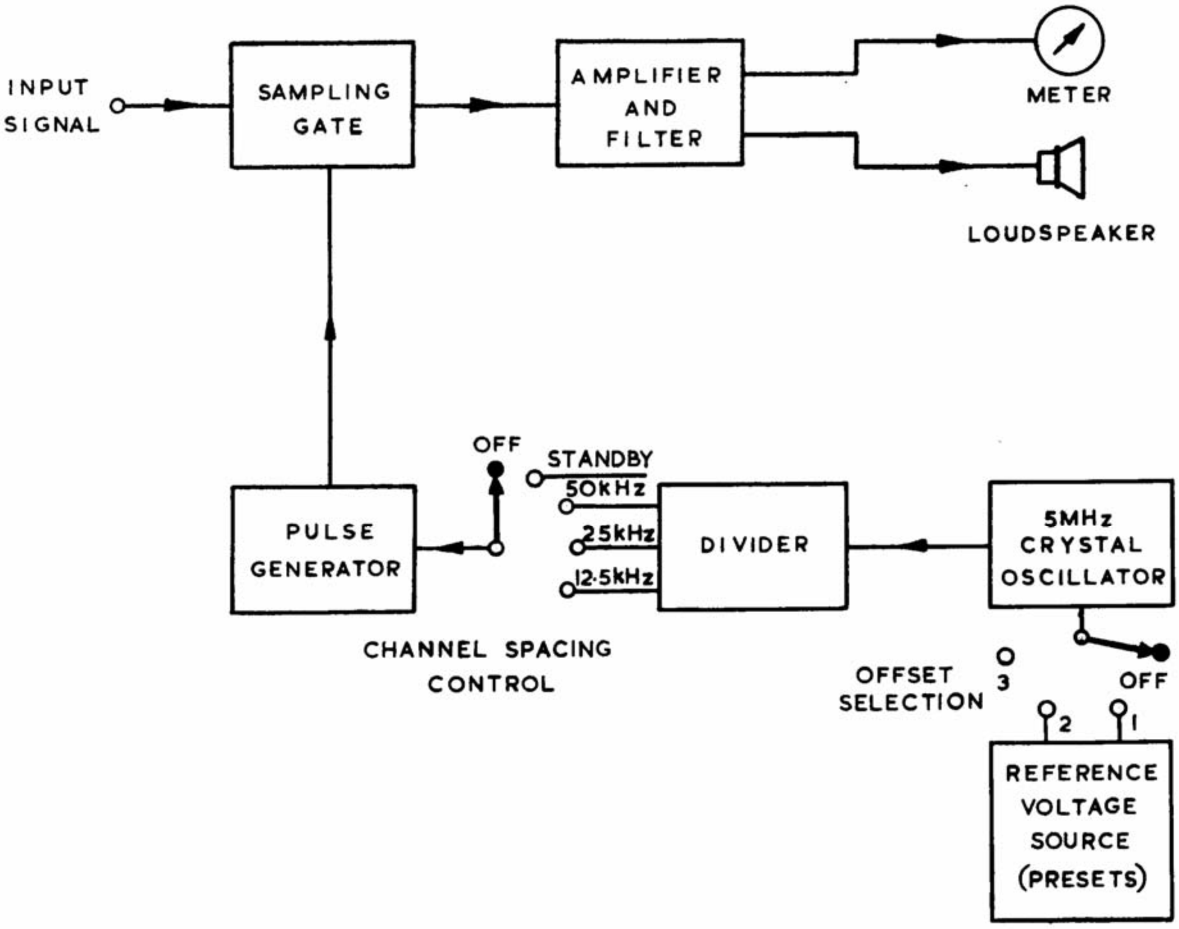
OPTION 01 - Battery Pack (less batteries)

OPTION 02 - Mains Pack

OPTION 03 - Earphones

OPTION 04 - Extender Board Servicing Kit

Either Option 01 or Option 02 is essential for operation of the instrument.



SIMPLIFIED BLOCK DIAGRAM
CALIBRATOR TYPE 852

Fig. 2·1

SECTION 1

GENERAL DESCRIPTION

INTRODUCTION

1.1 The v.h.f. calibrator described in this handbook is a portable instrument, which may be mains powered (Type 852M) or battery powered (Type 852B).

FUNCTION

1.2 The purpose of the instrument is to indicate when a v.h.f. transmitter is correctly tuned. The v.h.f. transmitter signal is introduced into the calibrator via the telescopic antenna or the coupling unit of the calibrator.

CONSTRUCTION

1.3 The calibrator is of simple and robust construction, utilising printed circuit boards and solid state devices. The case in which the unit is housed is made from injection moulded A.B.S. and is divided into three sections.

Type 852M (Mains Powered)

1.4 The lower section of the case of the Type 852M contains the mains power unit. The heavy components of the power unit are mounted on a metal baseplate and the lighter components comprises electronic smoothing assembly 19-0114, which is fixed to the base plate by screws and spacers. Pins 1 to 4 cater for two alternative mains supplies (110V a.c. and 220V a.c.), and are connected as follows:-

(a) 110V (applied to pins 1 and 2) - strap 1 to 3 and 2 to 4

(b) 220V (applied to pins 1 and 4) - strap 2 to 3

These pins are wired to the mains plug (PL2) of the unit, and care should be taken to switch off the supply before altering the strappings. Three spring loaded metal plungers connect the power unit output to the contact assembly mounted in the adjacent section of the case. Two fuse holders and mains input connector are mounted on the baseplate, and are accessible from the back of the case.

Type 852B (Battery Powered)

1.5 The battery power supply assembly used with the instrument contains a battery pack, which consists of nine dry cells connected in series. A foam rubber moulding holds the cells firmly in position, and springs on the bottom make electrical contact with one end of each cell; the other ends of the cells engage with contacts on the adjacent section of the case. The negative supply of the battery pack is routed via a spring loaded plunger, while the positive terminal engages its contact directly. The battery connections are indicated on the case. The battery pack is protected from any possibility of damage due to wrongly made connections by a diode (D30) and a 1.5A fuse (FS3), wired together across its output terminals.

1.6 The centre section of the case is secured to the lower section by two drawbolts, and houses the circuits of the instrument proper. The eight-way socket (SK3) in the base of this housing mates with a plug (PL1) on the frame assembly. The plugs and socket route the power supply to the main circuits of the instrument. The extender lead (10-2058) is used to connect the plug and socket of the two sections of the instrument when the centre housing is withdrawn for servicing.

1.7 The main section of the instrument (Front Panel Assembly 11-0444) comprises three printed-circuit assemblies (Reference Voltage Assembly 19-0370, Sampler Divider Assembly 19-0383 and Stretcher Output Assembly 19-0373), a 'fast-warm-up' 5MHz oscillator Type 843 and the front panel and panel-mounted components. The sampler divider assembly plugs into sockets on the stretcher output assembly and can be removed for ease of servicing. The front panel assembly with the three p.c.b. sub-assemblies is secured to the middle section of the unit by six screws. When the instrument is completely assembled, contact is made between the 8-way plug in the chassis of the main section and the 8-way socket in the centre section of the case.

1.8 The layout of the front panel and cover arrangement is shown in the frontispiece. The telescopic aerial, the coupling unit and its coaxial lead are all stored in the cover which cannot be closed unless the function switch is at OFF. The moulding on the right-hand side of the cover is shaped to fit the off position of the switch only, and therefore prevents accidental battery drain in the 852B. The carrying handle serves as a stand for bench operation.

OPTIONS

1.9 Optional items of equipment are offered so that a Calibrator Type 852M may be converted into a Calibrator Type 852B and vice versa. Earphones are offered as an optional item for both types. Table 1 on the following page shows the list of options available.

TABLE 1

Equipment List Showing Appropriate Options

Basic Equipment	Standard accessories supplied with basic equipment	Optional equipment
852M consisting of calibrator type 852, a telescopic aerial, a coupling unit assembly, a mains pack	Mains Fuses Mains Lead Extender Lead	OPTION 01 consisting of a battery pack (less batteries) OPTION 03 Earphones OPTION 04 Extender board servicing kit
852B consisting of calibrator type 852, a telescopic aerial, a coupling unit assembly, a battery pack	Extender Lead	OPTION 02 consisting of a mains pack, with mains fuses and lead as standard accessories. OPTION 03 Earphones OPTION 04 Extender board servicing kit.

SECTION 2

BRIEF TECHNICAL DESCRIPTION

2.1 The Calibrator is designed to set the frequencies of radio transmitters having channel spacings of 12.5, 25 and 50 kHz and carrier frequencies that are an exact multiple of the channel spacing frequency. The frequency setting accuracy of the calibrator is better than 1 part in 10^6. An offset facility provides for those frequency bands in which the carrier frequencies are not exact multiples of the channel spacing frequency.

2.2 The instrument operates on a frequency comparison principle, and indicates whether or not the output frequency of the transmitter under test is an exact harmonic of an accurate frequency (equal to the channel spacing frequency) generated in the calibrator. The instrument mixes the two frequencies to give an audio output, the frequency of which is the difference between the transmitter signal and the nearest harmonic of the calibrator frequency. It is essential that the frequency switch is set to the position appropriate to the channel spacing of the transmitter under test.

2.3 The principle of operation of the instrument is such that it can, with a high degree of accuracy, measure not only carrier frequencies which are exact multiples of the channel spacing frequencies but also carriers in which an effective offset condition is present. The frequency of a carrier in this latter category is measured by increasing or decreasing the reference frequency generated in the unit by an amount determined by the magnitude of the offset. The "effective offset" is that difference in frequency between the transmitter carrier frequency and the nearest harmonic of the channel spacing. For example, if the carrier is 105.20625 and channel spacing 12.5 kHz, then the offset is 6.25 kHz. For those frequency bands in which the carrier frequencies are not exact multiples of the channel spacing frequency, Table 2 shows the amount of offset (in KHz, positive or negative) and the maximum error across the band due to the shift in the reference frequency.

TABLE 2

Frequency (MHz)	Offset KHz	Reference Frequency offset (Hz)	Maximum Error due to shifted reference
105–108	+ 6.25	293.4	$\pm 8.5 \times 10^{-7}$
138–141	+ 6.25	224.1	$\pm 5 \times 10^{-7}$
Nominal Reference Frequency 5 MHz			

SECTION 3

OPERATING INSTRUCTIONS

PREPARATION FOR USE

Instruments With A.C. Power Supply

3.1 Before connecting the unit to the a.c. supply line ensure that:-

(1) Line fuses are of the correct rating (0.5A for 220V nominal line voltage, 1A for 110V nominal line voltage).

(2) The taps of the line transformer are set correctly (see page 1, para. 1.4.

Instruments With Battery Power Supply

3.2 Ensure that the batteries to be used are of the correct type and that they are fitted in accordance with the instructions on the battery pack case.

Antenna Connection

3.3 Open the cover and connect either the telescopic antenna or the coupling unit assembly into the input socket in the top left hand corner of the front panel. The coupling unit is connected by means of the coaxial lead supplied. The telescopic antenna should be used if the transmitter under test is radiating from an antenna; the coupling unit should be used if the transmitter has a dummy antenna, or is radiating at very low power, and should be connected in series with the transmitter antenna circuit. The B.N.C. socket on the coupling unit is connected to the instrument, and the connectors on either end of the coupling unit provide a straight through connection. The degree of coupling may be adjusted by loosening the locknut on the B.N.C. socket and either screwing the socket in, or out, of the coupling unit as required.

3.4 For correct operating, the voltage level at the input must not exceed 250 mV r.m.s. THE INPUT SHOULD NEVER UNDER ANY CIRCUMSTANCES BE ALLOWED TO EXCEED 2V r.m.s. OTHERWISE DIODES D14 AND D15 IN THE COMPARISON BRIDGE MAY BE DAMAGED. The front panel meter monitors the level of the input signal.

Final Preparation

3.5 Turn the CHANNEL SPACING switch to CHECK BATTERY. The meter needle should swing towards or into the black sector. If the meter fails to register in the black sector, the battery pack should be fitted with new cells and the check repeated. Assuming the reading is satisfactory, the instrument is now ready for use.

OPERATING

3.6 Set the CHANNEL SPACING and OFFSET switches in accordance with Table 3. Ensure that a meter deflection approaching the black sector is obtained with the transmitter off tune. A good coupling between the transmitter and the instrument is essential for a satisfactory meter reading, and is assisted by correct positioning of the antenna or coupling probe.

3.7 Set the volume control to a suitable level and tune the transmitter to reduce the frequency of the signal heard in the instrument speaker or headphones. When the transmitter is nearly on tune, the level meter will change from a steady reading to a pulsating one. The transmitter must be further tuned until the level meter indicates minimum beat frequency. Thus the transmitter is correctly tuned when the audio output from the instrument is a minimum frequency, and the level meter indicates a zero beat frequency. Ideally, zero beat indication would be obtained on the level meter, but in practice transmitter instability usually prevents this.

3.8 When headphones are used they should be plugged into the phone jack on the front panel. The phone jack disconnects the speaker when the headphones are inserted.

Frequencies Not Shown in Frequency Selection Table.

3.9 Any frequency in the range of 100 kHz to 500 MHz can be checked with the 852, if it meets the following requirements.

(a) The frequency must be a multiple of (or divisible by) the channel spacing selected.

(b) The channel spacing setting must be such that the frequency adjustment will not permit tuning the adjacent channel.

NOTE: Always use the highest channel spacing frequency when checking frequencies that can be tuned over a wide range. Example: If the frequency is divisible by 12.5, 25, 50 kHz, then use 50 kHz to provide widest spacing between spectral lines.

Table 3

Frequency Selection Table.

Frequency (MHz)	Channel Spacing (kHz)	Offset
105-108	12.5	1
138-141	12.5	2

SECTION 4

TECHNICAL DESCRIPTION

BASIC PRINCIPLES

4.1 The instrument generates an accurate frequency, which it compares with the transmitter signal and uses the difference between these frequencies to indicate whether or not, the transmitter signal is an exact harmonic of the instrument signal.

4.2 In Fig. 2.2, diode D is reverse-biased by e_b, and the sinusoidal signal e_s varies this reverse bias as shown. The pulses e_p are superimposed on the bias voltage, and are of sufficient amplitude always to overcome the sinusoidally varying reverse bias on D. Consequently during each pulse, a quantity of charge flows into capacitor C. The magnitude of this charge depends on the point in the cycle of e_s that pulse e_p occurs. If the pulses occur at varying points on e_s, then the charge on C varies; but if the pulses always occur at the same point in each cycle of e_s then the quantity of charge in C is the same for each pulse. During the intervals between pulses C discharges through R. If the pulse e_p is short compared with half the period of e_s and e_s is continuous, it is not necessary to sample every cycle of e_s. Thus if the frequency of the signal e_s is an exact harmonic of e_p, C will charge to the same voltage for each pulse. Conversely, if es is not a harmonic of ep, C will charge to varying levels; an envelope waveform will therefore be produced, the frequency of which equals the difference between e_s and a harmonic of e_p.

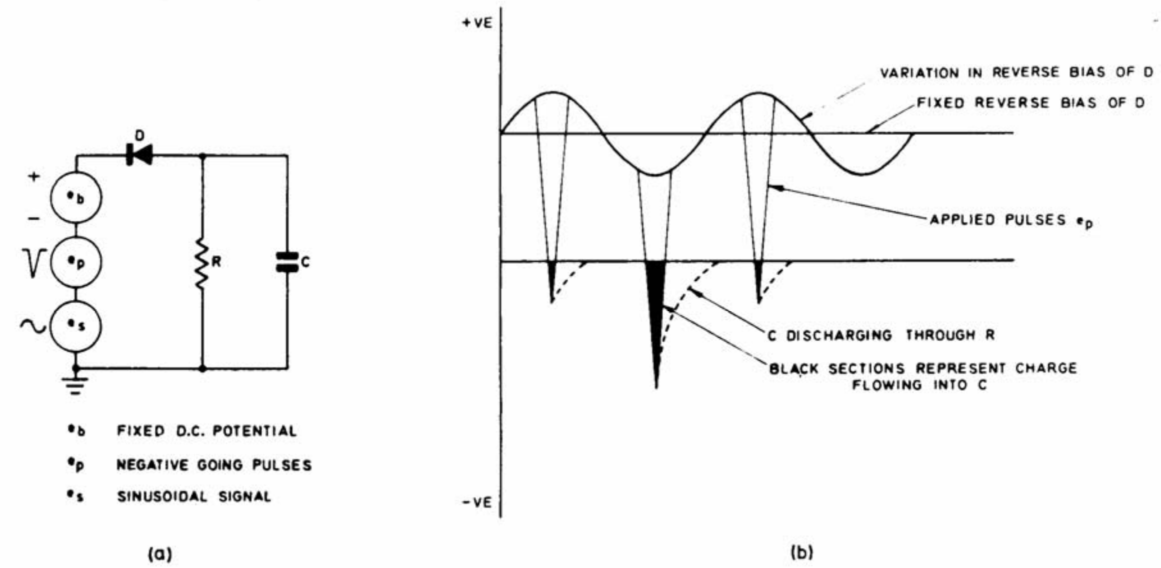


FIG. 2.2 BASIC PRINCIPLES OF OPERATION

4.3 This principle can be used to tune a v.h.f. transmitter, having transmission frequencies which are harmonics of its particular channel spacing and may be extended, by using the technique of shifting the reference frequency, to transmitters operating on frequencies which are not an exact multiple of the channel spacing frequency. The channel spacings provided for are 12.5, 25, and 50 kHz. Thus for a 12.5 kHz channel spacing transmitter, the instrument generates 12.5 kHz pulses. Modern transmitter design practice is such that the available tuning range only allows the correct frequency to be set. Thus in Fig. 2.2, by substituting the transmitter for e_s and the 12.5 kHz instrument pulses for e_p and monitoring the audio across C, the transmitter can be correctly tuned. Correct tuning would be indicated when the monitored signal frequency was zero. If the channel spacing were 25 kHz, it might be possible to detune the transmitter by more than 12.5 kHz; thus if instrument pulses at a frequency of 12.5 kHz were used, more than one harmonic relationship would be possible, and the transmitter might be tuned to an incorrect frequency. For this reason the instrument pulse frequency is increased to 25 kHz for tuning transmitters with 25 kHz channel spacing and 50 kHz for transmitters with 50 kHz channel spacing.

APPLICATION OF BASIC PRINCIPLES

4.4 Instead of the arrangement shown in Fig. 2.2, the instrument uses a balanced bridge, the principle of which is shown in Fig. 2.3. Fig. 2.3 also indicates how the charge on capacitor C depends upon the frequency

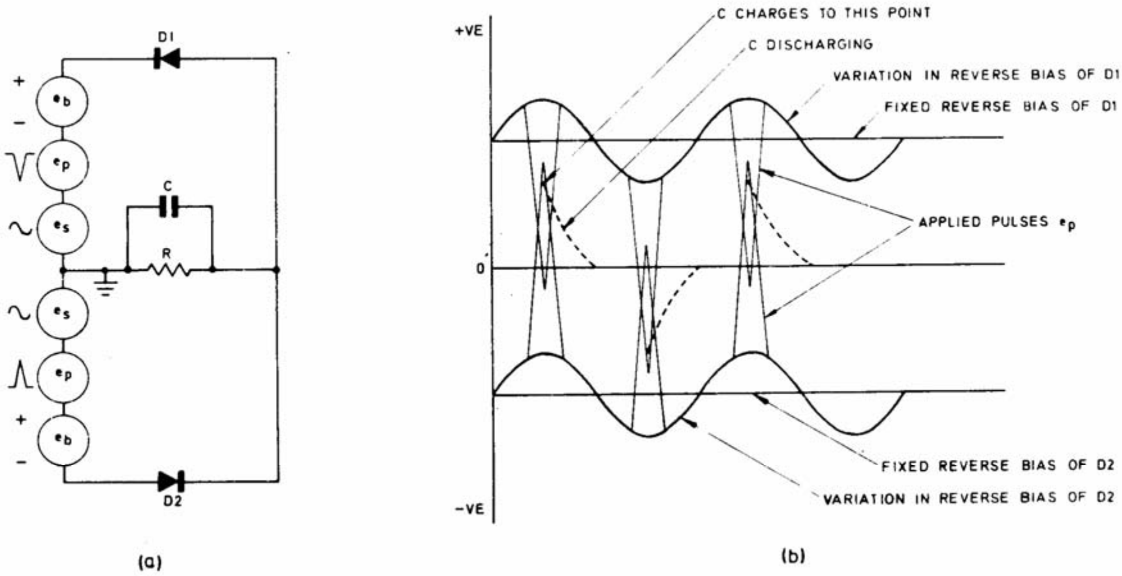


FIG. 2.3 PRINCIPLE OF THE BALANCED COMPARISON BRIDGE

relationship between e_s and e_p. The charge flowing into C is the algebraic sum of the charges that are due to both pulses. The charge level is modulated as before, except that pulses which correspond with positive half cycles of e_s charge C in one direction while pulses corresponding with negative half cycles charge C in the opposite direction. Thus when e_p and e_s are not harmonically related, an a.c. envelope about earth is developed across C. Conversely when e_s and e_p are harmonically related a d.c. output envelope is developed at C which may be either positive or negative or zero, depending on which point of e_s corresponds with e_p.

4.5 The circuit diagram of the unit (at the end of the book) shows the similarity between the bridge and the circuit of Fig. 2.3. D14 and D15 are hot carrier diodes, chosen for their high speed switching capability and low capacitance. D14 and D15 are reverse biased by the voltage stabilizer circuits using D13 and D16. RV1 enables the biasing of D14 and D15 to be balanced; pulse inputs fed via capacitors C22 and C23 overcome this reverse bias. The input signal is applied via the instrument input socket SK2, and R31 maintains the input impedance at approximately 50 ohms. Stray capacitance in the bridge performs the function of C in Fig. 2.2. The envelope output to C27 will be a.c. when the transmitter is off tune, and d.c. when it is on tune.

4.6 The simplified block Diagram (Fig. 2.1) shows the general arrangement of the instrument, while the circuit details are discussed in Section 5 commencing on the following page.

SECTION 5

CIRCUIT DESCRIPTION

PULSE GENERATION

5.1 The fast-warm-up oscillator Type 843 generates a 5 MHz signal, which is fed into amplifier Q1 via coupling capacitor C2. The positive half cycles of the a.c. voltage developed across L1 switch on Q3. Q3 earths the emitter of Q2 via R7, and switches on the regenerative divider formed by Q2 and its associated components. The charge on C3 maintains R7 at earth potential during the half cycles of the 5 MHz signal that allow Q3 to switch off. Thus Q3 ensures complete shut-down of the regenerative divider upon failure of the 5 MHz signal, guarding against the generation of incorrect frequencies. The regenerative divider divides by 5 and feeds the 1 MHz signal via C6 to amplifier Q4.

5.2 The amplified output of Q4 is fed to the transistor pump formed by Q5, C7, D1 and C9 and a staircase voltage is developed across C9. The regenerative pair Q6 and Q7 form a voltage comparator, which discharges C9 after 10 steps of the staircase voltage and resets the transistor pump. The resulting pulse output from Q6 is at one tenth the frequency of the input to Q4, and is fed to a second similar divider circuit. This circuit divides by 2, 4 or 8 depending on whether C15, C12 or C13 repectively is in circuit. The choice of capacitor is made by the frequency switch on the front panel; for example, for 12.5 kHz transmitter channel spacing, C13 would be in circuit. Diodes D3 and D4 compensate for the ambient temperature effects on D2, D6 and the emitter-base junctions of Q6 and Q10, thus giving temperature stability to the voltage comparators.

FREQUENCY COMPARISON

5.3 Each pulse is fed via switch Q14 to the avalanche-mode pulse generator Q15, which produces current pulses in the unbalance-to-balance transformer T1. Negative-going pulses are fed via C22 to the sampling bridge formed by D14, D15, R38 and R39, and positive-going pulses are fed to it via C23. This bridge also receives the transmitter signal and is the heart of the calibrator; its action is described in detail in paragraphs 4.1 to 4.5.

5.4 The amplitude-modulated pulses are fed from the bridge to the amplifier Q16, 17 and 18, and capacitor C31 provides further stretching of the modulated pulses. Further amplification is provided by Q19, 21 and 22 and the signal is then applied to the low pass filter formed by R64, C39 and C41. Any components above about 1 kHz are filtered out, and the signal is then applied to the audio amplifier Q24, 25, 26 and 27. With S1 in the 50 kHz position, emitter resistor R67 gives negative feedback; with S1 in the 25 kHz position, R67 is partially decoupled by C46 and R71, thus reducing the negative feedback and increasing the gain. This is necessary since the average value of the pulses decreases with decreased pulse repetition frequency. Similarly with S1 in the 12.5 kHz position, the negative feedback is further reduced by C46 and R72. The complementary pair Q26 and 27 form the output stage of this class B push-pull amplifier, and drive the loudspeaker LS1. If headphones are connected, jack JK1 disconnects the loudspeaker.

5.5 To assist audibility of very low frequencies the audio output circuit and the loudspeaker effectively differentiate the audio waveform to produce an output of 'clicks'.

5.6 The output from Q22 is also fed to D21 and C38, which converts it to a d.c. signal that is fed to meter M1. When the transmitter is almost on tune, the variation in the pulse level causes pulsating indication on M1; but when the transmitter is exactly on tune, M1 indicates a steady level.

FREQUENCY OFFSET

5.7 An 'offset' facility is provided by the application of a preset d.c. voltage to the varactor tuning circuit of the fast-warm-up oscillator. The potentiometers RV3 and RV4, on the Reference Voltage Assembly 19-0370, are preset to provide voltage levels which via the OFFSET switch enable the oscillator to operate at frequencies slightly higher than 5MHz. The chosen offsets are 293.4Hz (OFFSET 1) and 224.1 Hz (OFFSET 2).

POWER SUPPLIES

5.8 The positive 12V d.c. supply is derived from terminal 8 of the electronic smoothing assembly. The primary winding of T3 has input taps for either 110 or 220V. D17 and 18 provide full wave rectification and C34 and 48 provide smoothing. Further smoothing is provided by transistor Q20, which is connected as an emitter follower. R55 and C35 decouple the base of Q20, thus holding it at a steady level, and maintaining steady conduction of Q20 for small variations in voltage at terminal 9. LP1 lights to indicate the presence of d.c. at terminal 9 in the 852M version of the calibrator only.

5.9 The remaining part of the circuit is the d.c.-to-d.c. converter, which provides the approximately 68V positive d.c. supply to Q15 of the avalanche mode pulse generator. Q12 and 13 function as high speed switching elements and, in conjunction with saturable-core transformer T2, produce square waves. T2 steps up these square waves in voltage, and applies them to the rectifier bridge D9-D12. C24 removes any ripple on the output of the bridge, and a steady d.c. level of about 68V is obtained from R33.

FAST WARM-UP OSCILLATOR TYPE 843

5.10 The Type 843, as shown in Fig. 4.6, sub-divides into four sections:-

(a)	Control Board Assy.	19-0037	(Circuit reference prefix - 1)
(b)	Amplifier Board Assy.	19-0038	(Circuit reference prefix - 2)
(c)	Xtal (5MHz) Board Assy.	19-0371	(Circuit reference prefix - 3)
(d)	Mother Board Assy.	19-0040	(Circuit reference prefix - 4)

5.11 Functionally, the instrument comprises the following stages:-

(a) Crystal-controlled Oscillator

(b) AVC Amplifier

(c) Temperature Controller

(d) Voltage Stabilizer

5.12 The crystal-controlled oscillator is a standard Pierce circuit with the output taken from the load resistor of 3Q1. Frequency trimming is carried out by varicap diode 3D2, which is supplied with a variable voltage tapped from Zener diode 3D1 by potentiometers 4RV1 and 4RV2. An additional 'adjust-on-test' capacitor, CX, is used to tune the crystal frequency to the required mean value. Only the components CX, 3D1, 3D2, 3R1 and the crystal XL1 are temperature controlled. External connections via the OFFSET switch S2 to the potentiometers RV3 and RV4 provide for frequency offset (see para. 5.7)

5.13 The output of the oscillator is amplified in the common-emitter stage 2Q1 and transformed to a lower impedance by the emitter-follower stage 2Q3. 2Q3 feeds both the output terminal (through 2R8 and 2C5) and the AVC amplifier 2Q2 (via 2C4).

5.14 In the absence of a signal the collector of 2Q2 is held at approximately +4 volts, this voltage being applied to the base of 3Q1. Thus the gain of 3Q1 is high and oscillations build-up. As the oscillations build-up they are rectified at the base of 2Q2. 2Q2 conducts, reducing the potential applied to the base of 3Q1, and thereby stabilizing the level.

5.15 The temperature controller is of the pulse-width modulated type, so that the minimum amount of power is dissipated in the control transistor, but the advantages of proportional control are retained.

5.16 The actual operating temperature of the controller is determined by the setting of 1RV1, this normally being adjusted such that the crystal operates at its turnover temperature.

5.17 Transistors 1Q1 and 1Q2 form a relaxation oscillator, and together with components 1R5, 1C2 and 1C3 they apply a modified saw-tooth waveform of about 1 kHz nominal frequency to the base of 1Q3. The d.c. potential at the base of 1Q3 is derived from the potential divider formed by the thermistor, TH1, resistor 1R6 and potentiometer 1RV1. Under stable conditions 1Q3 is turned off by the initial negative spike of the modified saw-tooth waveform, and on again at a point on the rising portion of the waveform determined by the setting of 1RV1.

5.18 The thermistor, TH1, is mounted on the crystal. Changes in the crystal temperature cause the reistance of TH1 to vary, which in turn varies the d.c. bias to the base of 1Q3.

5.19 Transistors 1Q3 and 1Q4 form a Schmitt trigger with a snap-over action at the critical point. The output of 1Q4 is in the form of a pulse-width modulated 1 kHz pulse train, which is applied to the compound emitter follower 3Q2/3Q3, causing this to switch a 1 kHz current of 500 mA peak into the crystal heater winding. The function of 2L1 and 2L1 and 2C8 is to prevent the supply line being modulated by the 1 kHz current.

5.20 The fast-warm-up facility is provided by allowing the heater controls to saturate when the temperature is too low. The thermistor TH1, thus has a very high resistance, causing 1Q3 to be nonconducting during the warm-up period.

5.21 The voltage stabilizer 1Q5 uses Zener diode 1D1 as a reference. However, the stabilized voltage will fall as a function of temperature due to changes in Vbe of 1Q5. Further stabilization of the voltage fed to the variacap diode 3D2 is carried out by the Zener diode 3D1 in the crystal subassembly.

SECTION 6

MAINTENANCE

INTRODUCTION

6.1 This section of the manual provides facts and figures concerning circuit performance and the setting-up of internal controls. This information should be acted upon only by qualified and suitably equipped personnel who are experienced in servicing test equipment.

DISMANTLING AND REASSEMBLY

6.2 Specific dismantling and reassembly instructions for the Frequency Calibrator are considered unnecessary, the requirements in this respect being fairly obvious, if not from a brief visual examination of the unit, then from the description of its construction given in Section 1 and /or the service views contained in Figs. 2.4 and 2.5 at the end of this section.

GENERAL PERFORMANCE CHECK

6.3 This procedure is recommended for use wherever an assessment of general rather than detailed circuit performance is required. Apart from headphones the only test equipment necessary is a signal generator (frequency range 100 kHz to 500 MHz: output levels 1 mV to 100 mV into 50 ohms).

6.4 At the start of the check the instrument is assumed to be in a completely assembled state, the function switch to be at OFF and the cover closed.

(1) Open the cover.

(2) If the unit under test is a.c. mains operated, connect to a suitable a.c. power supply.
Check that the A.C. POWER indicator lamp (which in the battery operated version is fitted but not used) glows.
Check that the LEVEL meter index registers zero deflection.

(3) Switch to CHECK BATTERY.
Check that the LEVEL meter index registers within the black sector. The batteries must be in a satisfactory condition to carry out the test procedures.

(4) Attempt to close the cover.
Check that the fouling piece prevents it closing in all positions of the function switch except OFF.

(5) Check the Sensitivity. Set the CHANNEL SPACING switch to 50 kHz and apply a signal at 10.3 MHz to the signal input socket. Check that it takes not more than 100 mV of this signal to make the LEVEL meter index register maxtmum deflection in the white sector. If necessary adjust C21. Refer to paragraph 6.12 for instructions.

(6) Carry out a response check as follows:-
 (i) Change the frequency of the input to 500 MHz.
 (ii) Check that it takes not more than 100 mV of this signal to make the LEVEL meter index register in the black sector.
 (iii) Tune signal generator back to 10 MHz to check that there are no 'holes' in the response.
 (iv) With CHANNEL SPACING set to 50 kHz and the VOLUME control set to an appropriate level vary the signal generator frequency from 10 MHz upwards and check that the null points occur at 50 kHz intervals. (e.g. at 10.00, 10.05, 10.10 etc.

(7) Find 10.025 MHz with 25 kHz channelling. Then return the CHANNEL SPACING switch to 50 kHz and check that LEVEL meter beat is not accompanied by an audible beat.

(8) In the 25 kHz setting of the CHANNEL SPACING switch check that three discrete nulls appear between 10.0 and 10.1 MHz.

(9) In the 12.5 kHz setting of the CHANNEL SPACING switch check that seven discrete nulls appear between 10.0 and 10.1 MHz.

(10) Check that on any 50 kHz channel the audio null is mantained as the CHANNEL SPACING switch is turned to 25 kHz and 12.5 kHz channelling.

(11) Plug headphones into PHONES jack.
Choose any convenient signal frequency and channelling to produce an audio output.
Check that audio output is heard in headphones but not in loudspeaker.

DETAILED PERFORMANCE CHECK

6.5 This procedure provides the basis for a detailed assessment of circuit performance and for this reason is suitable for fault finding as well as for routine maintenance.

Power Supply Connection

6.6 To enable the procedure to be carried out the instrument must be dismantled sufficiently to give access to its interior and then the internal power supply re-established through the extender lead provided.

Test Equipment Required

CAUTION: Test equipment should be connected to the circuit with the power OFF. Take care to avoid accidental short circuits during testing which could result in damage to the instrument.

6.7 Voltmeter d.c. to measure 25V
Ammeter d.c. to measure 1A
Frequency meter (counter) to measure 5 MHz to an accuracy of 1 part in 10^8.
Oscilloscope to measure up to 5 MHz.
A.F. signal generator, frequency range 1 Hz to 50 kHz, output levels 3 mV to 1V into 600 ohms.
R.F. signal generator, frequency range 100 kHz to 500 MHz, output levels 1 mV to 100 mV into 50 ohms.
Audio millivoltmeter.
Headphones.
'L' attenuator pad, comprising resistors of value 560 ohms and 10 ohms, tolerance 5% and power rating ½ watt.

Sampler Divider Assembly 19-0383

6.8 (1) Switch to CHECK BATTERY and check the following:-

(i) That the d.c. supply voltage, measured across pins 6 and 7 (+ve) of the power socket, is between 10V and 15V.

(ii) That the supply current stabilizes at approximately 40 mA. after 30 seconds from switch on. (See NOTE).

(iii) That the LEVEL meter index registers within the black sector.

NOTE: During the first 30 seconds from switch-on, the supply current is approximately 500 mA due to the 843 oscillator warm-up load.

(2) Set the CHANNEL SPACING switch to 50 kHz and check that the supply current stabilizes at approximately 100 mA.

(3) With the oscilloscope, check for a near sine wave signal at the junction R9/10 and for a negative pulse signal at the junctions R14/15 and R24/25.

(4) Observe the signal at the junction R9/10. If necessary, adjust L2 to bring the displayed waveform into lock. Compare this with the signal at C2 and verify that division by 5 occurs to produce a signal at 1.0 MHz.

(5) Short-circuit resistor R1 and check that the 1.0 MHz signal disappears.

(6) With the frequency meter (counter) compare the frequency of the signal at the junction of R9/10 with the frequency at the junction R14/15, and verify that they have a ratio of 10 to 1.

(7) Compare the frequency of the signal at the junction of R14/15 with the frequency at junction R24/25 for different settings of CHANNEL SPACING switch. The frequency ratios should be in accordance with Table 4 below.

TABLE 4

Test Points	CHANNEL SPACING Selected	Frequency Ratio To be observed
Junction of R14/15 and Junction of R24/25	50 kHz	2 : 1
	25 kHz	4 : 1
	12.5 kHz	8 : 1

Stretcher Output Assembly 19-0373

6.9 (1) Remove the Sampler Divider Assembly 19-0383 from the unit.

(2) Turn the VOLUME control fully counter-clockwise. Apply an audio signal, via the specified pad, to pin 14 and 13 (0V).
Monitor on the oscilloscope the output across pins 21 and 20 (0V).

(3) Set the CHANNEL SPACING switch to 50 kHz.
Check that for a 500 Hz input to the pad of not more than 7 mV r.m.s., the monitored output is not less than 7V peak-to-peak and just distorting by limiting top and/or bottom.

(4) Turn the VOLUME control clockwise.
Check that the output squares off at approximately 2V peak-to-peak.

(5) Check that an audio output can be heard in the headphones and, when the headphones are disconnected, in the loudspeaker.

(6) Turn the VOLUME control counter-clockwise.

(7) Using the audio millivoltmeter measure the audio response across pins 21 and 20. Check that this is within 4 dB from 10Hz to 500Hz and at least 16dB down at 4kHz.

(8) Check the LEVEL meter sensitivity by verifying that it takes an input to the specified attenuator pad of not more than 60 mV r.m.s. for the meter index to register maximum deflection in the white sector.

(9) Replace the Sampler Divider Assembly.

CALIBRATION

The Oscillator

6.10 The Type 843 oscillator is specially designed to provide very fast warm-up characteristics. Nevertheless, in common with all crystal oscillators, best long term stability is obtained under conditions of continuous operation. After periods of inactivity exceeding 24 hours the normal warm-up time of three minutes may be followed by a period in which frequency changes at a rate faster than that assigned to long-term ageing. It is therefore recommended that on receipt from the factory or subsequent to any other lengthy interruption of service the equipment should be operated for several hours before oscillator re-calibration is carried out.

(1) Dismantle the instrument sufficiently to give interior access and then establish the power supply through the extender lead provided.

(2) Connect the counter, used in the detailed performance check, to pin 1 on the oscillator base.

(3) Set the OFFSET switch to OFF.

(4) Check the reading on the counter.
If necessary adjust the fine frequency control on the 843 oscillator to obtain a reading on the counter of exactly 5 MHz. (Fig. 2.5 identifies the adjustment.) Use a small screwdriver.

(5) If a reading of 5 MHz is unobtainable with the fine tuning control, or if it is obtainable but only with the control very close to either of its limits, proceed as follows:-

(i) Set the fine tuning control approximately to its centre position.

(ii) Adjust for a reading as near as possible to 5 MHz using the coarse tuning control.

(iii) Carry out any further tuning that may be necessary to obtain exactly 5 MHz using the fine tuning control.

(6) With the OFFSET switch set to the appropriate position for each control, adjust the pre-set potentiometers RV3 and RV4 on the Reference Voltage Assembly 19-0370 to obtain the offset frequencies shown in Table 5, below.

TABLE 5

OFFSET Switch Setting	Frequency (Hz)	Adjustment
Off	5,000,000	on 843 unit
1	5,000,293.4	RV3
2	5,000,224.1	RV4
3	NOT USED	

ALIGNMENT

Adjustment of L2 (Regenerative Divider)

6.11 (1) Prepare the unit as in para. 6.10 operation (1)

(2) Connect the oscilloscope (used in the detailed performance check) to the junction of resistors R9 and R10.

(3) Observe the display and, if necessary, adjust L2 to bring it into lock.

Adjustment of C21 (Pulse Level)

6.12 (1) Prepare the unit as in para. 6.10 operation (1).

(2) Set the channelling selector switch to 50 kHz.

(3) Apply a signal at a convenient frequency, say 10 MHz, to the unit signal input socket.

(4) With the signal generator set to give an input level of 100 mV, adjust C21 to the minimum value that is required to make the LEVEL meter index register maximum deflection in the white sector.

Adjustment of RV1 (Sampler Bridge Balance)

6.13 (1) Prepare the unit as in para. 6.10 operation (1).

(2) Set the channelling selector switch to 50 kHz.

(3) With no signal input to the instrument adjust RV1 until the LEVEL meter index registers minimum deflection in the white sector.

BATTERY CHECK (Type 852B)

6.14 Whether or not the batteries need to be replaced will be indicated after carrying out the test referred to in Section 3 paragraph 3.2.

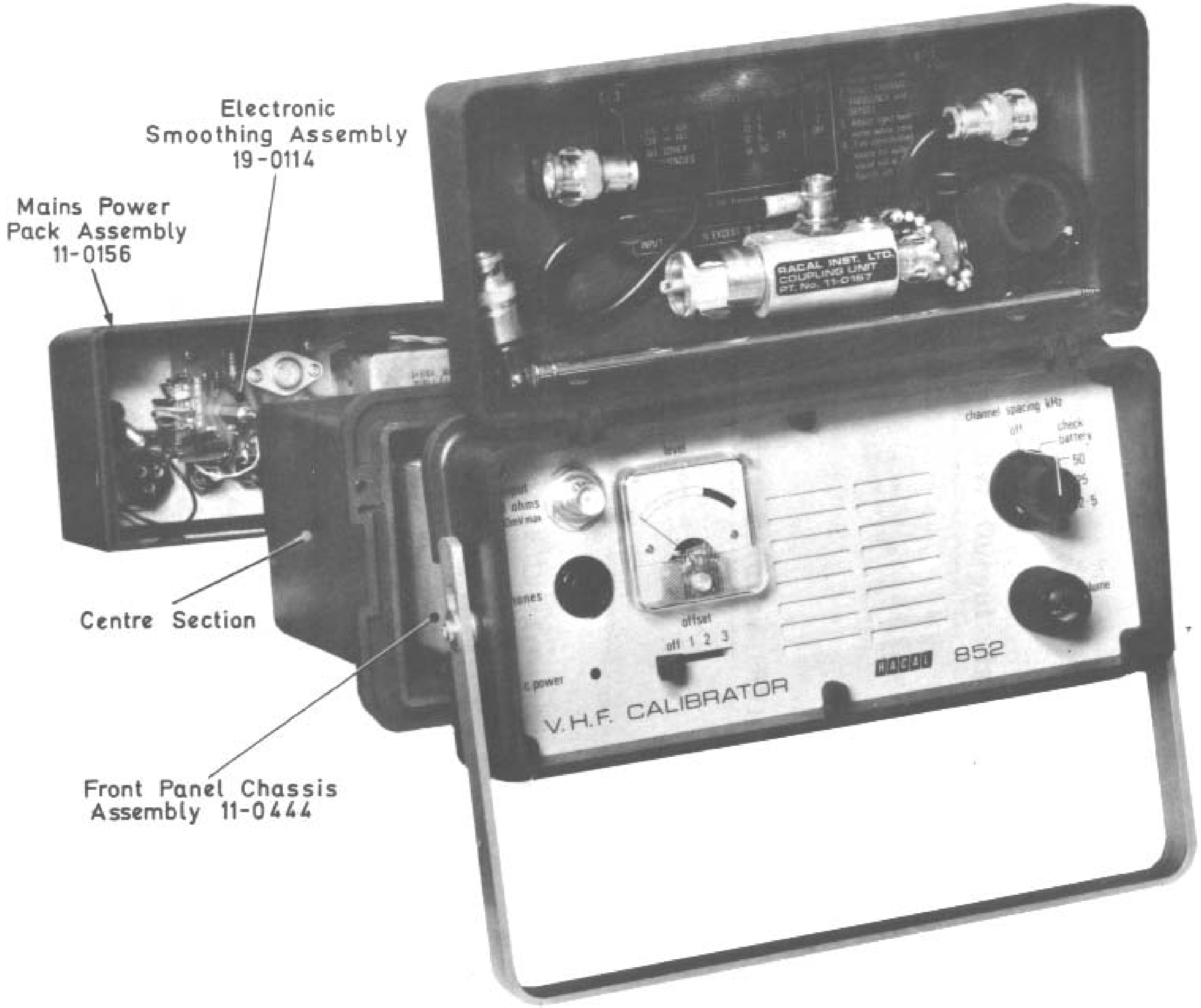
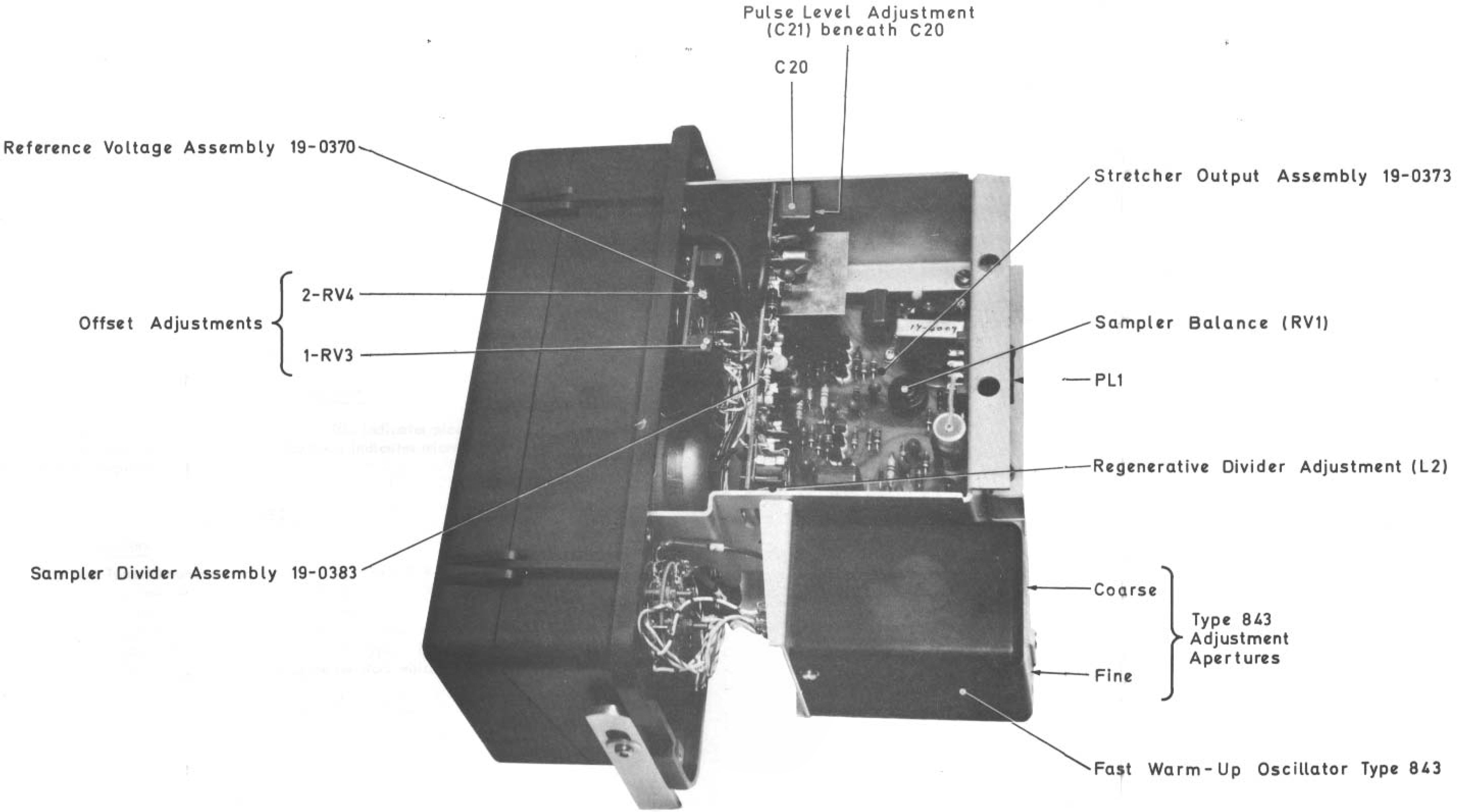


Fig. 2·4

Service View: Type 852 with Mains Power Pack



Service View: Type 852 Front Panel Chassis Assembly

Fig. 2·5

PART 3

PARTS LIST

CONTENTS

Component Values

Resistors

No suffix indicates 'ohms'
Suffix 'k' indicates kilohms
Suffix M indicates megohms

Capacitors

No suffix indicates picofarads
Suffix μ indicates microfarads

NOTES

Replacement Resistors

The Erie Type 15 composition resistor which has a 0.4 inch (10mm) lead spacing may be replaced by the Mullard Type CR16 carbon film type. In cases where the printed circuit board has resistor mounting holes with 0.5 inch (12.5mm) spacing, the recommended replacement resistor is the Mullard CR25, 330mW, carbon film type. The Mullard CR25 may also replace those $\frac{1}{4}$ watt 5% metal oxide resistors which have 0.5 inch hole spacing.

PARTS LIST

ORDERING OF SPARE PARTS

1. To be assured of satisfactory service when ordering replacement parts, the customer is requested to include the following information.

   (a) Instrument type and serial number.

   (b) The type reference of the Assembly in which the particular item is located (for example, "19-0373").

   (c) The Racal Part Number and circuit reference of each item being ordered.

   It should be noted that a minimum charge of £5 sterling is applicable to all orders.

2. The name of the manufacturer (Vendor) quoted in the right-hand column of the Parts List is for general information only. Racal Instruments Limited, reserves the right to supply an equivalent or improved part by another manufacturer, if necessary.

Part No.	Description	Rat.	Tol. %	Value	Component Reference	Vendor
	CASE ASSEMBLY 11-0152					
23-0007	Fuselink	1.5A			FS3.......	(Bulgin F270 (Beswick TDC13 (or (Bussman (USA) GMA
23-3050	Socket 8-way				SK3......	McMurdo RS8
	PLATE AND CONTACT ASSEMBLY 11-0155					
23-0013	Fuseholder P.C.					Bulgin F267/P.C.
	MAINS PACK ASSEMBLY 11-0156					
19-0114	Electronic Supply Assembly (See parts list 19-0114)					Racal Insts.
17-4011	Transformer Assembly				T3........	Racal Insts.
21-0560	Electrolytic	25V		3 300µ	C34, C35	Mullard 071-16332
23-0004	Fuselink	0.5A(220V			FSI, FS2	Bulgin F270
23-0006	Fuselink	1A (110V)				Bulgin F270
23-0014	Fuseholder					Bulgin F296
23-3036	Receptacle-Male 3 pin-mains connector				PL2	Bulgin P429
10-2018	Power Lead Assembly					Racal Insts.
	FRONT PANEL ASSEMBLY NO.11-0444					
11-0144	Lamp Assembly- Indicating				LP1......	Racal Insts.
15-0012	Knob-(Indicative)					Racal Insts.
15-0068	Knob-(Continuous)					Racal Insts.
17-0010	Switch (Frequency)				S1.......	Racal Insts.
20-6007	Potentiometer W/W			1K	RV2......	Colvern CLR/ 1106/11
	CAPACITORS					
21-0509	Electrolytic	25V		250µ	C43......	Waycom A6-1

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
22-1602	S1 Diode	100V 1A			D24	Texas IN4002
23-2001	Meter				M1	Hioki MK.38 through K.B.K. Ltd.
	or					
23-2000	Meter					Shinohara MR.38 through S.T.C.
23-3049	Socket-Panel Mounting				SK1	A.E.I. VH437/ 7010
23-3051	Plug-8 way				PL1	McMurdo RP8
23-3052	Jack Socket (phone)				JK1	Render J401A
23-4018	Switch, Offset				S2	N.S.F. MLA.8.
23-9015	Loudspeaker				LS1............	Goodmans 77-207-25(SQ)

CRYSTAL SUB-ASSEMBLY (5MHz) No. 11-0458 (Part of Oscillator Type 843)

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
17-2007	Crystal-5 MHz				XL1	
	RESISTORS					
20-0104	Composition	1/10W	10%	100K	3R1	Erie 15
	DIODES					
22-1812	Voltage Reg		5%	7.5V	3D1	Mullard BZY-88 C7V5
22-1027	Silicon Variable Cap				3D2	Fairchild BBY13
22-3000	Thermistor				TH1	S.T.C. M15

CONTROL BOARD ASSEMBLY No. 19-0037 (Part of Oscillator Type 843)

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
	RESISTORS					
20-0100	Composition	1/10W	10%	10	1R3	Erie 15
20-0104	Composition	1/10W	10%	100K	1R4, 1R5	Erie 15
20-0222	Composition	1/10W	10%	2.2K	1R2	Erie 15
20-0392	Composition	1/10W	10%	3.9K	1R1	Erie 15
20-0681	Composition	1/10W	10%	680	1R11	Erie 15

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
	RESISTORS					
20-2103	Metal Oxide	¼W	5%	10K	1R9, 1R10.......	Erie MO4
20-2152	Metal Oxide	¼W	5%	1.5K	1R7, 1R8	Erie MO4
20-2332	Metal Oxide	¼W	5%	3.3K	1R6............	Erie MO4
20-6000	Variable	W.W.10K			1RV1	Amphenol 2600P
20-0330	Composition	1/10W	10%	33	1R12...........	Erie 15
	CAPACITORS					
21-1002	Tantalum or	15V		10μ	1C4............	S.T.C. TAG 10/25
21-1011	Tantalum	20V		10μ		Waycom CL106/M
21-3509	Polystyrene		5%	100	1C2	Suflex HS7/A
21-4502	Polyester	250V	20%	0.022μ	1C1	Waycom MKS
21-4504	Polyester	250V	20%	0.047μ	1C3	Waycom MKS
	DIODES					
22-1814	Zener		5%	9.1V	1D1	Hughes HS7091
	TRANSISTORS					
22-6000	Silicon pnp				1Q2............	Fairchild U2956/5
22-6001	Silicon npn				1Q1, 1Q3, 1Q4, 1Q5...........	Texas D1559
23-5016	Connector Strip 6 way					Verelco 6C

AMPLIFIER BOARD ASSEMBLY No. 19-0233 (Part of Oscillator Type 843)

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
17-3017	Coil Assembly				2L1	Racal Instruments
	RESISTORS					
20-0101	Composition	1/10W	10%	100	2R3, 2R12.......	Erie 15
20-2102	Metal Oxide	1/4W	5%	1K	2R1............	Erie MO4
20-2103	Metal Oxide	1/4W	5%	10K	2R10, 2R11, 2R13.	Erie MO4
20-2152	Metal Oxide	1/4W	5%	1.5K	2R6............	Erie MO4
20-2273	Metal Oxide	1/4W	5%	27K	2R4............	Erie MO4
20-2331	Metal Oxide	1/4W	5%	330	2R9............	Erie MO4
20-2562	Metal Oxide	1/4W	5%	5.6K	2R5............	Erie MO4
20-2681	Metal Oxide	1/4W	5%	680	2R7, 2R8........	Erie MO4

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
	CAPACITORS					
21-1008	Tantalum	15V		150µ	2C8	S.T.C.472/LWA/ 403FAA
21-1002	Tantalum	15V		10µ	2C6, 2C7	S.T.C. TAG 10/15
	or					
21-1011	Tantalum	20V		10µ		Waycom CL 106
21-~~4502~~	Polyester NOT STOCKED	250V	20%	~~0.22µ~~	2C1, 2C2, 2C3, 2C4	
21-1546	CERAMIC PLATE			0.022µF	2C5	Waycom MKS
	DIODES					
22-1006	Silicon				2D1	Transitron EA403
	TRANSISTORS					
					22-6018 —	MMPS3640
22-6000	Silicon pnp				2Q3	Fairchild U2956/5
22-6001	Silicon pnp				2Q1, 2Q2	Texas D1559 ZTX313 2N2369
23-5020	Connector Strip 10 way					Verelco 10C

MOTHER BOARD ASSEMBLY No. 19-0040 (Part of Oscillator Type 843)

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
	RESISTORS					
20-2103	Metal Oxide	1/4W		10K	4R2	Erie MO4
20-2104	Metal Oxide	1/4W		100K	4R3	Erie MO4
20-2222	Metal Oxide	1/4W	5%	2.2K	4R1	Erie MO4
20-2473	Metal Oxide	1/4W		47K	4R4	Erie MO4
20-6001	Variable WW			20K	4RV1, 4RV2	Amphenol 2600P
	CAPACITORS					
21-4502	Polyester	250V		0.022µ	4C1	Waycom MKS
23-5026	Connector Strip 6 way					Verelco 6C
23-5030	Connector Strip 10 way					Verelco 10C

ELECTRONIC SUPPLY ASSEMBLY No. 19-0114

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
	RESISTORS					
20-0472	Composition		10%	4.7K	R76	Erie 15
20-3151	Metal Oxide	1/2W	±5%	150	R55	Erie MO5

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
	DIODES					
22-1006	Silicon				D19	Transitron EA403
22-1602	Silicon				D17, D18	Motorola 1N4002
22-6011	TRANSISTOR npn power				Q20	R.C.A. 40250

REFERENCE VOLTAGE ASSEMBLY 19-0370

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
	RESISTORS					
20-2123	Metal Oxide	1/4W	5%	12K	R89.............	Erie MO4
20-2103	Metal Oxide	1/4W	5%	10K	R77, ...	Erie MO4
20-2821	Metal Oxide	1/4W	5%	820	R80	Erie MO4
20-6005	Variable W/W		5%	10K	RV3, RV4........	Painton 200P
20-2562	Metal Oxide	1/4W	5%	5.6K	R78.............	Erie MO4
	DIODES					
22-1810	Voltage Regulator 6.2V400mW				D29.............	Mullard BZY88 C6V2
	TRANSISTORS					
22-6008	Silicon pnp				Q32............	Motorola 2N 3906

CRYSTAL BOARD ASSEMBLY (5MHZ) No. 19-0371 (Part of Oscillator Type 843)

Part No.	Description	Rat.	Tol %	Value	Component Reference	Vendor
	RESISTORS					
20-0103	Composition	1/10W	10%	10K	R2	Erie 15
20-2332	Metal Oxide	1/4W	5%	3.3K	R3	Erie MO4
	CAPACITORS					
21-3510	Polystyrene		2½%	270	C2	Suflex HS7/A
21-3511	Polystyrene		2½%	390	C1	Suflex HS7/A
21-1561	Ceramic		10%	10-470* *(See Note)	CX..............	Erie YD
	TRANSISTORS					
22-6004	Silicon npn				Q1	Semiconductors ST 70
22-6049	Silicon npn				Q3..............	Motorola 2N3705
22-6010	Silicon pnp				Q2..............	Motorola 2N4126
	or					or
22-6008	Silicon pnp					Motorola 2N3906

NOTE: The value of CX is selected on factory test and is in the range 10p to 470p.

Part No.	Description	Rat	Tol %	Value	Component Reference	Vendor
23-5020	Connector Strip 10 way					Verelco 10C

STRETCHER OUTPUT ASSEMBLY No. 19-0373

Part No.	Description	Rat	Tol %	Value	Component Reference	Vendor
	RESISTORS					
20-0333	Composition	1/10W	10%	33K	R22, R75	Erie15
20-0224	Composition	1/10W	10%	220K	R32	Erie 15
20-0100	Composition	1/10W	10%	10	R91, R92	Erie 15
20-0102	Composition	1/10W	10%	1K	R57, R58, R33	Erie 15
20-0103	Composition	1/10W	10%	10K	R68, R23	Erie 15
20-0152	Composition	1/10W	10%	1.5K	R45, R52, R69	Erie 15
20-0153	Composition	1/10W	10%	15K	R53, R65	Erie 15
20-0221	Composition	1/10W	10%	220	R47..............	Erie 15
20-0223	Composition	1/10W	10%	22K	R51, R66	Erie 15
20-0331	Composition	1/10W	10%	330	R70..............	Erie 15
20-0332	Composition	1/10W	10%	3.3K	R56..............	Erie 15
20-0471	Composition	1/10W	10%	470	R44, R48..........	Erie 15
20-0472	Composition	1/10W	10%	4.7K	R43..............	Erie 15
20-0682	Composition	1/10W	10%	6.8K	R60..............	Erie 15
20-3103	Metal Oxide	1/2W	5%	10K	R46	Erie MO5
20-3152	Metal Oxide	1/2W	5%	1.5K	R62	Erie MO5
20-3221	Metal Oxide	1/2W	5%	220	R72	Erie MO5
20-3223	Metal Oxide	1/2W	5%	22K	R40, R41	Erie MO5
20-3330	Metal Oxide	1/2W	5%	33	R50..............	Erie MO5
20-3333	Metal Oxide	1/2W	5%	33K	R73..............	Erie MO5
20-3472	Metal Oxide	1/2W	5%	4.7K	R49, R64, R61	Erie MO5
20-3473	Metal Oxide	1/2W	5%	47K	R59..............	Erie MO5
20-3680	Metal Oxide	1/2W	5%	68	R74..............	Erie MO5
20-3681	Metal Oxide	1/2W	5%	680	R42, R54, R67, R71 .	Erie MO5
20-4412	Metal Oxide	1/2W	2½%	15K	R63..............	Erie MO5
20-6547	Variable Composition			22K	RV1..............	Plessey MP (Dealer)
	or					
20-6556	Variable Composition			27K		
	CAPACITORS					
21-0530	Electrolytic	25V		5μ	C27	Mullard C426AR/F6.4
	or					
21-1006	Tantalum	35V		4.7μ		I.T.T. TAG 4.7/35
21-1014	Tantalum	4V		47μ	C29, C36, C44, C45.	Waycom CL 476M
	or					
21-1007	Tantalum	3V		47μ		I.T.T. TAG 47/3

Part No.	Description	Rat	Tol %	Value	Component Reference	Vendor
21-1551	Ceramic	30V	-25% +50%	0.1µ	C38, ...	Erie 811/T/30V
21-2588	Silver Mica	350V	2%	1000	C31	Lemco MS611/M/R/G
21-4519	Polyester	400V	5%	0.022µ	C39, C41	I.T.T. PMT2R
21-4512	Polyester	100V	20%	1.0µ	C37, C24	Waycom MKS
21-1011	Tantalum	20V	20%	10µ	C28, C30, C32, C33, C40, C42, C47, C17, C46	Waycom CL 106/M
	or					
21-1002	Tantalum	25V		10µ		S.T.C. TAG 10/25
21-1006	Tantalum		20%	4.7µ	C50	Union Carbide K4R7E35
21-1549	Ceramic	30V	+50% -25%	.047µ	C16............	Erie 811T/30V
	DIODES					
22-1006	Silicon				D20, D21	M.C.P. MGD72
	RECTIFIERS					
22-1623	Silicon	200V	0.20A		D9, D10, D11, D12	A.E.I. MS4
22-1811	DIODE Voltage Reg.	6.8V	5%		D16	Mullard BZY88-C6V8
	TRANSISTORS					
22-6007	NPN				Q12, Q13	Motorola 2N3904
22-6009	NPN				Q16, Q17, Q18, Q19, Q21, Q23, Q24, Q26 Q22, Q25	Motorola 2N4124
	or					
22-6007	NPN					Motorola 2N3904
22-6010	PNP Silicon				Q27	Motorola 2N4126
	or					
22-6008	PNP Silicon					Motorola 2N3906
17-4009	Transformer				T2	Racal Instr.
23-5000	Edge Connector 8-way					Pressac 60/044/FR

Part No.	Description	Rat	Tol %	Value	Component Reference	Vendor
23-7058	Inductor		10%	33µH	L3,L4	Cambion 3640/57/2
	or					
23-7077	Inductor		10%	33µH		Delevan 1537-52

SAMPLER DIVIDER ASSEMBLY No. 19-0383

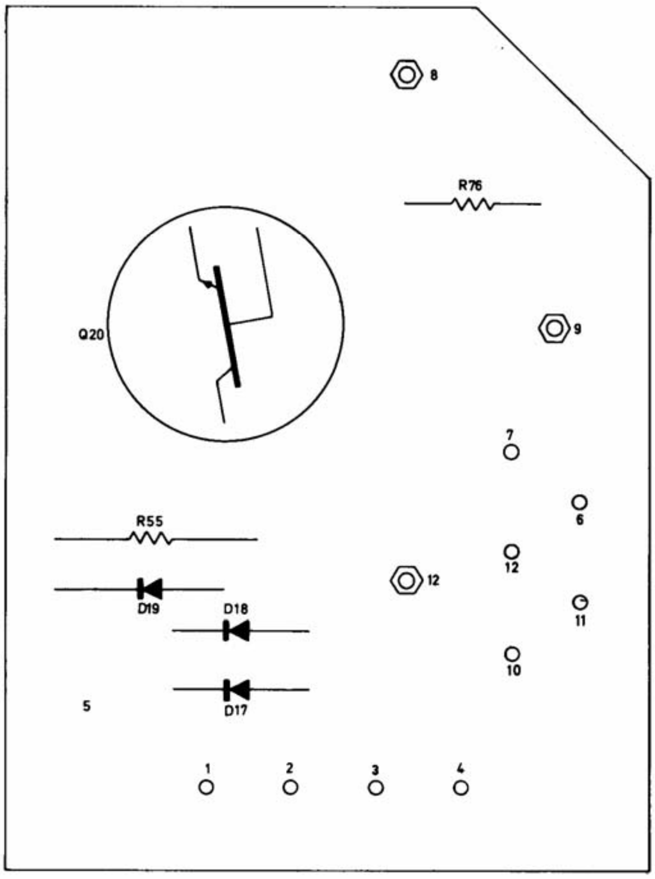
Part No.	Description	Rat	Tol %	Value	Component Reference	Vendor
	RESISTORS					
20-0102	Composition	1/10W	10%	1K	R6, R11, R13, R21, R26, R27	Erie 15
20-0103	Composition	1/10W	10%	10K	R4, R8..........	Erie 15
20-0151	Composition	1/10W	10%	150	R3.............	Erie 15
20-0153	Composition	1/10W	10%	15K	R2	Erie 15
20-0222	Composition	1/10W	10%	2.2K	R1, R7, R10, R17 R18, R30	Erie 15
20-0330	Composition	1/10W	10%	33	R19, R37	Erie 15
20-0332	Composition	1/10W	10%	3.3K	R5.............	Erie 15
20-0471	Composition	1/10W	10%	470	R12, R20	Erie 15
20-0472	Composition	1/10W	10%	4.7K	R9, R16, R18	Erie 15
20-0683	Composition	1/10W	10%	68K	R29, R36	Erie 15
20-2333	Metal Oxide	1/4W	5%	33K	R34	Erie MO4
20-2473	Metal Oxide	1/4W	5%	47K	R35............	Erie MO4
20-2392	Metal Oxide	1/4W	5%	3.9K	R38, R39	Erie MO4
20-2510	Metal Oxide	1/4W	5%	51	R31............	Erie MO4
20-4410	Metal Oxide	1/2W	1%	820	R14, R24	Erie MO5
20-4411	Metal Oxide	1/2W	1%	4.7K	R15, R25	Erie MO5
	CAPACITORS					
21-1002	Tantalum	15V	20%	10µ	C1, C8, C14, C25, C26	S.T.C. TAG 10/25
	or					
21-1011	Tantalum	20V	20%	10µ		Waycom CL 106/M
21-1524	Ceramic		10%	220	C19	Erie 831 N4200
21-1545	Ceramic	18V		0.01µ	C10, C6, C2, C3	Erie 831/T/18V
21-1551	Ceramic	30V		0.1µ	C18	Erie 811/T/30V
21-1561	Ceramic			10	C22, C23.......	Erie YD. NPO
21-4512	Polyester	100V	20%	1.0µ	C20	Waycom MKS
21-1591	Ceramic		+80% -20%	0.01µ	C49	Erie 801 K800011

N-0154 Battery Box Complete.

Part No.	Description	Rat	Tol %	Value	Component Reference	Vendor
21-2596	Silver Mica	350V	1%	1000	C9..............	Lemco MS611/M/R/F
21-2586	Silver Mica	350V	2%	220	C5..............	Lemco MS611/M/R/G
21-2598	Silver Mica	350V	2%	680	C4	Lemco MS611/M/R/G
21-2588	Silver Mica	350V	2%	1000	C11, C15........	Lemco MS611/M/R/G
21-2589	Silver Mica	350V	2%	2200	C12.............	Lemco MS611/M/R/G
21-2597	Silver Mica	350V	1%	98	C7..............	Lemco MS611/M/R/F
21-2591	Silver Mica	350V	1%	6800	C13.............	Lemco MS611/M/R/F
21-6004	Trimming			3.5 - 13	C21.............	Steatite Ins 75-Triko 02
22-1029	DIODES					
~~22-1006~~	Silicon				D1, D2, D3, D4, D5, D6, D7..........	M.C.P. MGD72
22-0000	Germanium				D8..............	Mullard 0A47
22-1811	Voltage Reg.	6.8V	±5%		D13	Mullard BZY88-C6V8
22-1018	Hot Carrier				D14, D15........	Hewlett-Packard HP5082-2900
	TRANSISTORS					
22-6009	Silicon 2N 4124				Q2, Q3, Q5, Q7, Q9, Q11, Q14...	Motorola 2N4124
	or					
22-6007	Silicon 2N 3904					Motorola 2N3904
22-6010	Silicon 2N 4126				Q1, Q4, Q6, Q8, Q10...........	Motorola 2N4126
	or					
22-6008	Silicon 2N 3906					Motorola 2N3906
22-5002	Germanium ASZ 23				Q15...........	Mullard ASZ23
23-7058	Inductor		10%	33μH	L1.............	Cambion 3640/57/2
	or					
23-7077	Inductor		10%	33μH		Delevan 1537-52
17-4010	Inductor				L2.............	Racal Instr.
17-4008	Transformer Assembly				T1.............	Racal Instr.

PART 4

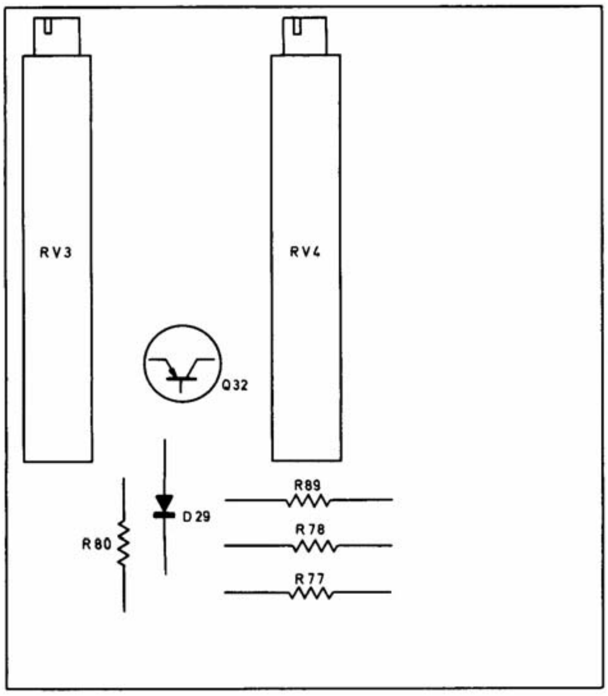
DIAGRAMS



NOTE :
FOR THE CIRCUIT DIAGRAM OF THIS ASSEMBLY REFER TO FIG. 4.7

852 : 19-0114
1

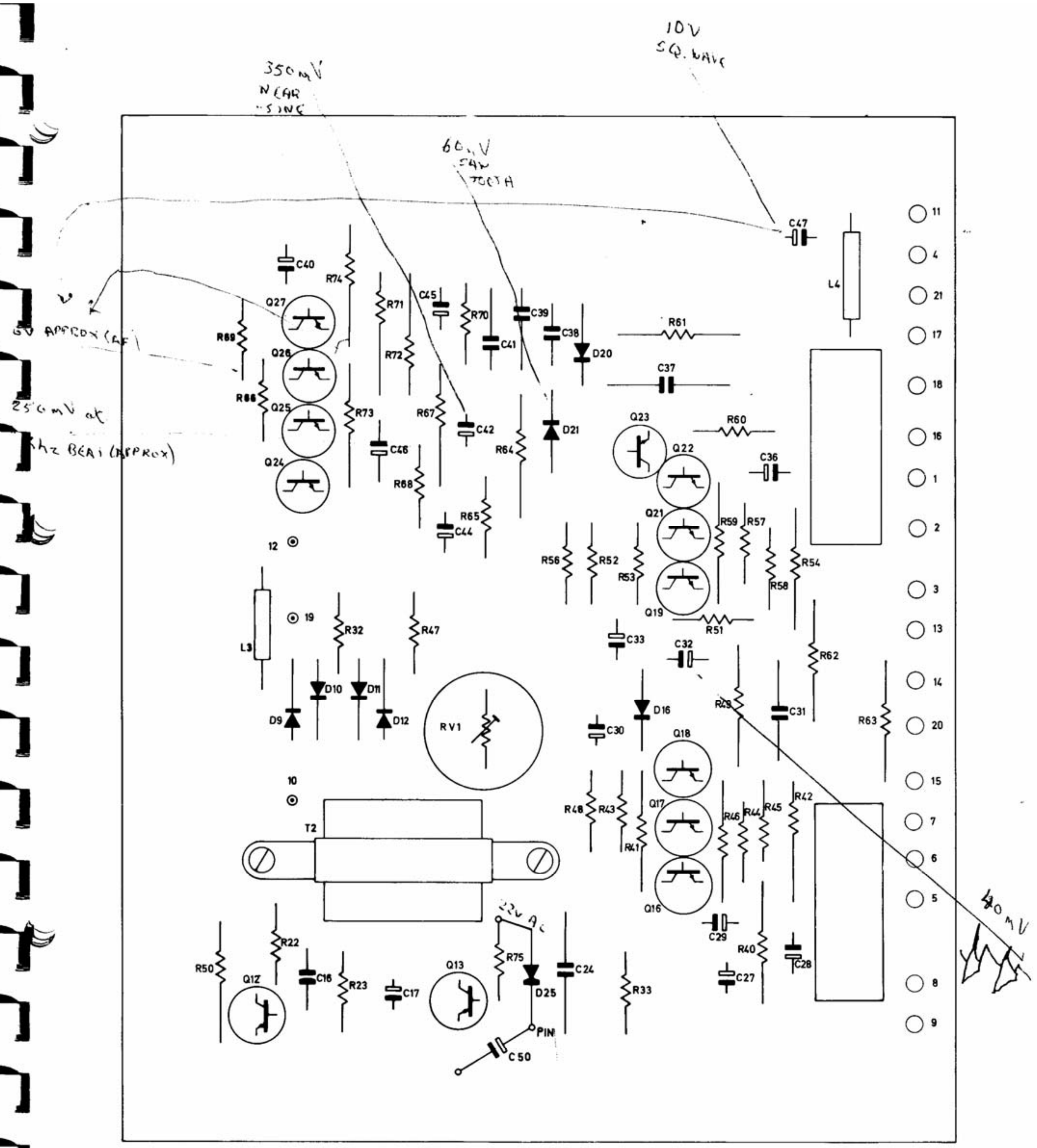
Layout : Electronic Filtering Assembly 19-0114 Fig. 4·1



NOTE :-
FOR THE CIRCUIT DIAGRAM OF THIS
ASSEMBLY REFER TO FIG. 4·7

19-0370 : 852
1

Layout : Reference Voltage Assembly 19-0370 Fig.4.2

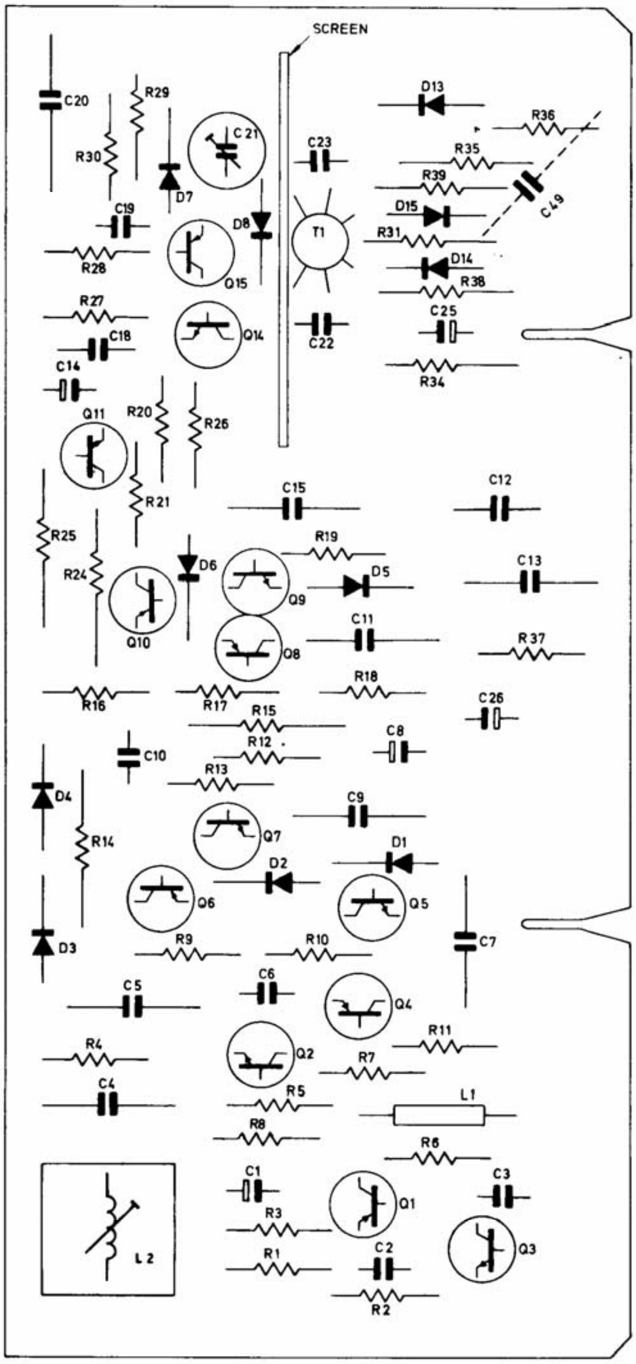


NOTE:- REFER TO FIG. 4.7 FOR THE CIRCUIT

10V/S RANGE

19-0373 : 852
1

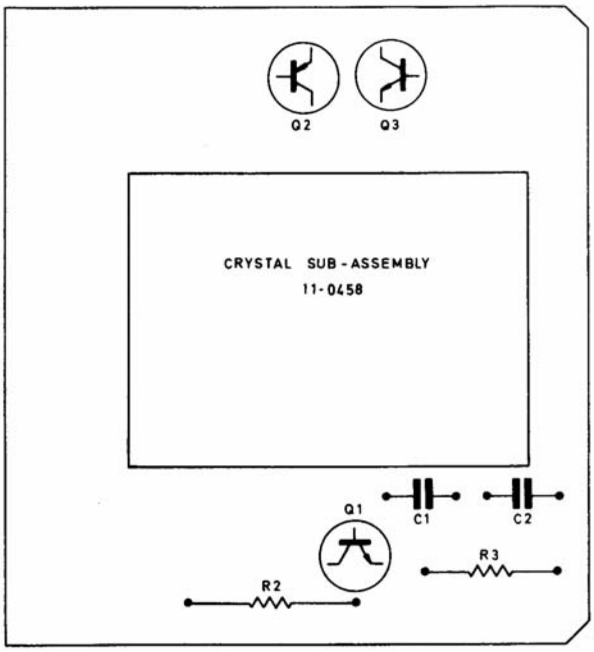
Layout : Stretcher Output Assembly 19-0373 Fig.4.3



NOTE: REFER TO FIG.4.7 FOR THE CIRCUIT

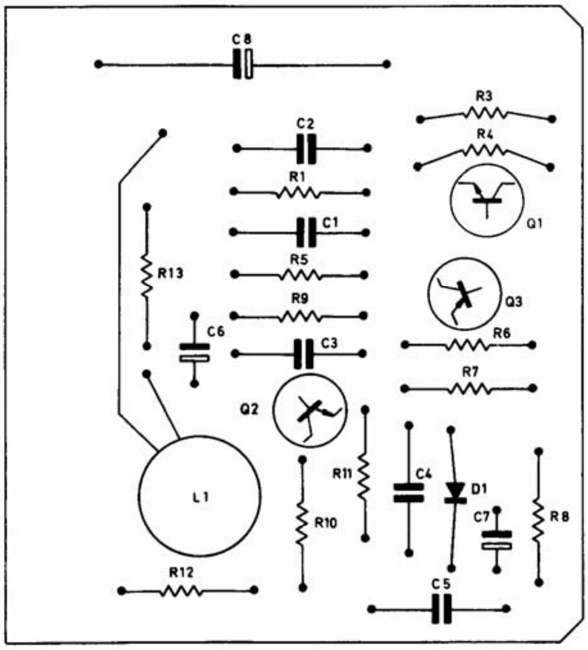
19-0383:852

Layout : Sampler Divider Assembly 19-0383 Fig.4.4



19-0371	
1	

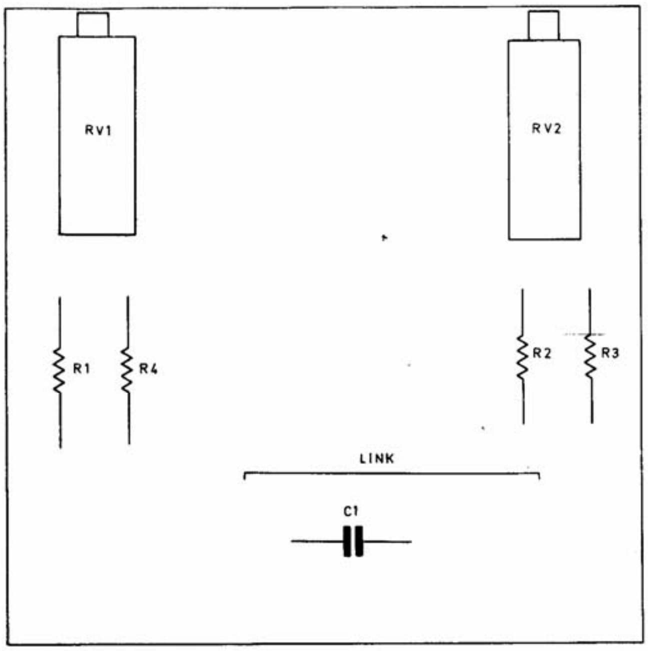
CRYSTAL BOARD ASSEMBLY 19-0371



19-0233	
1	

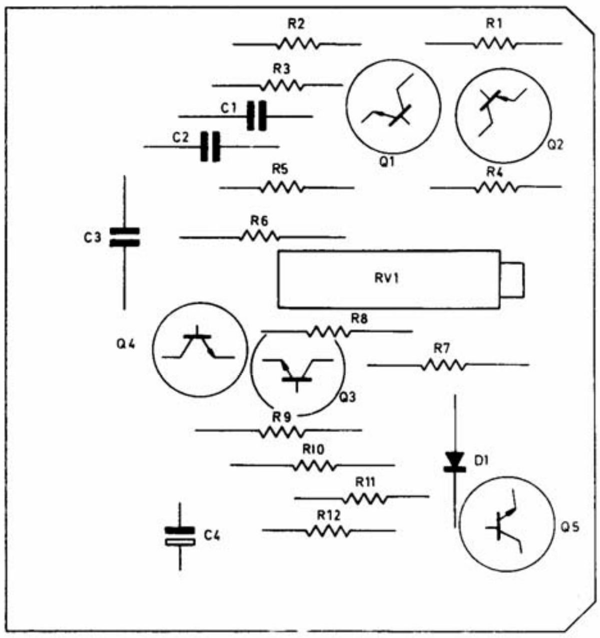
AMPLIFIER BOARD ASSEMBLY 19-0233

Assembly Layouts: Oscillator Typ



19-0040
1

MOTHER BOARD ASSEMBLY 19-0040

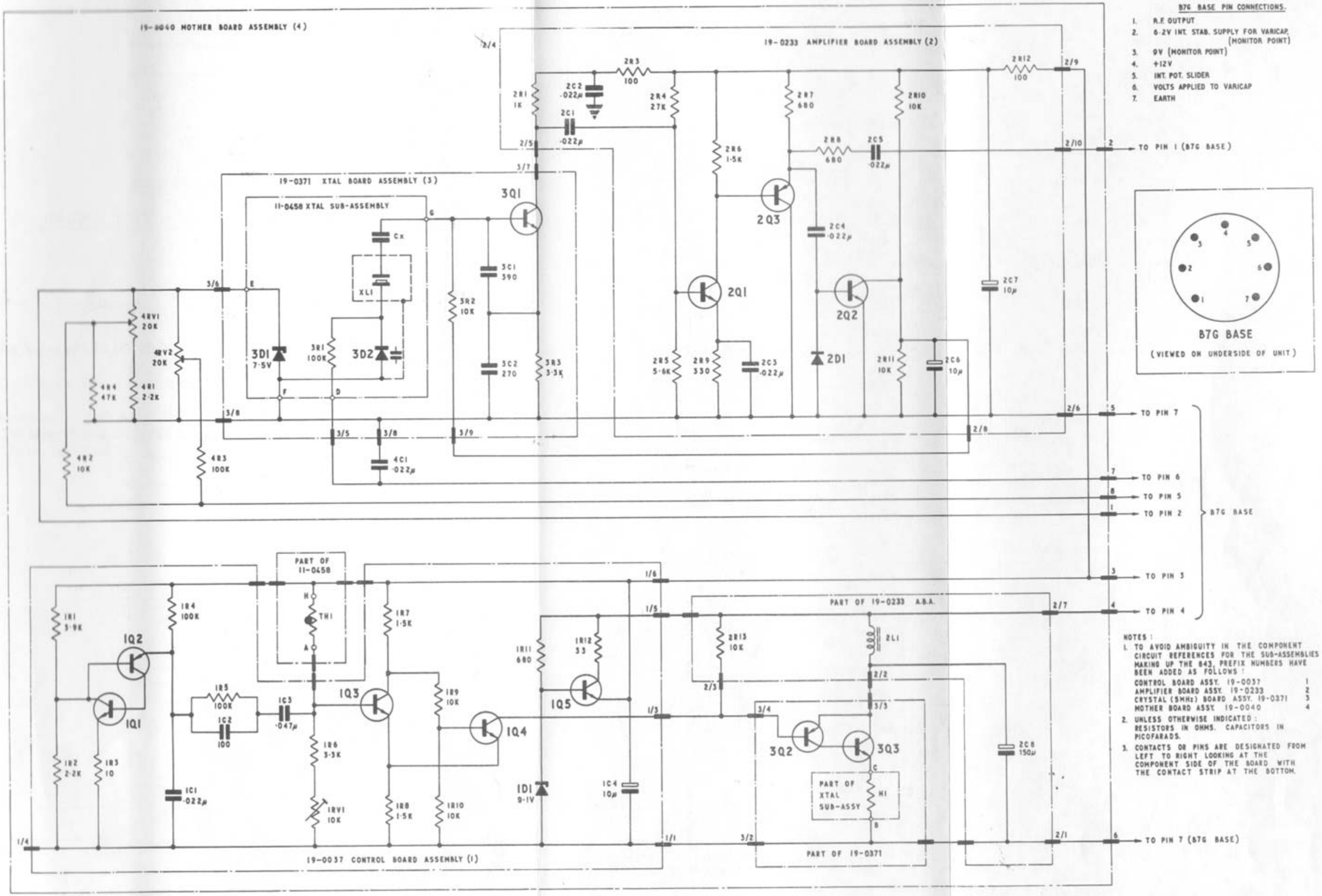


19-0037
1

CONTROL BOARD ASSEMBLY 19-0037

Layouts: Oscillator Type 843

Fig



B7G BASE PIN CONNECTIONS.

1. R.F. OUTPUT
2. 6·2V INT. STAB. SUPPLY FOR VARICAP. (MONITOR POINT)
3. 9V (MONITOR POINT)
4. +12V
5. INT. POT. SLIDER
6. VOLTS APPLIED TO VARICAP
7. EARTH

NOTES:

1. TO AVOID AMBIGUITY IN THE COMPONENT CIRCUIT REFERENCES FOR THE SUB-ASSEMBLIES MAKING UP THE 843, PREFIX NUMBERS HAVE BEEN ADDED AS FOLLOWS:

CONTROL BOARD ASSY.	19-0037	1
AMPLIFIER BOARD ASSY.	19-0233	2
CRYSTAL (5MHz) BOARD ASSY.	19-0371	3
MOTHER BOARD ASSY.	19-0040	4

2. UNLESS OTHERWISE INDICATED: RESISTORS IN OHMS. CAPACITORS IN PICOFARADS.
3. CONTACTS OR PINS ARE DESIGNATED FROM LEFT TO RIGHT LOOKING AT THE COMPONENT SIDE OF THE BOARD WITH THE CONTACT STRIP AT THE BOTTOM.

843 852

Circuit: 5MHz Fast Warm-Up Oscillator Type 843

Fig 4.6

AMENDMENTS

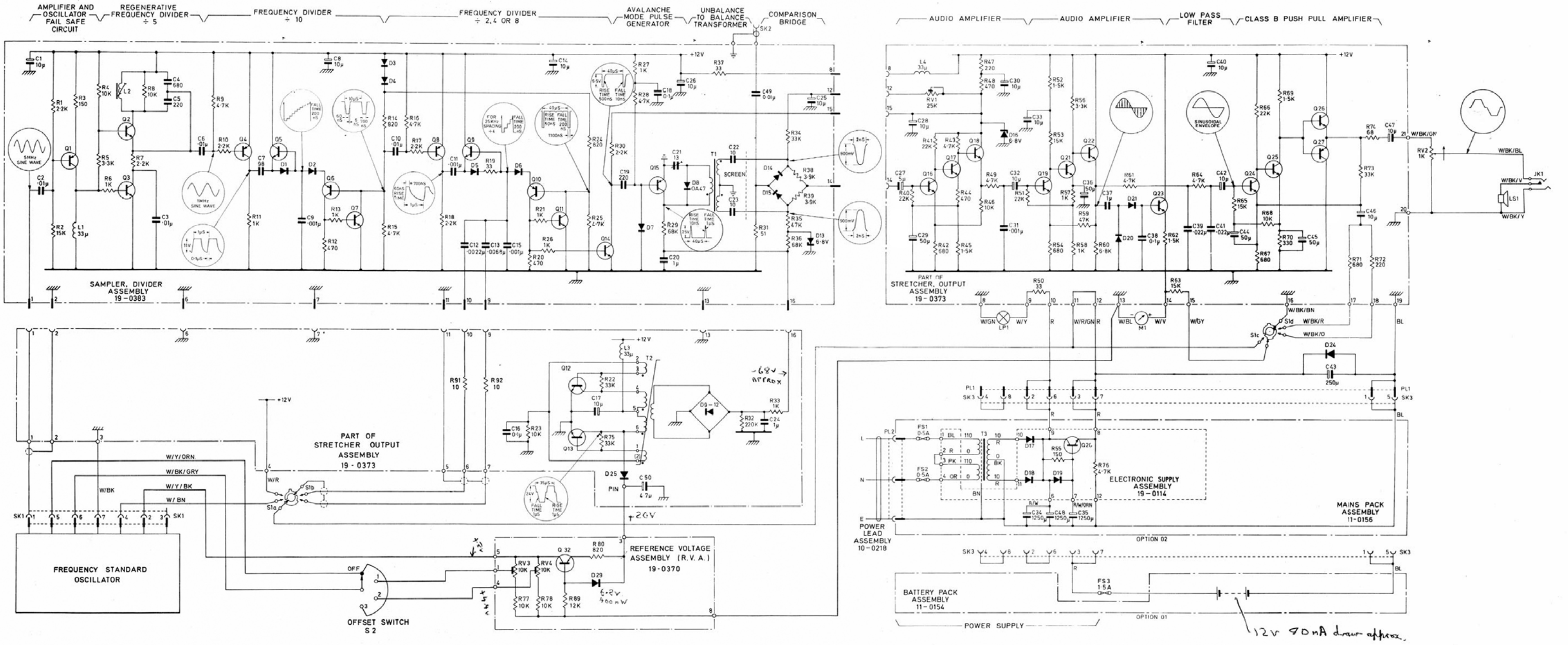
OVERALL CIRCUIT: CALIBRATORS TYPE 852

Please amend Fig. 4.7 as follows:-

(1) The value of C16 is now .047μ.

(2) The value of R78 is now 5.6k.

(3) In the Mains Pack Assembly 11-0156 the capacitor C48 is deleted entirely and the values of C34 and C35 are now 3,300μ.



Overall Circuit: Calibrator Type 852

Fig.4.7