FUNCTION GENERATOR

USER MANUAL

FUNCTION GENERATOR

This instrument is a signal generator with features such as highly stable, broadband and multi-function .The design of appearance is strong and elegant. And it is easy to operate, could directly generated sine wave, triangle wave, square wave, ramp, pulse, and has VCF input control functions. TTL / CMOS can be as synchronized output with the OUTPUT. The adjusted Waveform is symmetry and have reverse output, DC level can be adjusted continuously. Frequency meter could be as the display of internal frequency and measure the outside frequency. It is particularly suitable for teachings, scientific researching and experimenting of electronic and pulse circuits.

Ⅰ Main technical Features

1. Frequency range: 0.1Hz-2MHz
   0.1Hz-5MHz
   0.1Hz-10MHz
   0.1Hz-15MHz

2. Waveform: sine wave, triangle wave, square wave, Positive and Negative sawtooth and Positive and Negative pulse

3. Square-wave front:
   0.1Hz-2MHz <100ns
   0.1Hz-5MHz <50ns
   0.1Hz-10MHz<35ns
   0.1Hz-15MHz<35ns

4. Sine wave

Distortion :< 1% (10Hz-100KHz)

Frequency response: 0.1Hz-100 KHz ≤±0.5dB
100 KHz-5MHz ≤±1dB
100 KHz-2MHz ≤±1dB

5. TTL / CMOS output

Level:TTL Pulse low level is no more than 0.4V, high level is no less than 3.5V.

Rising time: no more than 100ns

6. Output: Impedance:50Ω±10%

Amplitude: no less than 20vp-p (Empty load)

Attenuation: 20dB 40dB

DC bias 0-±10V (Continuously adjustable)

7. Adjustment range of symmetry: 90:10-10:90

8. VCF input

Input voltage:-5V-0V±10%

The maximum voltage ratio: 1000:1

Input signal: DC-1KHz

9. Frequency meter

Measuring range: 1Hz-20MHz

Input Impedance: no less than 1 MΩ/20pF

Sensitivity: 100mVrms

The maximum input: 150V (AC+DC) with attenuator

Input attenuation: 20dB

Measurement error: ≤0.003%±1digit

10. The scope of adaptation of power

Voltage: 220V±10 %(110V±10%)

Frequency: 50Hz±2Hz

Power: 10W (Optional)

11. Environmental conditions

Temperature: 0^0C -40^0C

Humidity: ≤RH90% Atmospheric pressure: 86kPa-104kPa

12. Dimension (L ×W×H):310×230×90mm

13. Weight :About2-3Kg

Ⅱ Principle

The Block diagram of the apparatus is shown as Figure 1

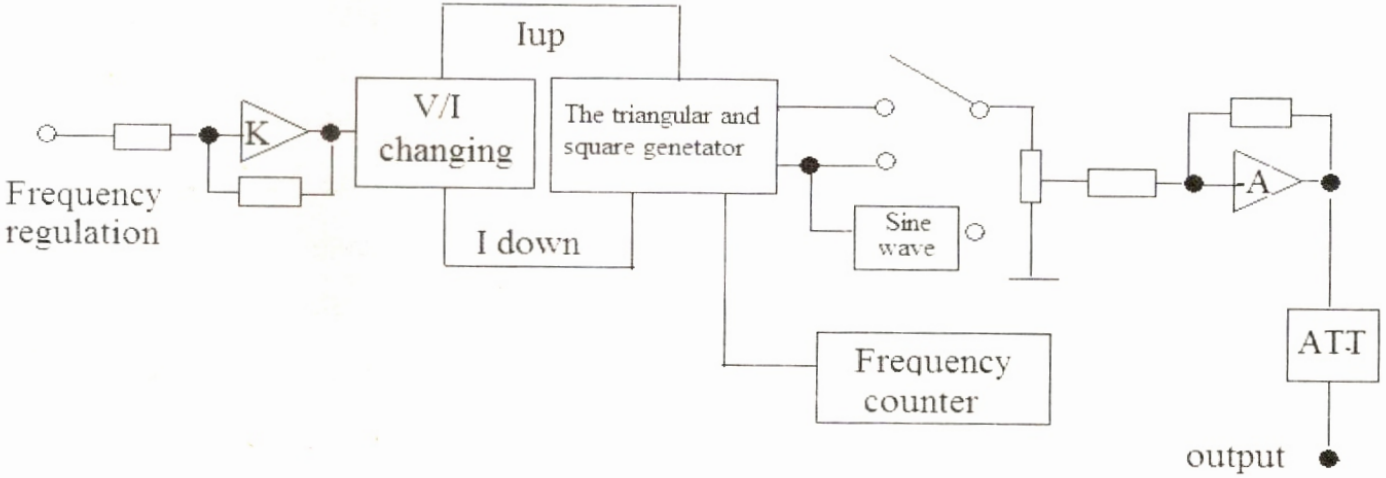


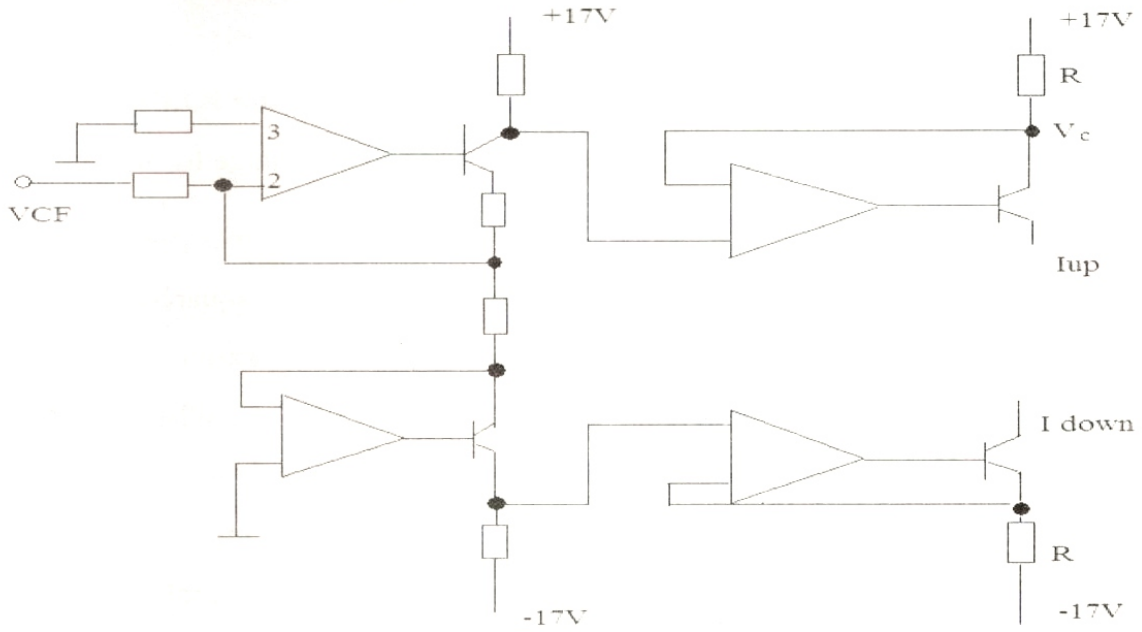
Figure 1

1. Constant current source control circuit,

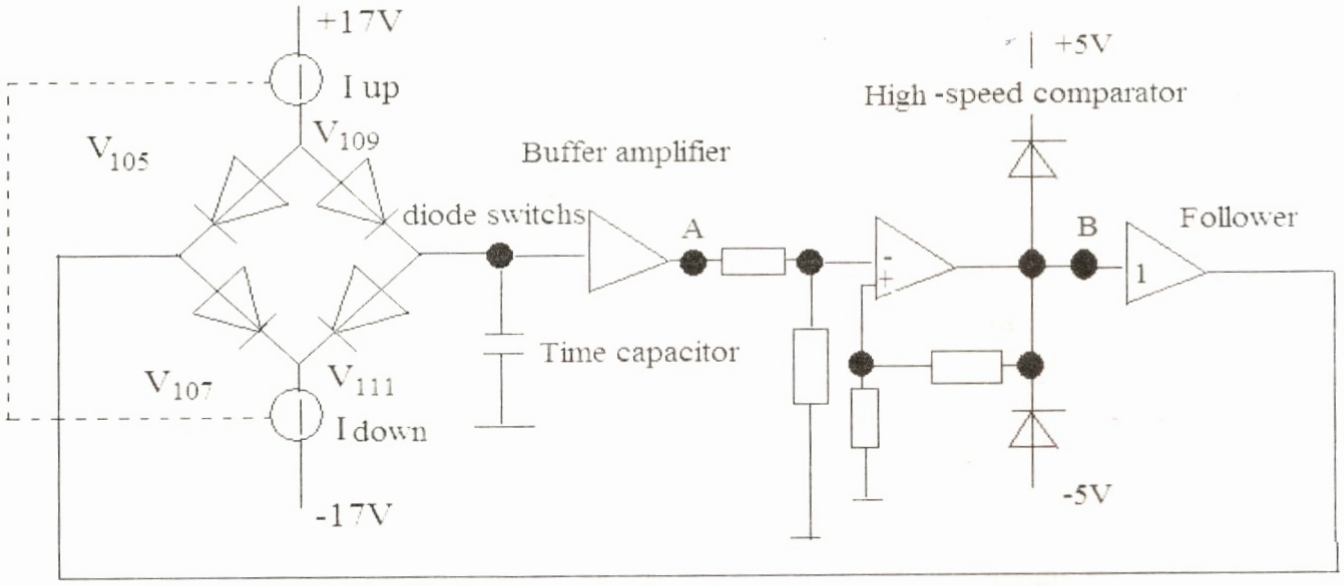
This part of the circuit is shown as Figure 2, positive V_{be} of transistor is offset due to the closed-loop of integrated circuits, if it is ignored as block offset voltage $I_{UP}=I_{DOWN}=V_C/R$

2. Square-wave generator,

This is a constant current source controlled with triangular wave - square-wave generator, in Figure 3. Diode consisted circuit control capacitor C charging and discharging, using high-speed comparator to control the on and off of the diode switches (V105-V111). When the comparator B is high, V107 and V109 conduct, V105 and V111 cut-off, constant current source doing positive charge to integral capacitance C, when the comparator B is low, V105 and V111 conduct, V107 and V109 cut-off, constant current source doing positive discharge to integral capacitance C .So as the cycle, the output of a point is the triangle wave, the output of B points is the square wave. While wave, square wave change, you could also change the integral capacitance to change the frequency of equipment.



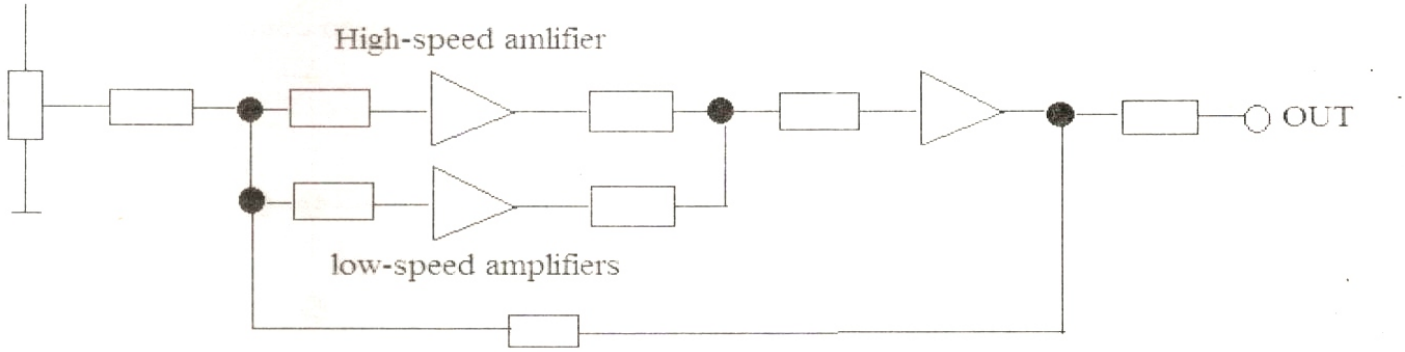
(Figure 2)



(Figure 3)

3. PA (Power Amplifiers)

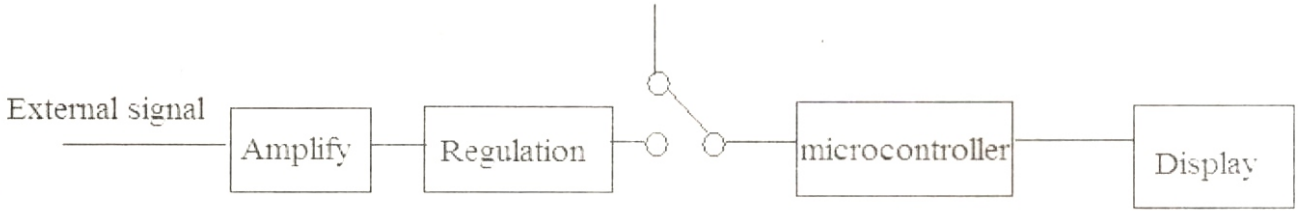
In order to guarantee a very high slew rate and good stability, power amplifier circuit used as the dual-channel, the entire amplifier circuit has the inverted phase features.



(Figure4)

4 . Digital frequency meter

The circuit is made up of broadband amplifier, square-wave shaper, microcontroller, LED display, etc. When the frequency is working at the "External measurement" state, the external signal was sent to counter to count after amplifying and regulation, finally displayed on the LED digital tube. While internal measurement, the signal entered into the counter directly, counting the time of gates, LED tube decimal point location and Hz or KHz are determined by the CPU



(Figure5)

5 . Power

This instrument use three groups of±23，±17，±5 powers。 The ±17 is the main regulation power supply; ±5 is obtained by three-regulator integrated circuits 7805 for the use of frequency, ±23 used as power amplifier.

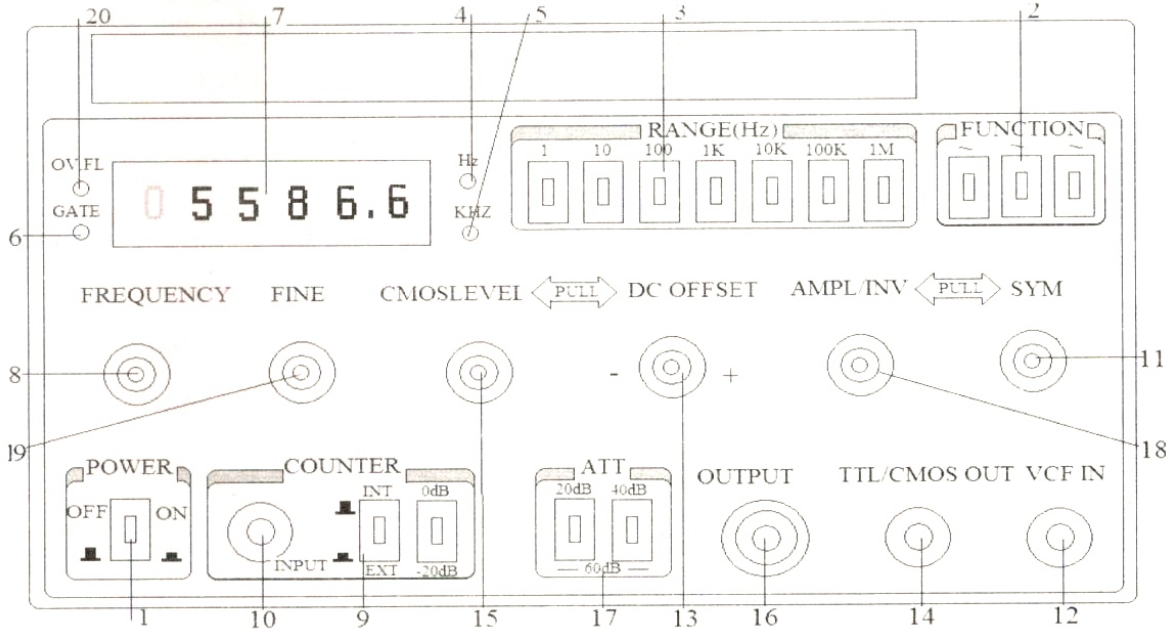
III Structural Features

The instrument adopts the all-metal chassis with solid structure, pasted plastic panels, new beautiful appearance。And it is small with light weight, the majority components（Including the key switch） of the circuit are installed on a printed circuit board。 All the adjustment components are

placed on the apparent position. When the equipment needs to be repaired, you can remove the two fastening screws of the back plate, to unload the upper and lower plate.

IV Instruction of use and maintenance

1、Panel sign and Function Description; See as table 1 and Figure 6



(Figure6)

Panel sign and function Description

Serial number	panel sign	name	function
1	Power	power switch	press switch, power connection, the apparatus is on working condition
2	Function	Waveform choice	1) selection of output waveform 2) Coordinate with the SYM, INV, you could get the positive and negative sawtooth wave and pulse wave
3	Range	Frequency-selective switch	Frequency-selective switch and"8" choose the working frequency
4	Hz	frequency units	indicate frequency units, lighting as effective
5	KHz	frequency units	frequency units, lighting as effective
6	Gate	gate show	While lighting it means that frequency meter is working.
7		digital LED	All the internally generated frequency or the outside measured frequency is displayed by the six LED.

8	FREQ	Frequency regulation	inner and outer measuring frequency (press) signal tuner
9	EXT-20dB	External input frequency attenuation 20dB coordinates with 3 select working frequencies.	Outer measuring frequency attenuation selection, while pressing the signal attenuated 20dB
10	CORNTER	Counter input	While measuring the outside frequency ,the signal entered from here
11	PULL.SYW	Ramp, pulse wave of the knob adjustment knob	Pulled out the knob, you can change the symmetry of output waveform, resulting in ramp and pulse with adjustable duty cycle, this knob is promoted as symmetrical waveform
12	VCR IN	VCR input	External voltage control the frequency of input
13	PULL DC OFFSET	DC bias adjustment knob	Pulled out the knob, you can set the DC Operating Point of any waveform, Clockwise direction is positive , Anti-clockwise for negative, this knob is promoted then the DC-bit is zero.

14	TTL/CMOS OUT	TTL/CMOS output	The output waveform as the TTL / CMOS pulse can be used as synchronous signals
15	PULL TO TTL CMOS LEVEL	TTL,CMOS Regulation	Pulled out the knob, you could get TTL pulse It is promoted CMOS pulse and its range could be adjusted
16	OUT PUT	signal output	The output waveform is output from here. The impedance is 50Ω
17	ATTENUATOR	output attenuation	Press the button and it could generate attenuation of -20dB or-40dB
18	PULL AMPL/INV	Oblique wave inversion switch, the rate adjustment knob	1. Coordinate with "11", when pulled out the wave is reverse. 2.Adjust the size of the output range
19	FINE	Frequency adjust slight	Coordinate with "（8）", used to adjust smaller frequency
20	OVFL	Overflow display	When frequency is overflow， the instrument display。

2. Maintenance and calibration.

The apparatus could work continuously under the required conditions, but in order to guarantee good performance, we proposed to correct every three months. The order of correction is as follows:

1) Adjustment of sine wave distortion

Symmetry, the DC bias and modulation control switch are not pulled out, placed the frequency multiplier to "1K", the frequency display as 5Khz or 2KHz, slowly adjust the potentiometer RP105, RP112, RP113 so that the distortion is minimum, repeat the above work several times ,sometimes the whole band (100Hz-100KHz) is less than 1% distortion

2) Square-wave

Operating frequency to 1MHz, correct C174 so that the square-wave response is at the best moment

3) Frequency accuracy adjustment

Set the frequency meter as "EXT" state; connect the standard signal source 20MHz output to external counter, adjust C214 to display as 20000.0 KHz.

4) Frequency sensitivity adjustment

The sine-wave signal which the output range of signal source is 100mVrms and frequency is 20MHz is connected to external counter, the gate time is set to0.01s; adjust RP115 to display as 20000.0 KHz

3 . Trouble clearing

Trouble clearing should be doing under the condition of you are familiar with the working principle and circuit. You should inspect the circuit step by step as the following order: the regulated power supply - Triangle wave - square wave generator - sine wave circuit - power amplifier - frequency count circuit - the display part of frequency meter. You should replace the integrated circuit or other components while founding which part is in trouble.

V Preparation of Annex

Manual	one
Cable （50Ω test line）	one
Cable （BNC line）	one
Fuse	two
Power line	one