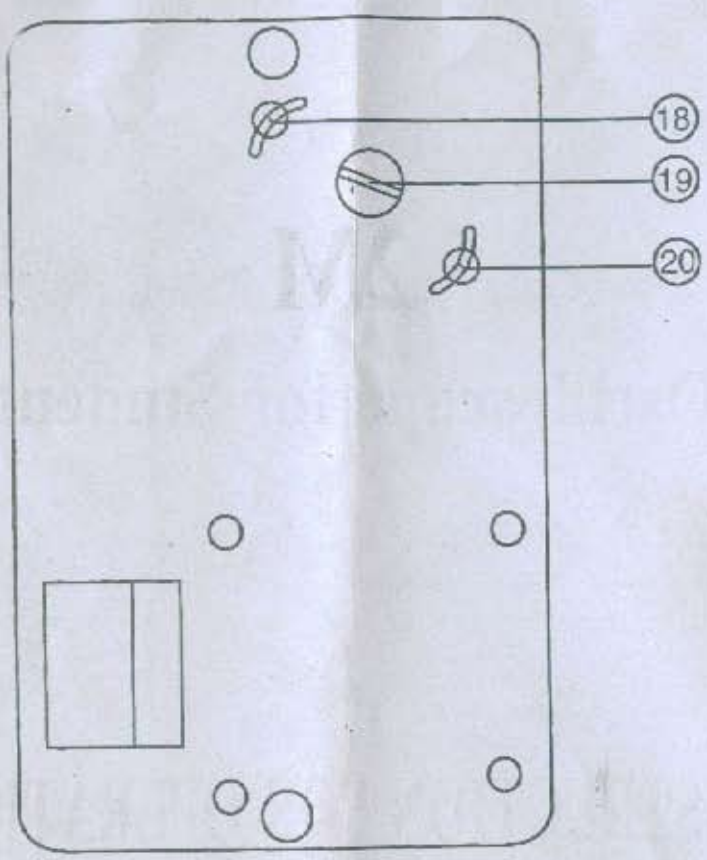
2M

Oscilloscope for Students

INSTRUCTION FOR OPERATION



Adjustment for Horizontal Line

Due to it that the earth magnetic field has the influence on the electronic beam, the scanning level line will be different along with the different positions and directions where the oscilloscope is placed. Before using, put the oscilloscope in a fixed position, without movement first, observe whether the horizontal line is level then; if not, loose screws 18 and 20 with a plus driver, and adjust slot 19 carefully with a minus driver to make the scanning level line parallel with the graduation line; again tighten 18 and 20 finally, that's OK. (Notice: when the machine is moved to any other position, can also adjust it according to the method above if the horizontal line is not level.)

Welcome To Use Oscilloscope for Students

The instrument is a small-sized oscilloscope impooved and designed according to the trade standard of JY0011-90 issued by State Education Commission. The original valve circuits in it have been all changed into transistor circuits to suit the needs of the technical development of electric industry in China at present. The frequency response is DC~2MHz and the vertical deflection factor is 50m Vp-p/lattice. The oscilloscope can do the quantitative test to wave shape range, the error is not more than 10%. The instrument is rational in structure, small in volume, light in weight, simple in operation, easy in carrying about, low in electric consumption and cheap in price; really an ideal oscilloscope used for students' experiments in groups in physics and labor skill lessons in middle schools and staff teching.

1. Technical System

1. Vertical System

Frequency Response:	DC~2MHz ≤ 3dB
	AC 10Hz~2MHz ≤ 3dB
Deflection Factor:	5m Vp-p/lattice, error±10%
Input Resistive-capacity:	1MΩ/40pF
Decay multiplier:	1, 10, 100 and 1000 four ranks,error±10%
Input Voltage Endurance:	400V (DC+AC pk)

2. Scanning System

Scanning Frequency	10Hz~100kHz, divided into four ranks:
	10Hz~100Hz
	100Hz~1kHz
	1kHz~10kHz
	10kHz~100kHz
Synchronization	Inner positive sync.
	Inner negative sync.

3. Horizontal System

Frequency Response:	10Hz~500kHz ≤ 3dB
Deflection Factor:	≤100m Vp-p/lattice
Input Risistive Capacity:	1MΩ/60pF
Wave Shape:	Sine 50Hz
Range:	250m Vp-p±10%

4. Oscillographic Tube

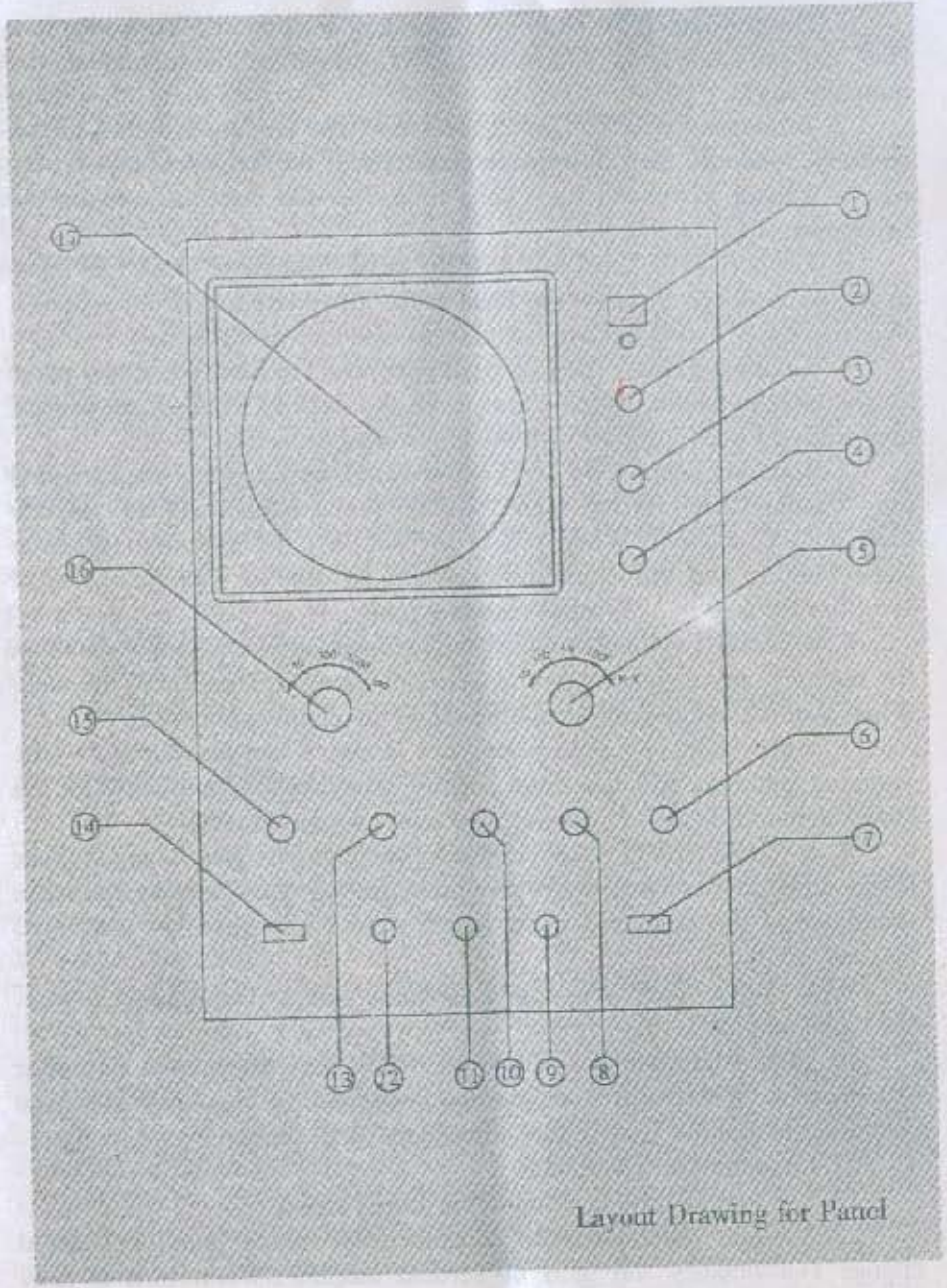
Model Number:	8SJ3IJ
Effective Area:	6 lattice × 10lattice (1 lattic=0.6cm)
Afterglow:	Middle

5. Others

Working Environment:	Temp. 0℃~+40℃
	Relative Humidity≤90% (40℃)
Power Source Used:	AC 220V±10%, 50Hz±5%
Power Consumption:	About 30VA
Working Time:	8 hours continuously
Dimension:	190(H) × 130(W) × 300(L)mm
Weight:	About 3kg

Ⅱ. Controller on Panel

The Drawing below is the panel layout drawing. The functions of controllers will be described as follows:



Layout Drawing for Panel

1. Power Source(S5): The Power switch of instrument. When turn it to "on", the indicator lamp V22 is red. After preheating, the instrument can normally work.

2. Brightness (RP9): Turn it clockwise, the brightness lights, on the contrary, weakens, then disappears gradually. If the lightspot stays on the screen without movement for a long time, it's had better to weaken the brightness or extinguish it.

3. Focus (RP10): Used to adjust the focal distance of electronic beam in the oscilloscope to make the focal point just converge on the screen,at this time the revealed lightspot should become a clear circle dot.

4. Auxiliary Focus (RP11): Used to control the lightspot at any place on the effective acting surface and make the defocus smallest, in general cooperatively used together with the adjustment of focus.

5. Scanning Scope (S3): The control switch for scanning scope,divided into 5 ranks:10Hz~100Hz, 100Hz~1kHz, 1kHz~10kHz, 10kHz~100kHz and "out-X" as well. When put in to "out-X", the scanning generator stops working and the external signal will be directly sent to horizontal amplifier through the "X-input" binding post.

6. X-Shift(RP8):Used to adjust the lightspot and signal wave shape on the screen to move rightwards and leftwards along the horizontal drection. When turn it clockwise,move rightwards on the contrary,leftwards.

7. Sync (K3): +, - sync polar elect swithc. When place it at "+",the scanning generator will make the positive semi-revolution sync. With the tested signal,while at "-", the negative semi-revolution sync.

8. X-Gain (RP7): Controls the lenght of light reace along X axis. When turn it clockwise,the trace prolongs, on the contrary,the trace shortens.And the displayed trace length should be controlled within 10 lattices.

9. X-Input (X3): The tested signal is sent to the binding post of horizontal amplifier.

10. Fine-adjustment for Scanning (RP5): Fine-adjustment controller for scanning. When turn it clockwise, the scanning frequency increases continuously and the ratio of fine adjustment $\geqslant$10 times.

11. Common Earth Terminal.

12. Y-Input (X1):Input terminal for tested signal.

13. Y-Gain (RP2):Gain fine adjustment for vertical amplifier.Used to change continuously the gain of vertical amplifier.When turn it fully clockwise,the gain is th largest,on the contrary,the gain reduces.When the

gain is in the largest state,the sensitivity of oscilloscope is 50m Vp-p/ lattice.

14. DC & AC (SI):Coupling select switch for vertical amplifier. When place it at DC, the tested signal will be directly sent to vertical amplifier, suitable for observing various signals in slow changes,but when at AC,the DC component in the tested signal will be separated to make the wave shape displayed on the screen not effected by the DC electric level.

15. Y-Shift (RP3):Used to adjust the lightspot or signal wave shape displayed on the screen to move up and down along the ertical direction. When turn it clockwise,the lightspot or signal wave shape move upwards, on the contrary,downwards.

16. Attenuation (S2): Y-input signal attenuator,divided into five ranke:"1","10","100","1000"and"experiment signal"."1"without decay," 10","100"and"1000"will be respectively decayed to 1/10,1/100 and 1/ 1000,they can optimistically chosen according to the sizes of the tested signals to make the proper and needed displays shown on the screen.When placed at the position of "expariment signal",the tested signal in the machine will be directly sent to the vertical amplifier and the sine wave shape will be displayed on screen.

Fuse Seat (F1): On the back cover plate. There's 0.5A safety fuse.

III. Principle of Electric Circuit

The electric circut of this oscilloscope is composed of vertical amplifier, scanning generator,level amplifier,high/low voltage power source, control circuit for the display of oscillographic tube and experiment signal. Now described respectively as follows:

1.Vertical Amplifier

It's composed of source follower of field effect tube V1,primary class differential amplifier V4,V5,secondary differential amplifier V6,V7.

The tested signal is imported from X1,X2 binding posts,through coupling switch S1,decay switch S2 and into source follower V1,When S1 switch is placed at "AC" postion,the tested signal passes through coupling capacitance C1 to separate the DC component in input signal which is suitable for the applicatin of higher frequency of signal.But the capacitive impendance of coupling capacitacne will change with the sizes of signal frequency of imput signal.Therefore,when observe the low frequency signal, the abnormal phenomenon can appear.At this time,can put the coupling capacitance at "DC" position,that is ,can directly observe the low

frequency signal in the coupling state.But the DC component in the tested signal can make the screen display deflect the base line. In order to correctly observe and analyze the tested signal within the effective working surface,the higher tested signal can be sent to the input stage of amplifying circuit after decaying through RC decay net (ie,deca switch S2) with frequency compensation.The decay switch is divided into five ranks:"1"," 10","100","1000" and "experiment signal".Rank "1",without decay,"10"," 100"and"1000" will be decayed to 1/10 and 1/1000,and in Rank " experiment signal",it will directly display the sine experiment signal in the machine (about 250m Vp-p/50Hz) to check whether the oscilloscope is correctly working.To the attenuator (S2),RC compensation mode is adopted. When in low frequency,it branches the voltage for the resistance and when in high frequency the voltage for the resistance and when in high frequency the voltage is mainly branched by the capacitance.If adjust the capacitive ratio of capacitance equal to the resistance ratio,the frequency characteristic will gain a good compensation.C2,C4 and C6 in Electric Principle Drawing are the variable condensers for adjusting decay.

At the grid-input end of source follower,it connects serially the RC curnet-limiting net which is composed of capacitance C8 and resistance R8 and takes the collector junction of V2 as the clamping diode to prevent the damage to source follower due to it that the input signal is excessive. The tested signal will,from source input,enter the primary differential ampifier to amplify which is composed of V4 and V5.The DC potential of V4 base stage can be adjusted by means of the central arm of the balanced intermediated potentiometer PR1.The swcondary differential composed of V6 and V7 is an output stage of vertical amplifier,too.To the amplifier,the serial negative voltage feedback mode is adopted and R23 and R24 are negative feedback resistances to guarantee the frequency response of the amplifier meets the requirements.The bleeder net composed of R21,R22 and R23 is joined into V6 and V7 base stage to change the DC potential between the two base stages and to realize the goal of vertical shift.The potentiometer RP4 serially connected by the emitters V6 and V7 can adjust the amplifying capacity of the differential amplifier to meet the requirements of veritcal reflection factor:50m Vp-p/ lattice.C11,C12 and C13 is a compensation net to improve the transient behaviour of the circuit.The output signal from V6 and V7 collecting anode is connected to oscillographic tube V35,Vertical deflection plate.

2.Scanning Generator

The scanning generator is composed of V8,V9 and V13.It's a kind of mutual compensation,self-exciting saw tooth wave generator.A mutual compensation bistable circuit is composed of V9 and V3.V8 is a constant-current charging valve.C18 ~C21 are the charging and discharging condenser for producing tooth waves.The merit of this circuit is short in return period of scanning and the return period of the lowest frequency rank is less than 0.1ms and the highest frequency is less than 1μs.The linearity of tooth wave is very good,the working range is wide and the circuit is simple.The working procedure is as follows:When the power is on,V9 cuts off,the voltage of collecting anode reduces and the reduced voltage is joined to V13 base stage through R41 to make V13 cut off,too. After V9 is cut off,the scanning capacitance C18 ~C21 and C17 are constanly charged by the constant-current tube V8 to make its potential linear rise to form the positive-direction scanning signal (scanning stroke) the rising speed is decided by the capacitivity of scanning capacitance C18 ~C21 and C17 and the current-limiting resistance R3 and RP5 connected serially with the constant-current tube.Therefore,can utilize potentiometer RP5 to change the current-limiting value to achieve the goal of fine adjustment for scanning.After the scanning capacitance is charged,the voltage of emitter V9 rises to make the tube conduct and the voltage of collecting anode rise,and then join and conduct V13 base stage throuth R41,and the voltage of collecting anode reduce.Because V13 collecting anode is connected will V13 base stage through R39,the voltage of V9 base stage reduces,too to make V9 tube is further conducted.The two tubes V9 and V13 become positive and negative feedback mutually to make them rapidly conducted and saturated.The mutual compensation, bistable circuits invert rapidly with each other.After V9 and V13 are conducted,the scanning capacitance discharges through V9,R41 and V13 to form the return period of scanning.After the capacitance discharges,the voltage of emitter V9 reduces.When the voltage which is compared with the voltage of base stage is lower than the cutting off voltage,V9 cuts off at once,and the voltage of collecting anode reduces, and add to V13 base stage through R41 to make V13 cut off too,and the voltage of collecting anode rise so as to make the voltage of V9 base stage rise and V9 cut off further.This positive and negative feedback course makes the mutual-compensation,bistable circuit inverts rapidly with each other.After V9 cuts off,the scanning capacitance is again charged through the constant-current tube.The procedure above is repeatedly carried out,naturally to form the

scanning signal. The ranked adjustment for scanning frequency is realized through changing the capacitance controlled by S3 switch.The sync signal is added to 13 tube base stage through C22 condenser to realize the sync between the scanning frequency and the tested signal of vertical amplifier. When S3 switch is placed at the position of the 5th rank"out -X",V9 emitter is connected with-10V power source and the tube cuts off;and the scanning generator will stop working,X -input signal is connected to horizontal amplifier through S3 switch.The diode V12 in the circuit is taken as the limitation for the sync signal.

3. Horizontal Amplifier

A ccording to the requirement of Type OS502 oscilloscope,the horizonta deflection factor must be less than 100m Vp-p/lattice.Because the horizontal deflection factor of 8SJ315 oscillographic tube used in this instrument is 28.6 -40V/cm,the amplifying capacity of the horizontal amplifier should be 170-240 and the general demand is less than 240.The horizontal amplifier is also composed of the field effect tube and its source follower and the secondary differential amplifier.Th scanning signal sent from S3 swtich or the X-input signal enter into V15 field effect tube and source follower through R44 resistance.The collecting anode V14 is taken as clamping diode to prevent the damage to source follower due to it that the input signal is too large.RP6 is a balanced adjusting potentiometer for X-gain.RP7 is a potentiometer for X-gain.V16 and V17 are the primary differential amplifier and V18 and V19 secondary differential amplifier. The signal amplified will directly be sent to the horizontal deflection plate of oscillographic tube.

4. Power Source,Experiment Signal and Control Circit for Display of Oscillographic Tube.

DC power includes four kinds:+10V,-10V,+170V and -1100V.The +10V and -10V stabilivolt is exported by the two groups of 15V AC voltage exported by the transformer through the full wave rectification,RC filter in positive and negative directions of V25,V26,V27 and V28 and then through the stabilivolt of V23 and V24 VR tube.The +170V voltage is given by two groups of secondary 170V AC voltage from transformer through the full wave rectification and RC filter.And the -1100V voltage is given by the secondary 320V AC voltage from fthe transformer through tripler voltage rectification of V29-V24.

The circuit part for controlling the display of oscillographic tube include the three potentiometers of brightness,focus and auxiliary focus. RP9 is the potentiometer for controlling the trightness of oscillographic tube.It controls the electronic beam through changing the sizes of bias voltage between the control grid of oscillographic tube and the negative electrode.When the negative going of bias voltage increases,the electronic number of the beam decreses and the brightness becomes drak,on the contrasy,becomes light.RP10 is the focus potentiometer and RP11 the auxiliary focus one. To adjust the two potentiometers,can respectively change the voltage of 1st and 2nd positive electrodes to make the field distribution on the oscillographic tube just enable the beam to become a circle dot and focus it on the screen.

The funcitons of experiment signal is to seize the voltage of AC sine wave from the secondary 29 end of the transformer and supply the input signal of 250m Vp-p AC sine wave through RC dividing and shoping of R71,R72 and C36 and then to transport to S2 decay switch for the vertical amplifier.

Ⅳ. Operation

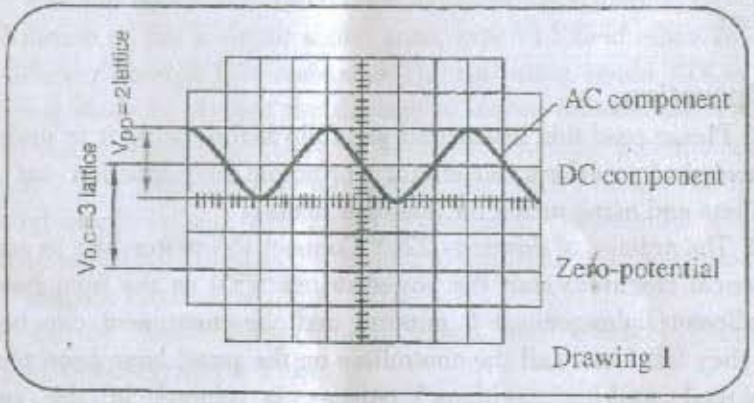
1. Please read this instruction carefully before using it to understand the technical performance,circuit principle,the function of panel controllers and using metod for this instrument.

2. The voltage of power is 220V.Connect the power line to socket of commerical electricity,start the power switch (S5) on the front panel and the indicator lights,preheat 5 minutes and the instrument can be used. When they left factory,all the controllers on the panel have been placed at the normal working positions.Y -decay is placed in the rank of experimental voltage.Therefore a sine wave figure of about 5-lattice range can be seen on the screen after starting the machine.If the display of wave shape is not good,can fine adjust various controllers to see the clear and stable sine wave.If not seen,can turn the potentiometers for vertical and horizontal shifts and check whether the brightness potentiometer is in the proper position.

3. Observation for wave shape.The tested signal is imported from Y-shift terminal,place the attenuator at the "1000" rank,boserve the Y-

direction display on the screen.If not or too small,put the attenuator to "100","10"or"1" ranks to make the 3~5 lattices display appear in Y-direction on screen,that's OK.And adjust other controllers correspondingly, the tested signal wave shape can be displayed on te screen.

4. Measurement for wave-shape range.If te tested singal peak in needed to be read.can clockwise turn the Y-gain button to the end,that is, the Y-gain is in the largest value.At this time,the vertical deflection factor is in the correction state.When Y-decay switch is placed at the position of "1","10","100"and"1000",the vertical deflection factor are respectively 50mV/lattice,0.5V/lattice,5V/lattice and 50V/lattice,and the peaks of tested shape can be read according to the number of lattice of wave shape displayed on the screen.When testing,pay attention to keeping the power voltage in 220V to guarantee the precision of measurement (When testing, first adjust scanning fine-adjusting button to make the wave shape steady). For example,the wave shape signal is shown as Drawing 1:



Drawing 1

The reading between peaks of the two wave shape peaks in the drawing is 3.6 lattices.If Y-decay is placed at "10" rank the tested peak of wave shape peak is:

Vp-p=3.6 lattices×0.5V/lattice=1.8V

When DC electric level is contained in the tested signal,this level can be tested out,but it's necessary to determine the zero potential on the screen first and can remove the tested signal and do the short ground return between Y-input and earth binding post and put the input coupling at DC,please remember,at this time,the position of scanning line

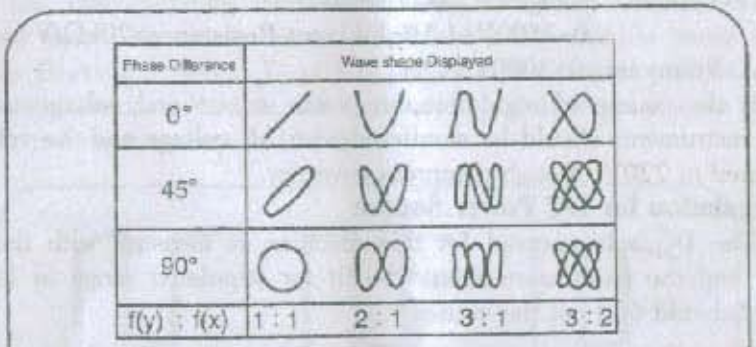
on th screen is in zero potential,again joined into the tested signal.If the wave shape of the tested signal displayed on the screen is shown as Drawing 1 and Y-decay switch is placed at "100"rank,the DC component of the tested signal is:

V=3 lattice×5V/lattice=15V

The peak of DC component peak is :Vp-p=2 lattice×5V/lattice=10V

5. Y-X Display

If it's necessary to let the oscilloscope do X-Y display,for example, observe Lishayu Figure,can place the scanning scope switch to the position "out X"and introduce the sine signal called as f (x) produced by the signal generator whose precision is high into xinput terminal and the tested sine signal called as f (Y) is introduced from the Ying input terminal;then adjust the frequency of generator for f (x) signal.Lishayu Figure can appear on the screen.According to the Figure,can calculate out the frequency and the phase relations between the two signals which is shown as Drawing 2.



Drawing 2

6. In order to prevent the unnecessary troubles and prolong the service life,should pay attention to the followings:

(1) The voltage of commercial power should be within the scope of 220V±10%, especially don't use over-high voltage of commerical power so as to prevent the components of the instrument from being broken.

(2) When using it, it's necessary to pull up the controllers on the panel gently.When they have reached the limit,don't again pull them up imperatively to avoid damaging the parts.

(3) Using it to do tests,should prevent introducing over-strong signal

which is tested to avoid the damage to the parts when Y-decay switch is placed at "1" rank.

(4) When moving the instrument,must prevent it from being impacted and the damage to the shell and parts.

(5) After using the machine,should put the dust cover on it and place it in a coll,dry and airing place to prevent it from being covered with dust and its parts being oxidized and rusted.

(6) When the instrument is stored for three months,must start it once and the running time should not be shorter than one hours.

V. Regulation for Instrument

This instrument used for a longer time or repaired should be overall regulated in general.

1. For regulating the machine,the following equipment is needed:

Signal Square Wave Generator Range:0~200V±1%,Frequency:1kHz

Signal Wide Band Generator Freq.Scope:5Hz~5MHz,Output Range:>500mV

AVO Meter Range:0~5000V,0~500V

0~2500V±1.5%,Inherent Rosistance>20kΩ/V

AC Voltmeter 0~3000V±1.5%

In the course of regulation,the power source and voltage used for these instruments should be monitered with AC voltage and the voltage is regulated to 220V through compress governor.

2. Regulation for DC Power Source

The DC voltage used for this machine is measure with the AVO meter and the parameters should be fit for stipulated range in List 1.If exceed,should find out the causes.

List 1

Voltage Measured	Position Tested	Voltage Scope(V)
-1100V	R78	-1000~1200
+180V	C25	+170~+200
+170V	C25	+160~+1800
+10V	V23	+9.2~+10.5
+10V	V24	-9.2~-10.5

3. Rectification for Vertical Deflection Factor and Attenuator

Send 1 kHz square wave signal exported by square wave generator to Y-input teminal.In line with the different decay ranks,the range of square wave signal is placed in different positions according to the requirements in List 2. The scanning scope switch is placed at "100Hz~1kHz" ranks,then trun the fine-adjusting button to display the stable square wave on the screen.

List 2

Decay Rank	Range of Square Wave	Lattice Number Displayed on Screen	Component Regulation
1	0.2V	=4 lallice	RP4
10	2V	4 lallice±10%	C2
100	20V	4 lallice±10%	C4
1000	200V	4 lallice±10%	C6

Adjust the corresponding controllers again to make the square wave displayed meet the requirements of critical compensation wave shape shown as Drawing 3. When Y-gain is placed at the largest position (Turn it to the end clockwise) the lattice number display by square wave should be fit for the requirements in List 2

Drawing 3

4. Check for Scanning Frequency

Add the wide band signal generator to Y-input terminal,adjust the frequency of siganl generator in the different scanning scope ranks,at the two limited positions of the fine adjustment for scanning to make a cycle wave shape appear on the screen.At this time,the frequency indication of singal generator should be fit for the requirements in List 3.

5. Regulation for Y-axis Frequency Response

Place all the controllers on the panel at the following Positions:

AC	DC
Decay	1
Y-gain	Turn it to the end clockwise
X-gain	Turn it to the end anti-clockwise

Put the frequency of signal generator to 1kHz outpout,then add it to Y-input terminal and again adjust the output range of signal generator to make the range along the vertical direction displayed on the screen is 6 lattices.Keep the output range of the signal generator without any change. Record the range along the vertical direction displayed on the screen whose signal frequency is in 5Hz,100Hz,100kHz,500kHz,1MHz.The quantity which is not less than 4.2 lattices should be fit for the qualification.

6.Regulation for Sensitivity & Frequency Response of X-Amplifier

Place all the controllers on the panel which will be regulated at the following positions:

Y-decay	1000
Y-gain	Turn it to the end anti-lockwise
X-gain	Turn it to the end clockwise

Put the scanning rank at the position of "out X" List 3

Scanning Rank	Position of Scanning Fine Adjustment	Frequency of Signal Generator
10Hz~100Hz	Turn it to the end anti-clockwise	≤10Hz
10Hz~100Hz	Turn it to the end clock wise	≥100Hz
10Hz~1kHz	Turn it to the end anti-clockwise	≤100Hz
10Hz~1kHz	Turn it to the end clock wise	≥1kHz
1kHz~10kHz	Turn it to the end anti-clockwise	≤1kHz
1kHz~10kHz	Turn it to the end clock wise	≥10kHz
10kHz~100kHz	Turn it to the end anti-clockwise	≤10kHz
10kHz~100kHz	Turn it to the end clock wise	≥100kHz

Add the square wave of 1kHz, 0.5V range produced by square generator to X-input terminal,the range along the horizontal direction displayed on the screen should be ≥5 lattices which is fit for the standard.

Aagin add 1 kHz signal produced by the wide-band signal generator to the X-input terminal and adjust the output range of signal generator to make the range along the horizontal direction displayed on the screen is 6 lattices.Keep the output range of signal generator without any change. Record the range along the horizontal direction displayed on the screen whose signal frequency is in 10Hz,100Hz,10kHz,100kHz and 500kHz,and the quantity should not be less than 4.2 lattices which is fit for the standard.

VI. Common Faults and Their Repairs for Instrument

1. Turn on the power switch and the indicator lamp is not light but there will be a lightspot on the oscillographic tube in one or two minutes. The reason is that the indicator lamp has been burnt,loose or relieved.

2. After turning on the power switch,the indicator is not light and there's no lightspot on the oscillographic tube,either.The reason is mostly that the power isn't connected,perhaps the power line is broken,the power switch is damaged or the safety fuse is blown out;can inspect the damaged parts with AVO meter or change the parts.

3. After turning on the power siwtch,the safety fuse is blown out at once.The common season is that the load of transformer is in shot circuit; can check whether V20~V21 commutation diode is broken through or in short circuit;change the damaged parts.

4. After turning on the power switch,the indicator is light but there's no lightspot on the oscillographic tube.The reason is probably the following conditions:

(1) The instrument is normal.Because of the improper position between Y-shift and X-shift potentiometers,the lightspot run sout of the screen;can properly adjust them.

(2) The-1100V high voltage power supply is abnormal and the D.C output voltage is in dissymmetry to make the lightspot run out of the screen; can,with AVO meter,measure the DC voltage of V6 ~V7 collectors (collecting anode), when RP3 is adjusted to the midst,the outpout DC voltages are not equal,it ex presses the vertical amplifier has faults;can check whether one of V3~V7 tubes is damaged and whether the connecting resistances are in scaling off;use the same method to test the DC voltage on V18,V19 collectors and check whether one of V16~V17 tubes is damaged and whether the connecting resistances are in sealing off.

5. After turning on the power switch,the indicator is light and the lightspot appears,but the adjustment for brightness and focus is out of order.The reasons are as follows:

(1) The lightspot is darker and the adjustment for brightness is in malfunction.The brightness-adjusting potentiometer is mostly damaged.

(2) If the light trace becomes a thin strip along the Y-shift direction

and the adjustment for focus is out of order,the focus potentiometer RP10 is mostly damaged or Ry 6 resistance is broken.

(3) If the light trace is a thin strip along X direction,the adjustment for auxiliary focus is out of order,the −180V power source likely disappears or the auxiliary focus potentiomenter RP5 damaged.

6. After turning on the power switch,there's a light indicator and a lightspot on the oscillographic tube,too,but no scanning line;the reason is as follows:

(1) The oscilloscope is normal.Due to it that the scanning scope switch is set at "outX" rank or X−gain potentiometer is set at the smallest position,can do a proper adjustment.

(2) The scanning generator is out of operation;can check whether V8,V9 and V13 damaged,whether the connecting resistance is in sealing off,whether the contact of S3 switch is good and whether the connecting wire is broken out.

(3) If the scanning generator is in normal work,it expresses the horizontal amplifier is damaged;can check whether the field effect tube V15 is normal and whether the connecting wire of potentiometer RP6 or RP7 is broken out.

7. After turning on the power siwtch,the indicator is light,there's also scanning line on the screen,but the decay switchis placed at the experiment signal rank,so there's no sine wave shope on the screen;can find out the troubles according to the following steps:

(1) If place decay switch at "1" rank and touch Y−input end with a driver,there's still no wave shape on the oscillographic tube, then it expresses the vertical amplifier is damaged;can check whether connecting resistance is in release and measure the voltage of all the transistors is normal;can find out the causes and change the damaged parts.

(2) According to the situation above,if touch Y−input end with a driver,the wave shape will at once appear.It expresses the work of vertical amplifier is basically normal and the fault is probably in the circuit of experiment signal;can check whether the parts on R71,R72 or R36 is damaged.

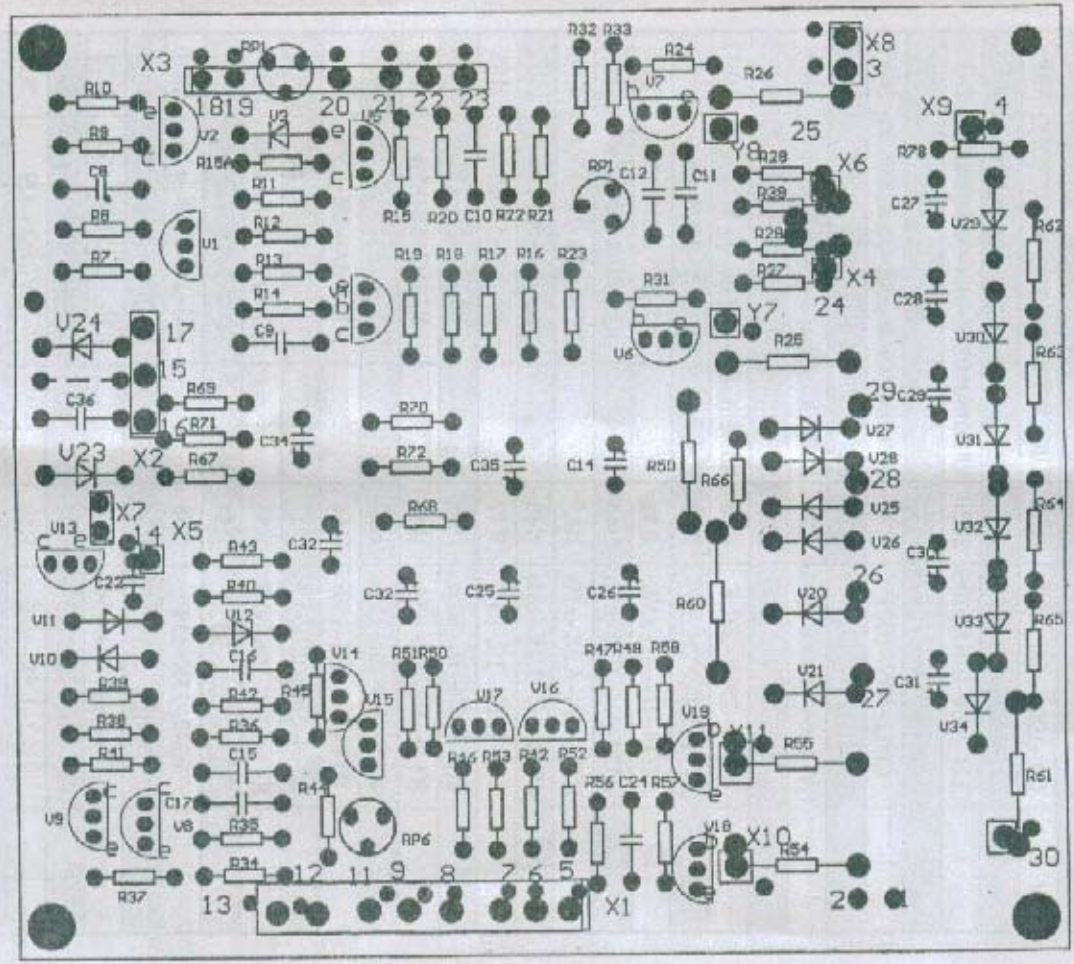
8. After turning on the power switch,indicator light,place te decay switch at the experiment signal rank,the sine wave appears but place it to "1","10","100" and "1000" ranks,the tested signal can't be imported.The trouble is probably in the coupling switch,decay switch or their conducting wire or parts which have been loose or damaged; can carefily troubleshoot them.

9. The troubles of the oscilloscope are varying.The several common faults and the repair methods are only chosen for the users as reference. Actually,it's not difficult to repair the troubles after grasping the electric principle and structure of this instrument.

Oscilloscope for Students					
Name	Type	Position No	Name	Type	Position No
Resistance	RJ−1/2−900K±0.5%	2R1	Resistance	RT14−1/4−5.6K−±5%	R21
	RJ−1/2−111K±0.5%	2R2		RT14−1/4−5.6K−±5%	R22
	RJ−1/2−900K±0.5%	2R3		RT14−1/4−47K−±5%	R23
	RJ−1/2−10.1K±0.5%	2R4		RT14−1/7−47K−±5%	R24
	RJ−1/2−1M±0.5%	2R5		RJ−2−12K−±5%	R25
	RJ−1/2−1K±0.5%	2R6		RJ−2−12K−±5%	R26
	RJ−1/2−1M±5%	R7		RT14−1/4−100K−±5%	R27
	RT14−1/8−470K−±5%	R8		RT14−1/4−100K−±5%	R28
	RT14−1/4−470−±5%	R9		RT14−1/4−3.3K−±5%	R29
	RT14−1/4−20K−±5%	R10		RT14−1/4−3.3K−±5%	R30
	RT14−1/4−1K−±5%	R11		RT14−1/4−1K−±5%	R31
	RT14−1/4−474K−±5%	R12		RT14−1/4−680−±5%	R32
	RT14−1/4−820−±5%	R13		RT14−1/4−680−±5%	R33
	RT14−1/4−47−±5%	R14		RT14−1/4−1.5K−±5%	R34
	RT14−1/4−47−±5%	R15		RT14−1/4−1.5K−±5%	R35
	RT14−1/4−1M−±5%	R15A		RT14−1/4−5.6K−±5%	R36
	RT14−1/4−2K−±5%	R16		RT14−1/4−4.3K−±5%	R37
	RT14−1/4−2K−±5%	R17		RT14−1/4−15K−±5%	R38
	RT14−1/4−2K−±5%	R18		RT14−1/4−3.3K−±5%	R39
	RT14−1/4−3K−±5%	R19		RT14−1/4−2.7K−±5%	R40
	RT14−1/4−240K−±5%	R20		RT14−1/4−220−±5%	R41
Triode	5485	V1		LED701(Φ3mm)	3V22
	9011	V2		IN4740A	V23
RV−tube	0.5W 6.2V	V3		IN4740A	V24
	9011	V4		IN4001	V25
	9011	V5		IN4001	V26
	3DA87C	V6		IN4001	V27
	3DA87C	V7		IN4007	V28
	9012	V8		IN4007	V29
	9012	V9		IN4007	V30

Oscilloscope for Students					
Name	Type	Position No	Name	Type	Position No
	IN4148	V10		IN4007	V31
	IN4148	V11		IN4007	V32
	IN4148	V12		IN4007	V33
	IN4148	V13		IN4007	V34
	9011	V14	Oscillograph tube	8SJ31J	V35
	5485	V15	Slide switch	KB-2	2S1
	9011	V16	Read switch	S252V125-9015-120-EG00-00	2S2
	9011	V17		S252V125-9015-120-EG00-00	2S3
	3DA87C	V18	Slide switch	KB-2	2S4
	3DA87C	V19	Power Swich	PLW1P1T	S5
	IN4007	V20	Terminal		X1
	IN4007	V21	Terminal		X2
			Terminal		X3
				Note:Started with2 is to fitted to No 2 plate	
Source Socket	4ZB-3	X4	X4	Started with 3 is to fitted to No 3 plate	
				The other are fitted in No 1 main plate	
Transformer	Process to map				
Great valve seat	1Merely	Included for Earth Tag			
Button	The same with ST16A small knob	8Merely			
Capacitance	CVCR06-1/9	2C6	Capacitance	CD15-450-2.2U	C27
	CL21-160V-4700P±10%	2C7		CD15-450-2.2U	C28
	CC1-0.01UF±20%	C8		CD15-450-2.2U	C29
	CY-100V-220P±10%	C9		CD15-450-2.2U	C30
	CY-100V-390P±10%	C10		CD15-450-2.2U	C31
	CY-100V-220P±10%	C11		CD11-25V-220U	C32
	CL11-63V-2200P±10%	C12		CD11-25V-220U	C33
	CC1-2.2P±10%	C13		CD11-25V-220U	C34
	CD11-250V-22UF	C14		CD11-25V-220U	C35
	CC1-5.1P±10%	C15		CL11-63V-0.22U±10%	C36
	CY-100V-47P±10%	C16	Potentiometer	SF6-Good-2K	RP1

Oscilloscope for Students					
Name	Type	Position No	Name	Type	Position No
	CY-100V-390P±10%	2C17	RB1601NOX0B-H-B202-Q0-KQ200B120		2RP2
	CY-100V-68P±10%	2C19	RA0901NOX0K-HA1-B503-Q0-KQ225B120		2RP3
	CL21-160V-4700P±10%	C19		SF6-Good-1K	RP4
	CL21-160V-0.047u±10%	2C20	RB1601NOX0B-H-B104-Q0-KQ200B120		2RP5
	CL21-160V-0.47u±10%	2C21		SF6-Good-4.7K	RP6
	CD11-50V-10UF	C22	RB1601NOX0B-H-B502-Q0-KQ200B120		2RP7
	CY-100V-470P±10%	C23	RA0901NOX0K-HA1-B503-KQ225B120		2RP8
	CY-100V-1000P±10%	C24	RB1601NOX0B-H-B105-Q0-KQ200B120		3RP9
	CD11-250V-22UF	C25	RB1601NOX0B-H-B205-Q0-KQ200B120		3RP10
	CD11-250V-22UF	C26	RB1601NOX0B-H-B105-Q0-KQ200B120		3RP11
Resistance	RT14-1/4-2.7K-±5%	R42	Resistance	RJ-1/2-2.2M-±5%	R63
	RT14-1/4-47-±5%	R43		RJ-1/2-2.2M-±5%	R64
	RT14-1/4-10K-±5%	R44		RJ-1/2-2.2M-±5%	R65
	RT14-1/4-4.3K-±5%	R45		RJ14-1/4-2K-±5%	R66
	RT14-1/4-2.2K-±5%	R46		RJ-1/2-56-±5%	R67
	RT14-1/4-1K-±5%	R47		RJ-1/2-56-±5%	R68
	RT14-1/4-1K-±5%	R48		RJ-1/2-56-±5%	R69
	RT14-1/4-750-±5%	R49		RJ-1/2-56-±5%	R70
	RT14-1/4-2K-±5%	R50		RT14-1/4-560K-±5%	R71
	RT14-1/4-2K-±5%	R51		RT14-1/4-2M-±5%	R72
	RT14-1/4-10K-±5%	R52		RJ-1/2-100K-±5%	R73
	RT14-1/4-10K-±5%	R53		RJ-1/2-100K-±5%	3R74
	RJ-2-15K-±5%	R54		RJ-1/2-150K-±5%	R75
	RJ-2-15K-±5%	R55		RJJ-1/4-5.1M-±1%	3R76
	RT14-1/4-240-±5%	R56		RJJ-1/4-1M-±1%	2R77
	RT14-1/4-820-±5%	R57a		RJJ-1/2-510K-±5%	R78
	RT14-1/4-820-±5%	R58		CL21-400V-0.022UF±10%	2C1
	RJ-2-1.5K-±5%	R59		CVCR06-1/9	2C2
	RJ-2-1.5K-±5%	R60		CY-100V-220P±10%	2C3
	RJ-2-3.6K-±5%	R61		CVCR06-1/9	2C4
	RJ-1/2-2.2M-±5%	R62		CY-100V-1000P±10%	2C5
	The same with ST16a Button	2 Merely			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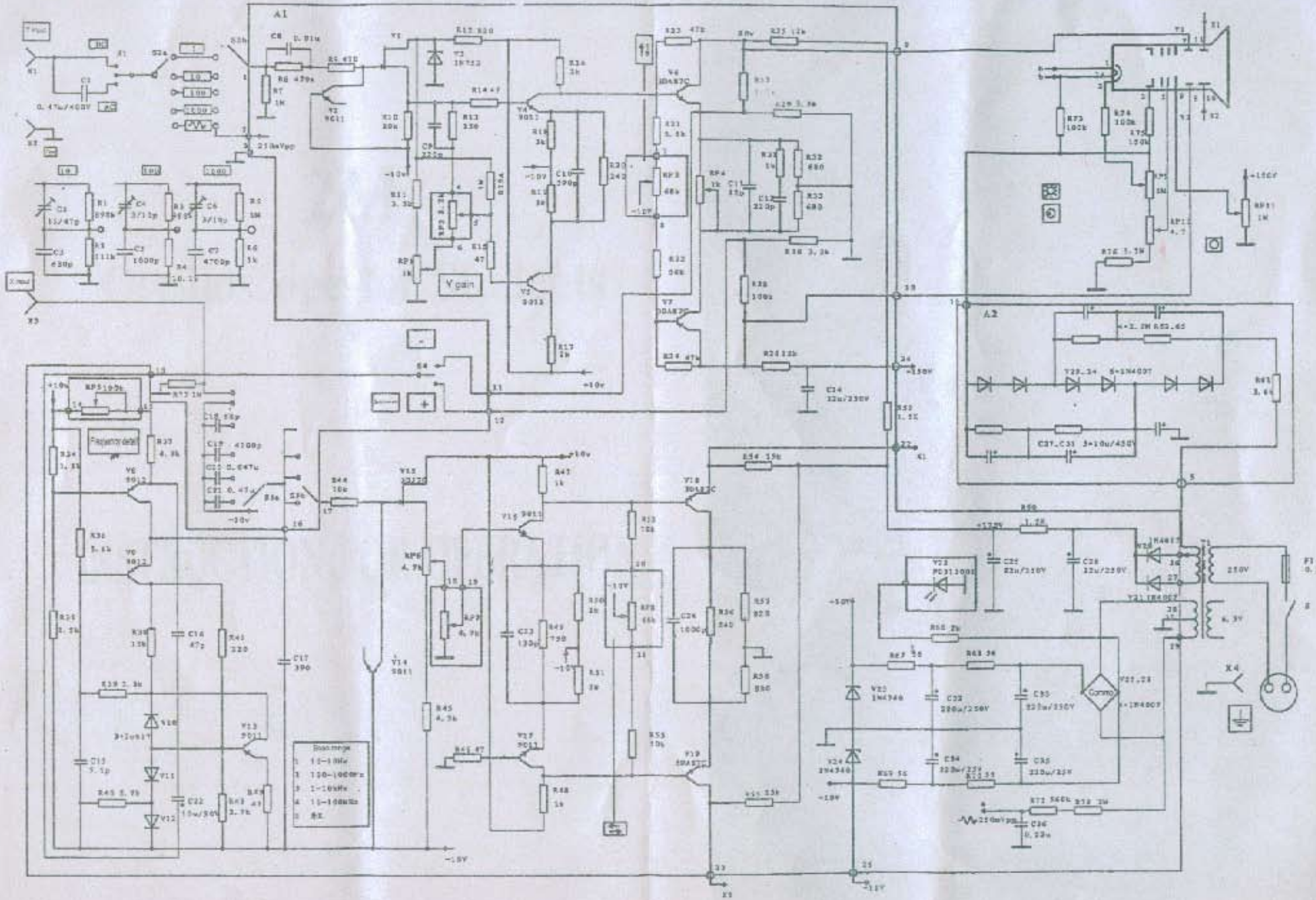

Principle Drawing for Oscilloscope for Students