

U N I T R O N I C S

All Silicon Transistor Ultra Low Noise 3 Stage Pre-amplifier for  
magnetic phono cartridges

Model: S P 1 1 0 A

M A N U A L

System development: Ying Kwong Electronics, application department.  
Distributed by : Ying Kwong Electronics & Models Co., Inc.



Features:

1. State of art circuit design using NPN-PNP-NPN Fairchild silicon Planar<sup>+</sup> transistors, ultra low noise transistor SE4010 is used in the front end.
2. Very high output voltage and low output impedance allow this preamplifier to drive all power amplifiers without difficulty.
3. Suitable for all magnetic heads.
4. Accurate RIAA compensation for magnetic phono.  
( + - 0.5db from 20 to 20K HZ )
5. Very high level of negative feed-back is employed, less than 0.05% distortion at 1V output.
6. Selected mylar capacitors and low noise 5% carbon film resistors for all critical circuits.
7. No hum, No hiss.
8. 18V power supply, using 2 9V 006P miniature batteries as economical operation due to low current drain ( 2ma per channel ). Higher supply voltage may be used.
9. Supply voltage can also be obtained from the B + of the power amplifier using a small dropping resistor.
10. Kit includes ready etched, drilled, printed, specially protected circuit board, selected transistors and parts. No adjustment is necessary after the set is completed. Ideal for beginners too.

+ Planar (reg'd) is the patented process and trade mark of FAIRCHILD Semiconductors, U.S.A. U.S. patents 2981877, 3025589, 3064167, 3108359 3117260, other patents pending.

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INTRODUCTION

The Unitronics SP110A silicon transistor pre amplifier is a refined version of our famous SP110. Our SP110 is possibly one of the most successful designs and ever since the circuit was published in the April issue of Radio World (1968), its popularity has never been challenged. The design philosophy of the SP110A follows the same basic rules of the SP110, the only difference is that a NPN-PNP-NPN configuration is used instead of the conventional NPN-NPN circuit. This new approach allows even lower noise level, higher gain and stability and distortion reduced to almost unmeasurable limits. We feel privileged to present the SP110A in the form of a complete kit, knowing that it represents a further accomplishment in the field of High Fidelity.

The design, using Fairchild PNP-NPN silicon Planar transistors CS9014 and CS9015 and the ultra low noise SE4010, achieves a standard never attained by other similar kits using Japanese germanium or silicon transistors. If you can use a soldering iron properly and with a reasonable amount of care, you can build this kit. Being the authorized distributor for Fairchild transistors, we are supplying you with selected transistors to suit this circuit's requirements. If you follow the instructions carefully, you will have a preamplifier that will provide you with the best performance and reliability for the year to come. You will also have the satisfaction to know that you are in possession of a preamplifier which is years ahead of other makes.

If for any reason you should encounter any trouble, simply come to our shop and our engineering staff shall be most willing to discuss with you. For overseas customers, simply drop us a line and we shall supply all information required.

We are sure that you shall enjoy building and using this Unitronics preamplifier.

CIRCUIT DESCRIPTION

The main difference between the SP110A and other conventional designs is the NPN-PNP-NPN circuit. It is a more advanced design over the usual NPN-NPN configuration in the following way:

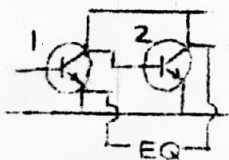


Fig 1

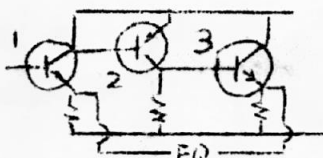


Fig 2

Note that in Fig 1, the NPN-NPN circuit, the RIAA feedback network is taken from the collector of Q2 to the emitter of Q1, at high frequency, the impedance of the network is low causing loading of transistor Q2, hence giving rise to distortion. In Fig 2 the feedback is taken from the emitter of Q3 (which is an emitter follower, having very low impedance.) thus the equalizing network has negligible loading effect on Q3 even at high frequency. Laboratory tests show that the new circuit gives distortion much lower than previously obtainable.

Large amount of negative feedback - We all know that the greater the negative feedback, the lower the distortion and the more accurate the RIAA equalization will be. In order to get more feedback, the open-loop voltage gain (voltage gain without feedback) must be very high. In usual NPN-NPN design, the gain is within 1000 to 2000, in the NPN-PNP-NPN circuit, the Q3 (emitter follower) isolates voltage amplifier Q2 from external loading, thus open loop can attain 4000 to 6000. This figure is attained only by a very few makes of pre-amplifiers, such as the Marantz and J.B. Lansing. With this high gain, large amount of negative feedback can be applied, reducing distortion to negligible proportion.

Very high signal to noise ratio. - Noise mainly originates from 1st stage Q1. A criterion for low noise design is (a) very low operating emitter current from 20uA to 100uA, this will reduce flicker noise. (b) relatively low collector-emitter voltage 2-5V. All these are met in the present SP110A emitter current is chosen to be 30uA which is the optimum value for magnetic cartridges source impedance.

## Unitronics SP110A Components Check List

Please check all components accurately and correctly before assembly, incorrect placement or positioning of parts may damage the unit permanently, We garentee the circuit design and all transistor and components, however we cannot garentee the workmanship of the individual builders.

Q1	Fairchild SE4010A silicon transistor	(	)	(	)
Q2	Fairchild Semiconductor CS9015C transistor	(	)	(	)
Q3	Fairchild Semiconductor CS9014C transistor	(	)	(	)
R1	150K	(	)	(	)
R2	470K	(	)	(	)
R3	100K	(	)	(	)
R4	15K	(	)	(	)
R5	180 ohm	(	)	(	)
R6	27K	(	)	(	)
R7	100K	(	)	(	)
R8	4.7K	(	)	(	)
R9	180K	(	)	(	)
R10	18K	(	)	(	)
R11	15K	(	)	(	)
R12	47K MISSING	(	)	(	)
C1	10-12.5uF 25V	(	)	(	)
C2	10-12.5uF 25V	(	)	(	)
C3	50uF 25V	(	)	(	)
C4	100pf	(	)	(	)
C5	.014 mylar (one .01 MISSING and one .004 parallel)	(	)	(	)
C6	.005 mylar	(	)	(	)
C7	10-12.5uF 25V	(	)	(	)
	Printed circuit board	(	)	(	)
	Solder wire	(	)	(	)
	screw and nuts etc.	(	)	(	)
	Shield wire 2'	(	)	(	)
	Instruction manual	(	)	(	)

### Assembly Instruction

( ) Screw four screws into the holes for mounting at the corners of the circuit board, lock with nut, this will provide you with a convenient soldering table.

( ) Check the components against the check list, there are, for mono version, 12 resistors, 8 capacitors, three transistors and miscellaneous hardwares, stereo version double this amount. R is not supplied as it is not required for 18V operation. It is used when you want to obtain supply voltage from the main amplifier. Correct value to be used as follow:

18 - 20V	omit R	36 - 40V	R = 10K
25 - 27V	R = 3.9K	50V	R = 15K

WARNING: Do not use one resistor for both channels, drop separately.

( ) The printed circuit board has already been treated with a protective coating, no cleaning is necessary before soldering.

( ) Mount all resistors, make sure that it is the correct one, mount them flat against the circuit board, solder with a 25 - 40W soldering iron, too hot an iron or prolonged heating may damage the structure of the resistors, and the copper cladding, Omit R if 18 V is intended to be used,

( ) Mount all electrolytic capacitors, C1.C2.C3.C7.C8 Pay special care to their polarity.

( ) Mount the remaining capacitors, they are - C4.C5.C6, C5 is consisted of two capacitors, .01 and .004 in parallel in order to get correct value.

( ) Mount Q1, make sure it is the Fairchild SE 4010A, note lead position.

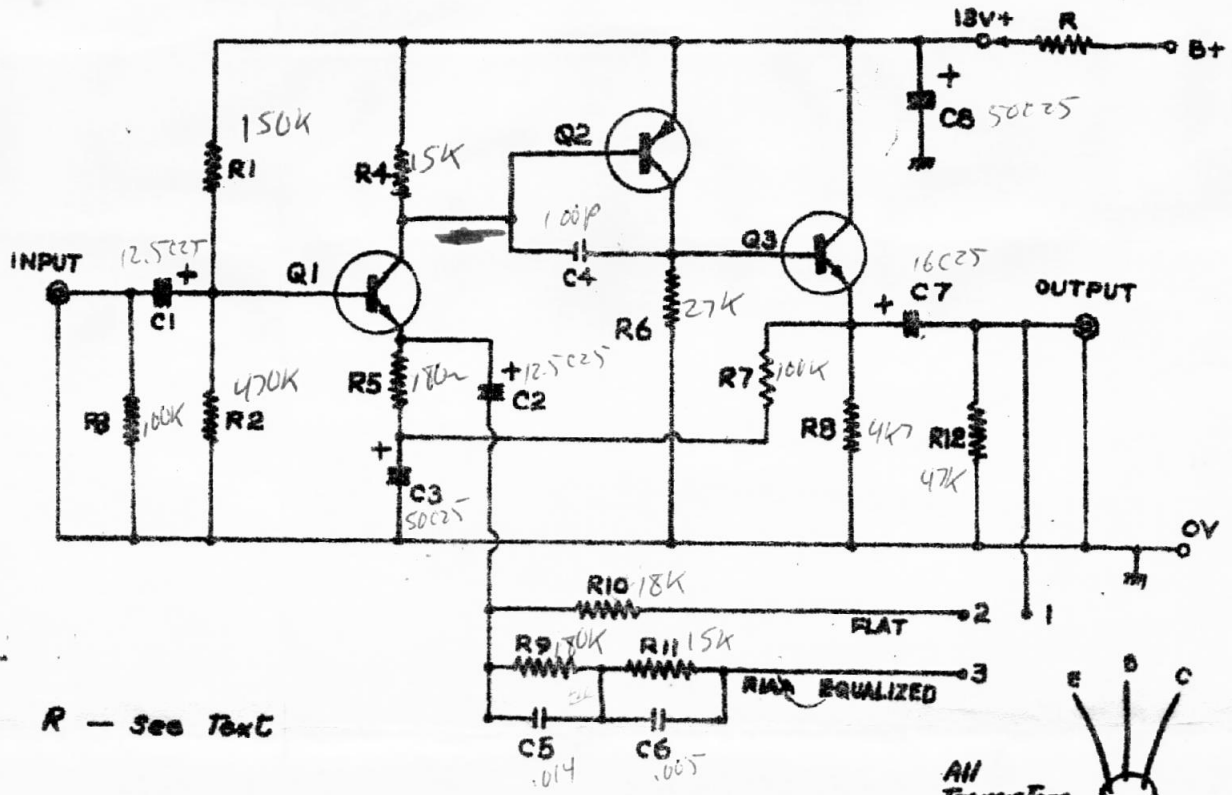
( ) Mount Q2 and Q3, Q2 is CS9015C(PNP) and Q3 is CS9014C(NPN), also make sure that they are inserted correctly.

( ) Inspect all soldering joints for cold joints, bad connexions, also that no land is in contact with neighboring lands, or bridged by solder flashes accidentally.

( ) Wire up the SP110A according to the diagrams for your requirement. your SP110A is now completed.

You may now sit back and enjoy real High Fidelity sound.

SP 110A silicon transistor 3 stage NPN-PNP-NPN direct coupled Preamplifier  
 schematic diagram SPI10A 線路圖

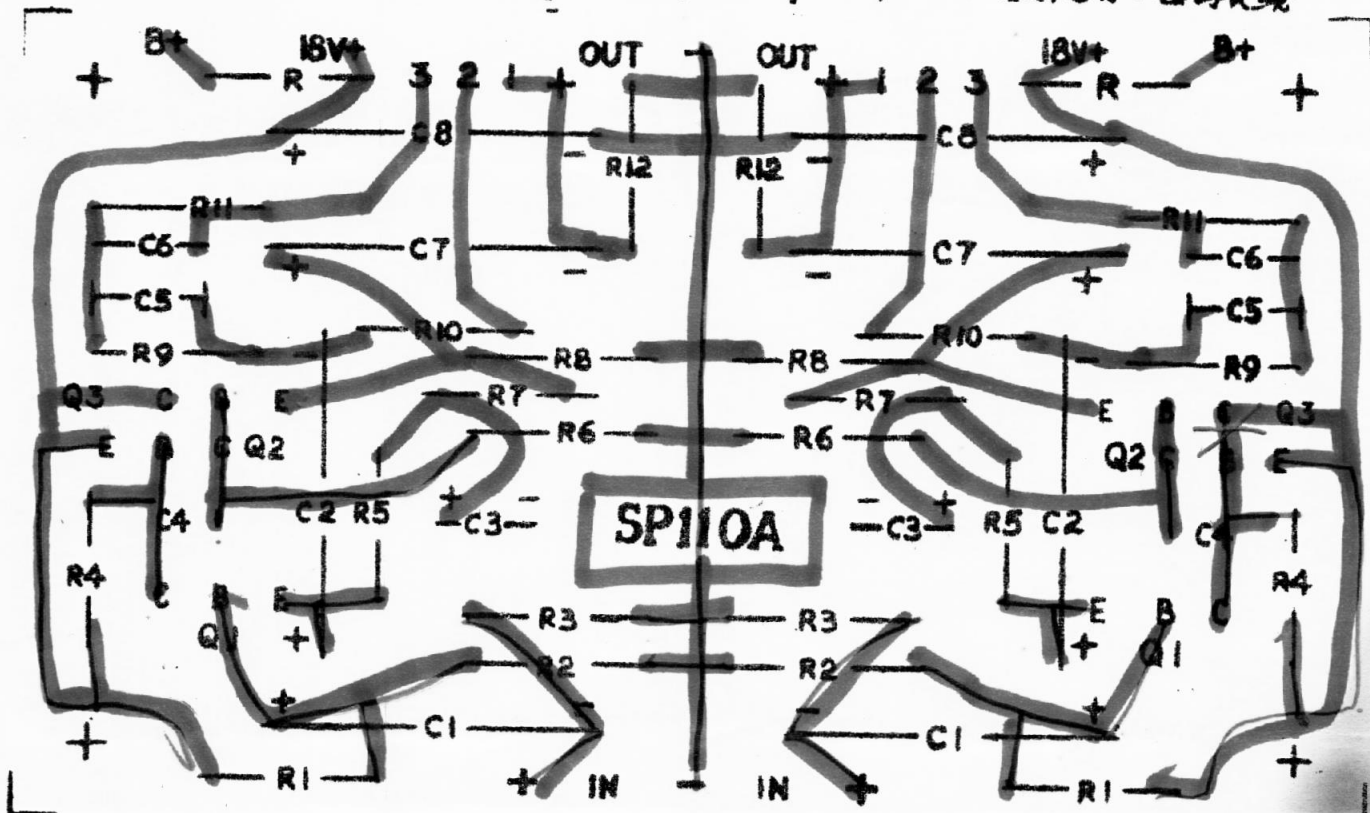


R - See Text

R1 150K	R6 27K	R11 15K	C4 100 pf
R2 470K	R7 100K	R12 47K	C5 .014
R3 100K	R8 4.7K	C1 12.5μ 25V	C6 .005
R4 15K	R9 180K	C2 12.5μ 25V	C7 12.5μ 25V
R5 180Ω	R10 18K	C3 50μ 25V	C8 50μ 25V

Q1 SE4010 A NPN  
 Q2  PNPS 9682  
 Q3  NPMPS9632

Note: Longer lead of electrolytic caps. is + 電解電容 + 極為長線





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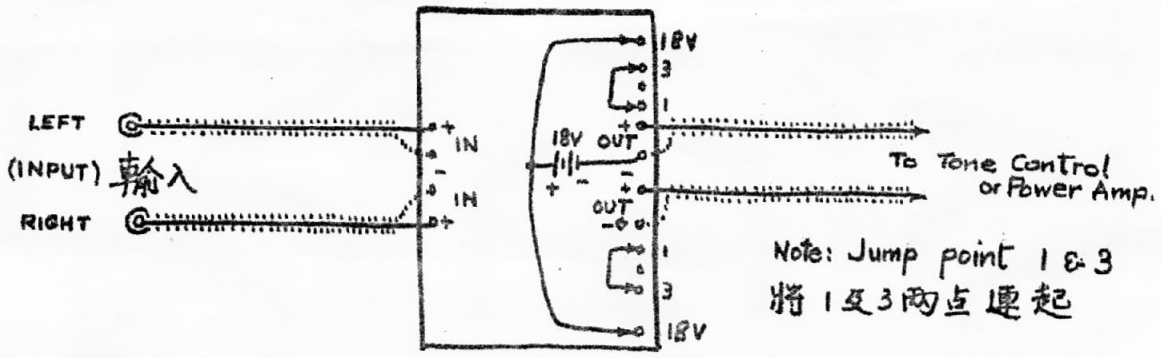


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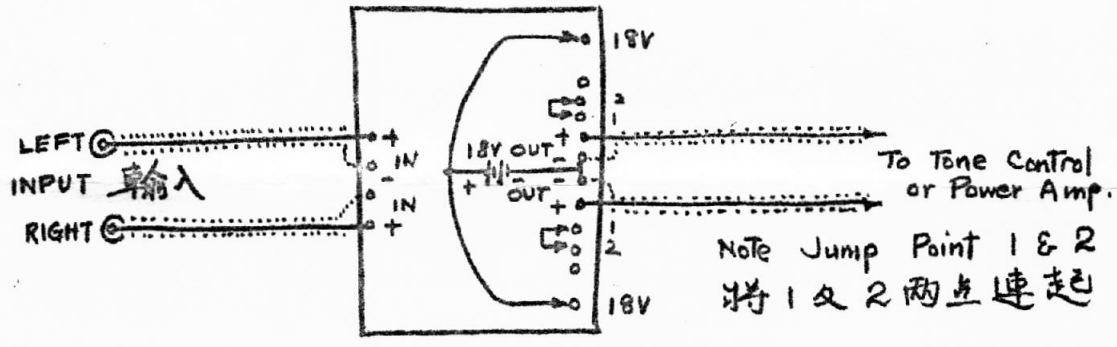


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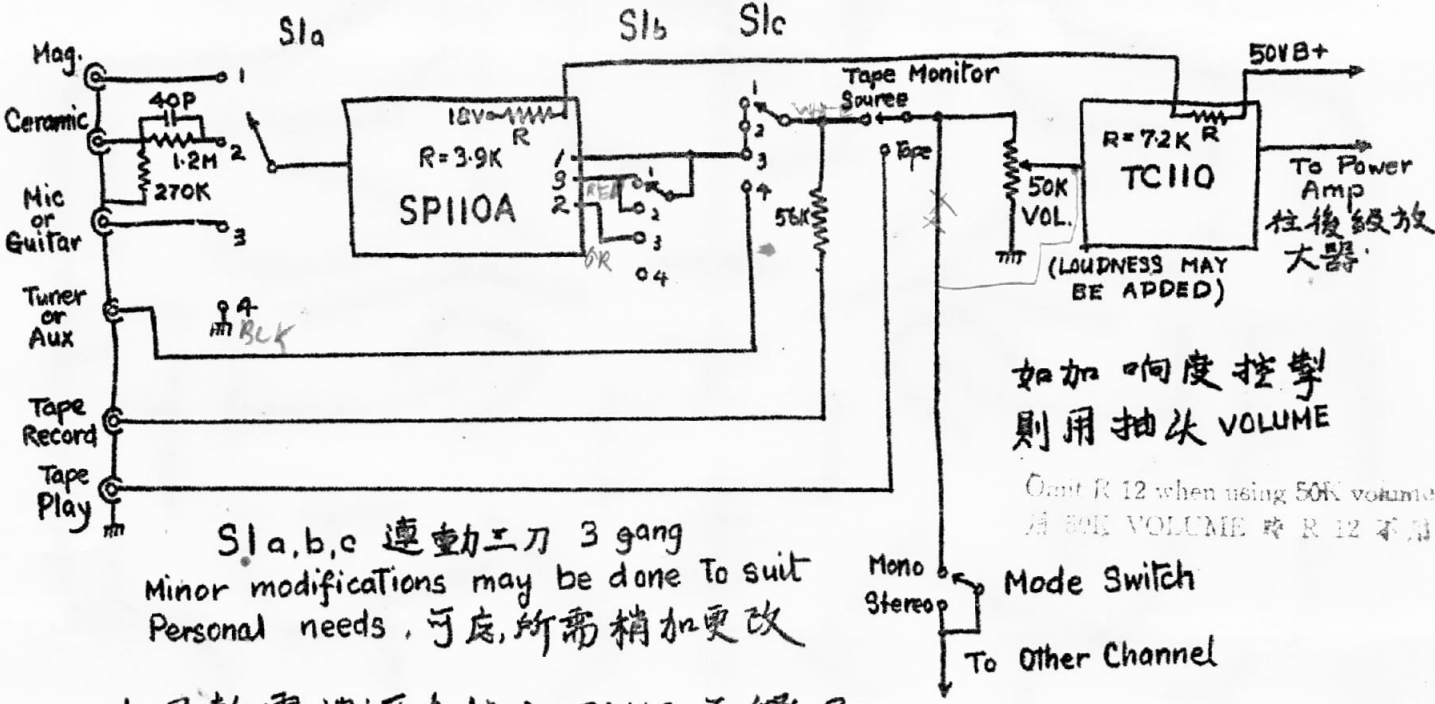
SP110A as magnetic Preamplifier, using 2 x 9V batteries  
 用18v.乾電池做磁頭放大用(單用途)



as microphone or guitar preamplifier, using dry batteries  
 用乾電電源做米高峯或電結他放大,單用途



As a complete stereo preamplifier in conjunction with TC110, using either dry cells or B+ from power amplifier.  
 与TC110共用為一多用途前置放大器,可用電池或B+電源。



S1a, b, c 連動三刀 3 gang  
 Minor modifications may be done to suit Personal needs, 可底, 所需稍加更改

如用乾電池可直接入 TC110, 不經 R  
 SP110A之 R 不實, 3件 9V 串連為 27V.