

**PROJECT 60**  
**ACTIVE FILTER UNIT**

**sinclair**

# FOREWORD

This manual describes the Active Filter Unit (A.F.U.) module of Project 60. Part I of this manual is additional or alternative to the main manual and should be used in conjunction with this where the A.F.U. is to be used with other modules of Project 60.

Part I I of this manual is more technical and refers specifically to the A.F.U.: it does not cross refer to the main manual.

# PART ONE

## 7.1 Assembling the Complete Project

### 7.1.1 introduction

Addition of the A.F.U. to the existing Project 60 is simple since the layout in the main manual includes a space for the A.F.U. On the back cover of this manual is given a cut out overlay. This should be cut around its outline and pinned over the appropriate corner of the main layout diagram when the entire layout will be apparent.

### 7.1.2 General Considerations in Mounting and Layout

This section is additional to section 2.5.

The A.F.U. is electrically an extension to the Stereo 60 and for all normal purposes it is best mounted at the right hand end of the Stereo 60 as 'an extra two knobs'. There is however no objection to its being several inches from the Stereo 60.

If required the A.F.U. can be mounted above or below the Stereo 60, since these are unlikely to be problems due to hum pickup or instability. The wiring between Z.30s and Stereo 60 should however be as short as convenient.

### 7.2.3 Wiring

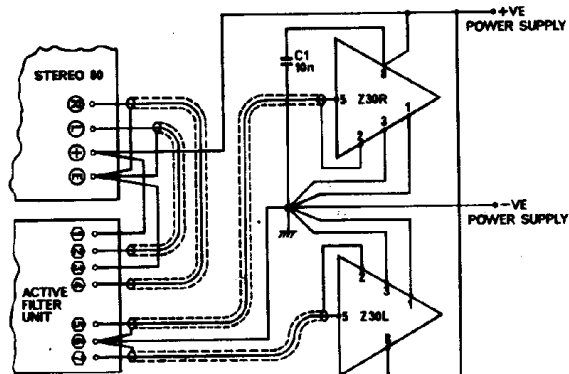
This section is additional to section 2.6.

The wiring between A.F.U. and Z.50s is exactly the same as the wiring between the Stereo'60 and Z.50s mentioned in section 2.6.1, with the A.F.U. in place of the Stereo 60.

The only additional wiring is that between Stereo 60 and A.F.U. which is best screened, as shown in fig. 7.1.3 However, if the A.F.U. is adjacent to the Stereo 60 these

wires will only be 1" or so long and in this case unscreened wiring is satisfactory: we have not used screened wiring in our layout. Other wiring is unchanged.

Fig 7.1.3



## PART TWO

### 7.2 Technical Information

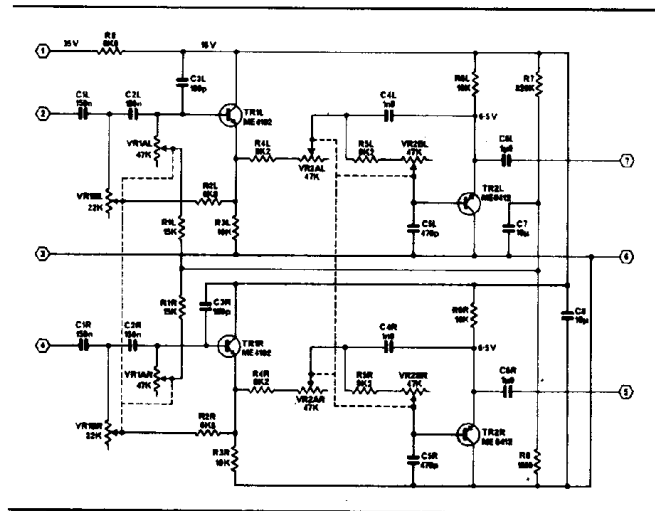
#### 7.2.1 Technical Description

The h.t. supply is decoupled by R9 and C8 and applied to R7 and R8 which provide the base bias voltages (decoupled by C7) to Tr1, via R1 and VR1A. Tr1 is arranged as an emitter follower and its emitter voltage provides bias, via R4, VR2A, R5, VR2B to Tr2, another emitter follower.

Tr1, with VR1 and associated components, is the rumble (high pass) filter, whilst Tr2 is the scratch (low pass) filter. The filter circuits are of the Sallen and Key type and complementary transistors are used to minimise distortion.

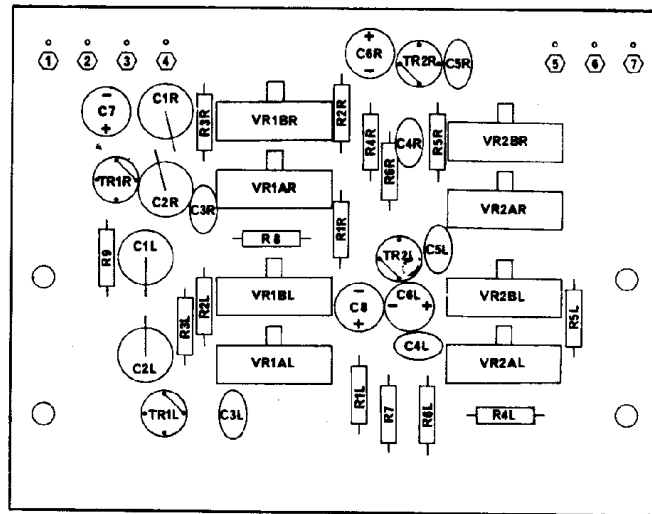
# CIRCUIT DIAGRAM

Fig 7.2.2



# COMPONENT LAYOUT

Fig 7.2.3






## 7.2.4 Typical Performance Figures

<b>Size Front Panel PCB</b>	90mm x 40mm 84mm x 64mm
<b>Supply voltage</b>	15 to 35v
<b>Supply Current</b>	3mA max.
<b>Voltage gain at 1 KHz, (Filters at 0):</b>	0.98 (-.2dB)
<b>Frequency response (Filters at 0)</b>	-3dB at 25Hz and 28KHz -1dB at 35Hz and 20KHz
<b>Distortion at 1 KHz and 250mV rms output</b>	0.02% with 35v supply
<b>H.F. cut off (-3dB point) variable between</b>	28KHz and 5KHz
<b>L.F. cut off (-3dB point) variable between</b>	25Hz and 100Hz
<b>Slope</b>	-12db per octave (both filters).


## 7.2.5 Mounting

Mounting of the A.F.U. is the same as for the Stereo 60 (section 3.5) except of course that the front panel cut out etc. will be a different size. A template for cutting the panel is given on the back page of this manual.

## 7.2.6 Power Requirements

7.2.6.1 Power is connected to the AFU, positive to  and negative through the earth wiring to  or .

The AFU will operate in this fashion from any voltage between 15 and 35, drawing up to 3mA max and is suitable for direct use from PZ5, PZ6 or any other power supply up to 35v.

If used with PZ8 at a voltage from 35-50v the basic wiring is unchanged but an additional resistor of 4K7 should be fitted in series with  (or if preferred replace R9 by 12K).

## 7.2.6.2 Use for other purposes

If Project 60 is not used it is probably best to operate the AFU from its own separate battery, 9v or 12v,

which is connected between ① and ③ . R9 should be short-circuited. For battery operation the polarity of the additional equipment is not important and ③ and/or ⑥ should connect to the earth(s) on the other equipment.

If the main amplifier is negative earth the amplifier's polarity will be satisfactory to drive the AFU which can then be operated via a resistor from amplifier's positive to ① . The value of this resistor will depend upon the amplifier's h.t. voltage, V, as follows:

$$\text{Resistor's value} = \frac{V}{3} - 10 \text{ KS2}$$

in practise the next preferred value below that calculated will be used.

### 7.2.7 Applications

Whilst the A.F.U. is basically designed for Project 60 it can be used for almost any purpose where a signal in the region of 10mV to 1v requires high or low pass filtering.

#### 7.2.7.1 Use with amplifiers

If an amplifier has insufficient filtering the AFU can be fitted. It is not particularly important where it is fitted electrically but if the amplifier has a tape monitor switch the AFU will often fit with the amplifier's tape out fed to the AFU and the AFU's output fed back into the amplifier's tape input. The amplifier's tape monitor switch will put the AFU in circuit.

Otherwise the AFU can be fitted electrically in circuit after the amplifier's preamp, tone controls or volume control as convenient.

#### 7.2.7.2 Use for tape recording

Any tape deck, when fed through a high fidelity amplifier, can give an uncomfortable level of noise and this can be filtered out by feeding the signal from the recorder through the AFU and then to the amplifier.

The AFU could also be fitted in the input to the tape recorder if recordings are to be made of a poor quality signal source.

### 7.2.7.3 Use with tuner etc.

The AFU can also be used to filter the output from a noisy or poor signal source such as an AM tuner before amplifying this or recording from it.

It is obviously not possible to list all the applications and connections possible but if the user can supply us with full details of his requirements and any appropriate technical data, circuit diagrams etc. on his proposed use we may be able to assist.

## PART THREE

### 7.3 SERVICE

#### 7.3.1 Fault Finding

D.c. voltages at the various points are marked, but since the circuit is direct coupled throughout, any fault in the d.c. circuitry will be indicated by an incorrect voltage on the emitter of Tr2. This voltage will be just less than half the voltage on C8. A discrepancy on one channel will indicate a probable fault in Tr1, 2, VR 1A, VR2A or VR 2B, Faults in Tr2, VR 2A or VR 2B will not of course affect the voltage on Tr1 emitter, but only on Tr2.

A discrepancy on both channels could be caused by Tr1 or R7, R8, C7, but the voltage on C7 will not be accurately measured unless a valve voltmeter is used.



### 7.3.2 Faults

The only likely faults are apparent ineffectiveness of the filters – this is more likely to be due to loudspeakers or the listener's hearing than indication of an actual fault.

The normal range of human hearing is up to 15KHz – very few people can hear much above this, exceptionally to 19KHz. The filter gives a 3db point variable between 4KHz and 30KHz so the average listener is unlikely to hear much effect over the top half of the scratch filters rotation.

Similarly the rumble filter gives -3dE between 25Hz and 100Hz. Frequencies below about 50Hz are more felt than heard and on most programme sources the lower end of the rumble filter may have little audible effect.

### 7.3.3 Service and Guarantee

Full service facilities are available on the A.F.U. Conditions of this and of the guarantee are given in section 6 of the main manual for Project 60.

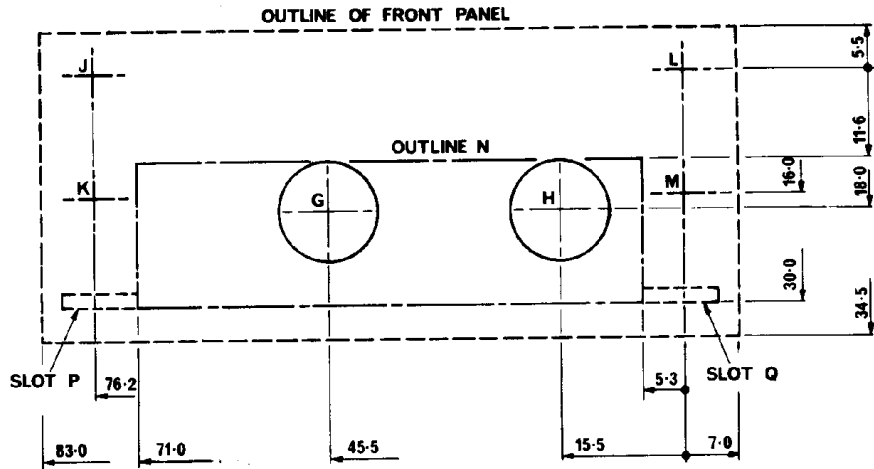
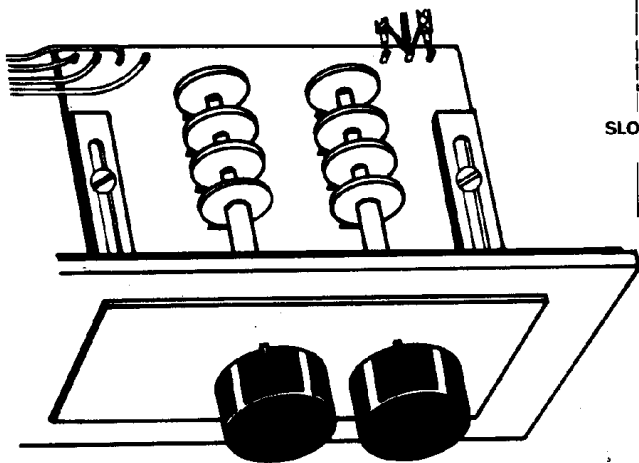
The standard service charge for the A.F.U. is 15/-.

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CUT OUT FOR  
MAIN LAYOUT



TEMPLATE FOR FRONT PANEL