

Instruction Manual
for
BK PRECISION[®]
Models 4001
and 4003
3 MHz
FUNCTION GENERATOR



This symbol on oscilloscope means "refer to instruction manual for further precautionary information". This symbol appears in the manual where the corresponding information is given.

BK PRECISION[®]

1031 Segovia Circle, Placentia, CA 92870

4001/4003 USER'S MANUAL ENGLISH

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I . NOTICE BEFORE OPERATION

1. Unpack the instrument :

After receipt of the instrument, immediately unpack and inspect it for any damage which might have been sustained when in transportation or shortage of accessories. If any sign of damage and shortage of accessories are found, immediately notify the dealer.

2. Environments :

Normally, operational temperature of the instrument is 10°C to 40°C (50°F to 104°F). Operation of the instrument outside of this temperature range may cause damage to the circuits.

Do not use the instrument in a place where strong magnetic or electric field exists. Such fields may disturb the measurement.

3. Check the Line Voltage :

The instrument can operate on any one of the line voltages shown in the below table by inserting the line voltage selector plug in the corresponding position on the rear panel.

Before connection the power plug to an AC line outlet, be sure to check that voltage selector plug is set in the correct position corresponding to the line voltage.

△ CAUTION : The instrument may not properly operate or may be damaged if it is connected to a wrong voltage AC line. When line voltages are changed, replace fuses also as required.

SELECTOR	LINE VOLTAGE	FUSE
115V	100~125V 50/60Hz	600mA F
230V	220~240V 50/60Hz	300mA F

⊙ Hints for operation the instrument observe the following suggestions for successful instrument operation.

1. Never place heavy objects on the instrument.
2. Never place a hot soldering iron on or near the instrument.
3. Never insert wires, pins or other metal objects into ventilation fan.
4. Never move or pull the instrument with power cord or probe cord.
Especially never move instrument when power cord or signal probe is connected to a circuit.
5. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

△ WARNING : The following precautions must be observed to help prevent electric shock.

1. When the instrument is used to make testing. There is always a certain amount of danger from electrical shock. The person using the instrument in such condition should be a qualified electronics technician or otherwise trained and qualified to work in such circumstance.
2. Do not operate the instrument with the cover removed unless you are a qualified service technician.
3. The ground wire of the 3-wire Ac power plug places the chassis and housing of the instrument at earth ground. Use only a 3-wire outlet, and do not attempt to defeat the ground wire connection or float the instrument. to do so may pose a great safety hazard.
4. Do not obstruct the ventilation holes in the rearpanel. As this will increase the internal temperature.
5. Never apply external voltage to output BNC of the instrument.
6. Excessive voltage applied to the input BNC may damage the instrument.
7. The instruments are designed for INDOOR USE ONLY.
8. This equipment has been evaluated to INSTALLTION CATEGORY II, POLLUTION DEGREE 2.

II. MAINTANCE

GENERAL MAINTANCE

Preventive Maintance -Clean and recalibrate the INSTRUMENT on a regular basis to keep the instrument looking nice and working well.

Cleaning -Remove any dirt, dust and grime whenever they become noticeable. You can remove dirt from the outside covers with a soft cloth moistened with a mild cleaning solution.

Servicing -If the instrument ever becomes inoperative or damaged, refer servicing to a qualified repair facility.

FUSE REPLACEMENT

If the fuse blows, the "ON" indicator will not light and the instrument will not operate. Replace only with the correct value fuse. For 110/125V line vlotage operation, use an 600mA,-250V fuse. For 220/240V line voltage operation, use a 300mA, 250V fuse. The fuse is located on the rear panel adjacent to the power cord receptacle.

Remove the fuseholder assembly as follows:

1. Unplug the power cord from rear of scope.
2. Insert a small screwdriver in fuseholder selt (located between fuseholder and receptacle). Pry fuseholder away from receptacle.
7. When reinstallmg fi~seholder, be sure that the fuse is installed so that the correct line voltage is selected (see LINE VOLTAGE SELECTION).

II . 4001 GENERAL

DESCRIPTION :

The **B+K** 4001 is a multi-purpose, highly reliable and low cost 3MHz sweep function generator.

The 4001 is rugged easy to operate. It also provide many convenient feature which make it becomes an ideal instrument for school education, production research and development in electronic device or circuitry and electrical or physical laboratory.

FEATURE :

- (1). Six waveforms out put -- different from the marketing conventional function generator, the 4001 provide 6 waveforms, easy to operate.
- (2). When use as pulse generator -- Adjustable width from 0.4S to 100ns make 4001 be an ideal instrument for Audio, Vidio and other basic electronic circuit application.
- (3). When use sweep generator -- Besides the outer VCF input function. 4001 provide variable internal linear sweep and log sweep which with sweep range over 1000:1 and sweep rate from 5S to 10ms. Also, 4001 provide single sweep or synchro-sweep output function. Can be used on observation, control or synchrosweep an other function generater.
- (4). Excellent heat dissipation -- Function Generator was based on the continuous charge-discharge of the capacitor to produce the wave form. Any changed on the capacity of the capacitor will cause to different frequency generated. And the raised temperature of the instrument will caused to the capacity of the capacitor changed too. Thus keep the inner temperature constant becomes a very important factor on the stability of the frequency generated.
- (5). Safety -- 4001 meet the regulation of CE, GS, UL etc.

III. 4001 SPECIFICATION

1. General specification

Frequency : 0.5Hz ~3Mhz in 6 steps, controlled by rotary switch.

Output wave form : Sine, Square, Triangle, Ramp, Positive Pulse and Negative Pulse, 6 wave forms.

Stability : 0.1% - 15minutes after switch on.

0.2% - 24hrs after switch on.

DC offset : Continuously Adjustable, $\pm 10V$ at non-load or $\pm 5V$ at 50Ω load.

Limits of operation : $0^{\circ}C \sim 40^{\circ}C$, 10 ~80% R.H.

Storage environment : $-20^{\circ}C \sim 70^{\circ}C$, 0 ~90% R.H.

Power source : AC 115V ($\pm 10\%$) 50/60Hz, FUSE : 600mA

AC 230V ($\pm 10\%$) 50/60Hz, FUSE : 300mA

Power consumption : 25W

Dimensions : 27.5 x 9.0 x 30.0cm

Weight : 2.5Kgs Net.

Accessory : Power cord, manual.

2. RAMP WAVE

Frequency : 0.5Hz - 2.5MHz

Symmetry : 80% (rise wave) to 20% (fall wave) < 5%, 1Hz ~100KHz.

Rise Wave Linearity : < 2%, 1Hz - 100KHz.

3. TRIANGLE WAVE :

Frequency : 0.5Hz - 3MHz.

Symmetry : 50% (rise wave) to 50% (fall wave), < 2%, 1Hz ~100KHz.

Linearity : < 1%, 1Hz ~100KHz.

4. SINE WAVE :

Frequency : 0.5Hz ~3MHz.

Distortion : < 2%, 1Hz ~100KHz.

Harmonic ratio : < 30dB, 100KHz ~3MHz.

Frequency Response : < 0.1dB up to 100KHz.

< 1dB 100KHz to 3MHz.

5. SQUARE WAVE :

Frequency : 0.5Hz ~3MHz.

Symmetry : 50% (positive half) to 50% (negative half), < 2%, 1Hz ~100KHz.

Rise time : < 60ns.

6. POSITIVE PULSE :

Frequency : 0.5Hz ~2.5MHz.

Width : 0.4sec ~100ns continuous adjustable.

symmetry : 20% to 80%, < 50%, 1Hz ~100KHz.

Rise Time : < 60ns.

7. NEGATIVE PULSE :

Frequency : 0.5Hz ~2.5MHz.

Width : 0.4sec ~100ns.

Symmetry : 80% to 20%, < 5%, 1Hz ~100KHz.

fall Time : < 60ns.

8. MAIN OUTPUT :

Output Impedance : 50Ω , < 2%, Accuracy.

Max. output : 20Vp-p (Non load), $\pm 1V$.

10Vp-p (50Ω load), $\pm 0.5V$

Min. output : 0.1Vp-p (Non load) and 0.05V (50Ω load)

Attenuator : one -20dB switch, < 2% Accuracy.

9. SYNCHRONOUS OUTPUT :

Output Impedance : $50\ \Omega$, $< 2\%$ Accuracy.

Output Level : TTL level, $> 3\text{Vp-p}$ fix amplitude.

Fanout : > 20 .

Rise Time : $< 30\text{ns}$.

10. VCF INPUT :

Input Impedance : $0 \sim 10\text{V}$.

Input Frequency : DC $\sim 1\text{KHz}$.

Input Frequency Variety : 1:1 to 1:1000.

11. SWEEP SYNCHRONOUS OUTPUT :

Output Impedance : 1KHz , $< 20\%$.

Output Wave form : Linear or Log Sweep Ramp Wave.

Output Amplitued : 10Vp-p (Non load) or 5Vp-p ($1\text{k}\Omega$ load)

Output Frquency : Continuous adjustable, $0.2\text{Hz} \sim 100\text{Hz}$.

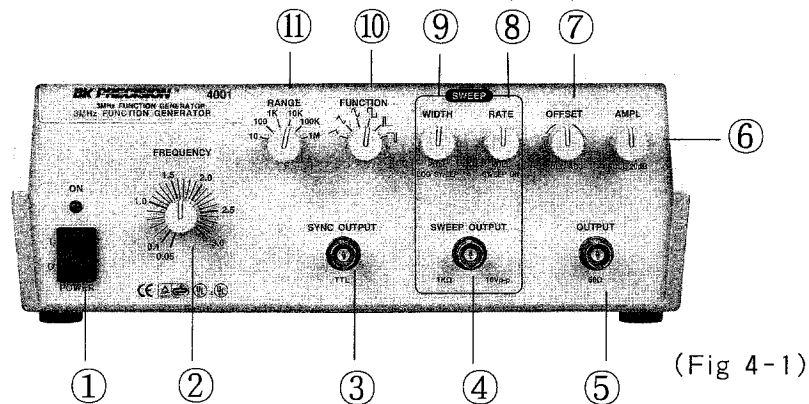
12. SWEEP GENERATOR :

Sweep form : linear or Log switchable.

Sweep speed : $5\text{sec} \sim 10\text{ms}$, continuous adjustable.

Sweep width : 1:1 \sim 1:100

IV. 4001 FRONT PANEL DESCRIPTION (Ref. to Fig 4-1)



(Fig 4-1)

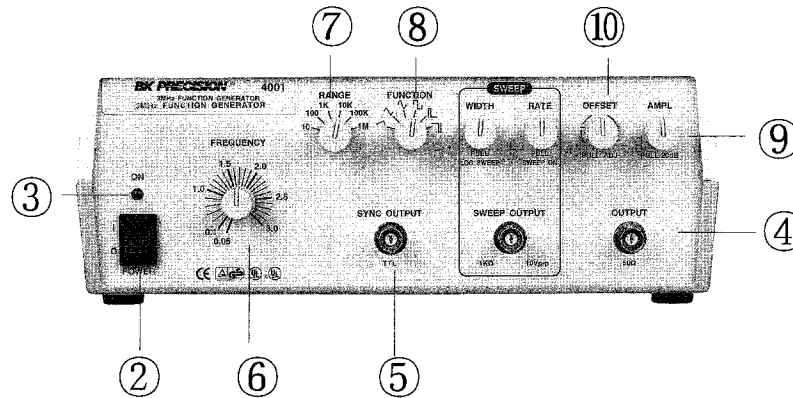
1. POWER SWITCH -- when pushed "ON" the switch will light the power pilot "LED" above the switch.
2. FREQUENCY -- Micro adjustment with the frequency. The frequency will be the product of the indicated scale by (2) and (11).
3. SYNC OUTPUT -- Synchronous Output the TTL level Square wave the output frequency will be as the Main output BNC.
4. SWEEP OUTPUT -- Sweep signal output BNC. It will operate individually whether the instrument was under SWEEP ON or OFF, the BNC will output the sweep ramp wave. The frequency are controlled by sweep rate (8).
5. MAIN OUTPUT -- Function wave output BNC, Max. output impedance 50Ω , Max. Amplitude 20Vp-p (Non-load).
6. AMPLITUDE -- Turn the switch to adjust the output signal amplitude. Pull out the switch to attenuate the output 10 times. Both operation are for Main output (5) signal only.
7. DC OFFSET -- The switch will set at Off position in normal use. It was for BIAS circuit. Pull "ON" and turn to adjust the Dc offset voltage.
8. SWEEP RATE -- Turn the switch to adjust the sweep rate from 5S to 10ms and the signal will output from sweep output (4). When pull the switch. The signal will synchronous output from Main output (5) and sweep output (4).
9. SWEEP WIDTH -- The switch will effect only under the switch (8) was pull to sweep "ON". Turn the sweep width. In normal position. It is linear sweep and it will be log sweep after "pull out" the switch.
10. FUNCTION WAVE SELECTOR -- Turn the switch to select the output wave forms.
11. FREQUENCY RANGE -- Main adjustment switch of the frequency. The output frequency will be 10 times on each step changed. Turn the switch to select the frequency of the output signal as the product of the indicated scale by (2) and (11).

V. 4001 OPERATION INSTRUCTION

⚠ **WARNING** : Before applying power to your 4001 , make sure that the input voltage setting is correct for your power source.

▲ **CAUTION** : All the switches on 4001 are set at "push" position unless special marked "pull" for special function.

A : FUNCTION GENERATOR (Ref. to Fig 5-1)

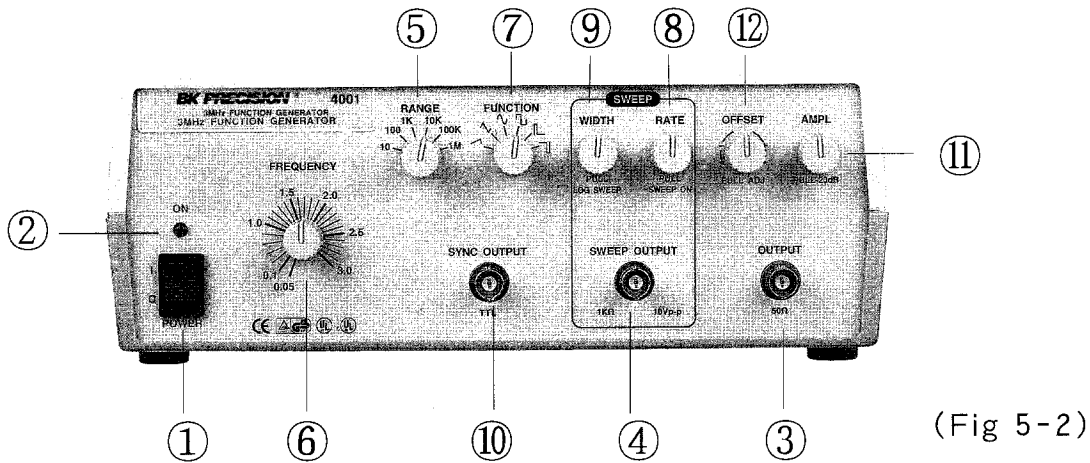


(Fig 5-1)

1. Check the AC line voltage selector plug on the rear panel of your 4001 in correct position for the Ac line voltage.
2. Switch on the power switch and make sure that the power pilot LED is lit.
3. Connect the OUTPUT BNC (5) of 4001 to the CH1 INPUT BNC of your Oscilloscope. Adjust your Oscilloscope and set the position which suit for observation.
4. Connect the SYNC OUTPUT BNC (3) to the CH2 INPUT BNC of your Oscilloscope and set the TRIG source of your Oscilloscope at CH2 position.
5. Turn the FREQUENCY knob (2) of 4001 from 0.05 to 3.0 position and check the wave form display on your Oscilloscope. The frequency will vary slowly on each step.
6. Turn the RANGE knob (11) counter-clock-wise from 10 to 1M. The frequency will increase 10 times on each step. if trun the switch clock-wise from 1M to 10, the frequency will reduce 10 times on each step.
7. Turn the FUNCTION knob (10) to check the wave form generated by 4001 and display on oscilloscope. CH1 will display the wave form as indicated by the FUNCTION knob (10) of 4001 , However, Ch2 will display TTL square wave only, it would not changed whatever the FUNCTION switch turned, but the frequency of CH2 will synchronous change as CH1.
8. Turn the AMPL knob (6). The amplitude of CH1 on your Oscilloscope will changed but CH2 are not. Pull out the knob, the amplitude of CH1 will reduce 10 times but CH2 will keep unchanged.
9. Turn the OFFSET knob (7), the display on the Oscilloscope will keep unchanged. Pull out the switch. The display of CH1 on the Oscilloscope will be affected by DC offset voltage from +10V to -10V by turn the switch. But the CH2 display with keep unchange.

NOTE : The display will be cut off if the DC offset voltage are too high.

B : SWEEP GENERATOR (Ref.to Fig.5-2)



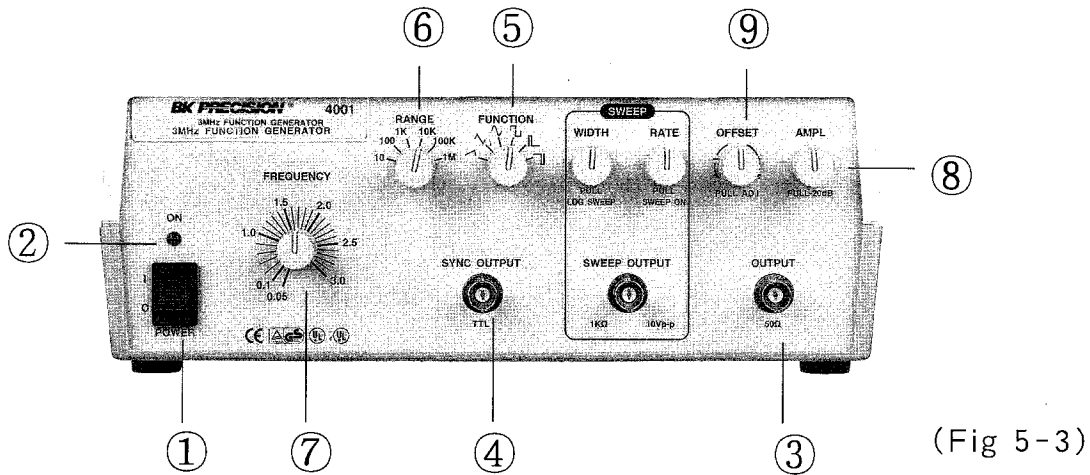
(Fig 5-2)

1. Switch on the 4001 and connect it with your oscilloscope, Main output (5) to CH1.
2. Connect the SWEEP out (4) BNC to CH2.
3. Set the RANGE (11) of 4001 at 100K position.
4. Set the FREQUENCY (2) of 4001 at 1.0 position.
5. Set the FUNCTION (10) of 4001 at sine wave.
6. Turn the SWEEP RATE (8) knob. the display of CH1 wil keep unchanged. The display of Ch2 will be affected only. This means the sweep out put will operate independent. Pull out the switch (8) to set 4001 SWEEP ON and turn the knob to set the sweep rate from 5sec. to 10ms.Both display of CH1 and CH2 will be affected.

△ NOTE : After "PULL SWEEP ON", the trigger source of the oscilloscope must be changed to CH1

7. Turn the SWEEP WIDTH (9) to adjust the sweep width according to the display of CH1 on your oscilloscope to set the sweep width and sweep rate. Set the FREQUENCY (2) switch at 0.05 to have the Max. sweep width (>100 times). It will very convenience on AUDIO testing.Or the band width of the circuit testing. Pull out the switch (9), the sweep mode will be changed from linear sweep to Log sweep. The wave form display on CH1 will be log form.
8. SYNC OUTPUT -- The BNC will synchronous output a TTL signal to use as a signal source of your oscilloscope or counter etc.
9. AMPL knob -- Turn the switch to adjust the amplitude of the signal output from Main output.
10. OFFSET KNOB -- Set the DC offset voltage of the signal output from Main output. This switch will operate only at "PULL" position.

C. To be as PULSE Generator (Ref. to Fig. 5-3)



(Fig 5-3)

1. Switch "ON" the power switch (1) and make sure the pilot "LED" been lit.
2. Connect the output BNC (5) to CH1 input of your Oscilloscope.
3. Connect the "SYNC OUT" (3) BNC to CH2 input of your oscilloscope.
4. Set the "FUNCTION" (10) selector at positive pulse position.
5. Set the "RANGE" (11) at the desired frequency. In this example, set at 100K position
6. Set the "FREQUENCY" (2) at the disired frequency. The frequency will be the produc t of the digits indicated by (11) and (2). In this example set at 1.0 position.

Example : The frequency : $100K \times 1.0 = 100KHz$
 The pulse width : $(1/frequency) \times 15\%$
 $= (1/100KHz) \times 15\%$
 $= 1.5\mu S$

The pulse output from "SYNC OUTPUT" TO CH2 will be the same width 1.5uS TTL pulse.

7. Adjust the "AMPL" (6) knob to adjust the amplitude of the output pulse. Or "PULL" out this switch toattenuate the output signal to 1/10, but the CH2 "SYNC OUTPUT" will not affected.
8. PULL OUT the "OFFSET" (7) switch and turn to adjust the DC offset voltage if necessary. In this operation, CH2 will not affected.
9. Set the "FUNCTION" (10) selector at negative pulse and operate as step 5,6,7,8

VI. 4003 GENERAL

DESCRIPTION :

The 4003 is a super deluxe function Generator combined a 5 digits, high resolution 60MHz counter.

The 4003 is a rugged, easy to operate, excellent heat dissipation and high stability instrument.

The 4003 is 4 in 1 instrument. It can be used as the following discribed 4 kinds of electronic instrument respectively.

1. To be as Function Generator :

6 wave forms selected by rotary switch instead of push-button to prevent mis-touch or bad connection. Max.output 20Vp-p (Non-load),and Mini. output 0.1Vp-p (Non load).

2. To be as Pulse Generator :

4003 provide positive pulse and negative pulse output, Max. output 20Vp-p (Non-load). Frequency display by LED, pulse width from 0.4sec to 100ns.Can meet most of Audio, Vidio and other Basic electronic application requirement.

3. To be as Sweep Generator :

4003 provide linear sweep or log sweep selection switch to select the sweep mood. Max. sweep width 1:100 and sweep speed 5sec to 10ms. Also 4003 provide VCF input and synchronous Ooutput Function. Convenient tooperate.

4. To be as counter :

4003 is a 5 digits micro-control counter. 4003 provide Auto range, Auto gate time and high resolution --0.001Hz, High input impedance --1M Ω , High band width --0.2Hz ~ 60Mhz, High voltage resistance --300Vp-p features,Also, 4003 provide Adjustable Trigger $\pm 2.5V$ with LED indicate. Display unit Auto - indicate, AC / DC selector,100Khz filter, Input Attenuator -- input x20 for 300Vrms high voltage signal.

VII. 4003 SPECIFICATION

1. General specification :

A : Generator

Frequency -- 0.5Hz ~3MHz display by 5 digits LED, Max. resolution 0.001Hz in 6 steps.
Wave form output -- Sine, Square, Triangle, Ramp, Positive Pulse and Negative Pulse
6wave forms.

Stability -- 0.1% ~15 minutes after switch "ON".
0.2% ~24hrs after switch "ON".

B : Counter

Display -- 5 digits 0.36" red LED.
Max. Resolution -- 0.001HZ.
Display unit -- Hz / KHz Automatically controlled by CPU.

C : Common Specification

Limits of operation -- 0°C ~40°C, 10% ~80%R.H.
Storage Enviroment -- -20°C ~70°C, 0% ~90%R.H.
Power cunsumption -- 25W.
power source -- AC 115V (±10%) 50/60Hz, FUSE: 600mA
AC 230V (±10%) 50/60Hz, FUSE: 300mA
Ventilation -- DC 12V / 100mA Fan.
Dimensions -- 275 x 90 x 300mm
Weight -- 2.5Kgs Net.
Accesrory -- Power cord, operation manual.

2. Ramp wave :

Frequency : 0.5Hz ~2.5MHz, 5 digits LED display, Max. resolution 0.001Hz, 6 steps
selected by rotary switch.

Symmetry : 80% (Rise wave) to 20% (Fall wave), < 5%, 1Hz ~100KHz.
Rise wave linearity : < 2%, 1Hz ~100KHz.

3. Triangle wave :

Frequency : 0.5Hz ~3MHz, 5 digits LED display, Max. resolution 0.001Hz
Symmetry : 50% (Rise wave)to 50% (Fall wave), < 2%, 1Hz ~100KHz.

4. Sine Wave :

Frequency : 0.5Hz ~3MHz, 5 digits LED display, Max. resolution 0.001Hz.
Distortion : < 2%, 1Hz ~100KHz.
Harmonic ratio : < 30dB, 100KHz ~3MHz
Frequency response : < 0.1dB, up to 100KHz.
< 1dB, 100KHz to 3MHz.

5. Square wave :

Frequency : 0.5Hz ~3MHz, 5 digits LED display, Max. resolution 0.001Hz.
Symmetry : 50% (Positive half) to 50% (Negative half). < 2%, 1Hz ~100KHz
Rise time : < 60ns.

6. Positive pulse :

Frequency : 0.5Hz ~2.5MHz, 5 digits LED display.
Width : 0.4sec ~100ns, continuous adjustable.
Symmetry : 20% to 80%, < 5%, 1Hz ~100KHz.
Rise time : < 60ns.

7. Negative pulse :

Frequency : 0.5Hz ~2.5MHz, 5 digits LED display, Max. resoluition 0.001Hz.
Width : 0.4sec ~100ns.
Symmetry : 80% to 20%, < 5%, 1Hz ~100KHz.
Fall time : < 60ns.

8. Main output :

Output impedance : 50Ω , $< 2\%$

Max. Output : $20V_{p-p}$ (Non-load), $\pm 1V_{p-p}$.

$10V_{p-p}$ (50Ω load) $\pm 0.5V$.

Min. Output : $0.1V_{p-p}$ (Non-load), or $0.05V_{p-p}$ (50Ω load)

Attenuator : One $-20dB$ Attenuator, $< 2\%$ Accuracy

9. Synchronous Output :

Output impedance : 50Ω , $< 2\%$, Accuracy.

Output level : TTL level, $> 3V_{p-p}$ fix amplitude.

Fan out : > 20

Rise time : $< 30nS$.

10. VCF input :

Input impedance : $0 \sim 10V$

Input frequency : DC $\sim 1KHz$

Input frequency variety : 1:1 to 1:1000

11. Sweep synchronous output :

Output impedance : $1KHz$, $< 2\%$

Output wave form : Linear or log sweep ramp wave.

Output amplitude : $10V_{p-p}$ (Non load) or $5V_{p-p}$ ($1K\Omega$ load)

Output frequency : $0.2Hz \sim 100Hz$ continuous adjustable.

12. Sweep generator :

Sweep form : Linear or log switchable.

Sweep speed : $5sec \sim 10ms$, continuous adjustable.

Sweep width : 1:1 \sim 1:100

13. Counter :

Display : 5 digits, 0.36" RED LED display.

Max. Resolution : $0.001Hz$

Display unit : Hz / KHz Auto range.

Time base : $20MHz$

Temperature coefficient : $< 10ppm / ^\circ C$

Accuracy : $< 0.002\% \pm 1$ digit.

Power supply : $+5V$, $160mA$

Internal counter :

Range : Auto range with 4 resolution, $0.001Hz / 0.01Hz / 0.001KHz$
 $/ 0.01KHz$, Auto control by CPU.

Display : $0.500Hz \sim 3000.0KHz$ Auto select by CPU.

Gate time : Variable, $0.25sec \sim 2sec$, Auto - setting.

Min. Display digits : 4 digits.

External counter :

Max. Input voltage : $< 250V_{rms}$

Input impedance : $1M\Omega$, $< 2\%$

Input frequency : $0.2Hz \sim 60MHz$

Attenuator : $*20$ ($-26dB$) Attenuator

Coupling : AC (HF) -- For $100KHz$ up frequency.

DC (LF) -- With $100KHz$ filter, for the frequency lower than $100KHz$

Range : The same as internal counter.

Min. display digits : 4 digits.

Gate time : $0.25sec \sim 10sec$, Auto - setting depends on the input frequency

Sensitivity : $< 30mV_{rms}$ ($1MHz$)

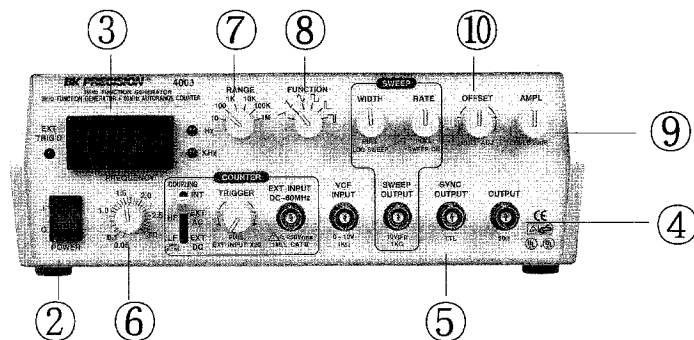
11. FREQUENCY RANGE -- Turn the switch to set the frequency of the output signal. The frequency display on (14) will be the product of the indicated digits by (2) and (11). The frequency will be 10 times difference on each step.
12. Hz -- the LED lit means the display units are "Hz".
13. KHz -- the LED lit means the display units are "KHz".
14. LED DIGITS -- 5 digits to indicate frequency generated or EXT input. The units will be indicated by (12) or (13) selected by CPU automatically.
15. EXT-TRIG -- The green LED indicate trigger condition.
 LED Light -- Trigger level too high.
 LED Dark -- Trigger level too low.
 LED flash -- Triggering state.
16. COUPLING -- Indicate the source of the frequency display by (14).
 INT -- Display the frequency of the signal generated by the 4003
 EXT AC / HF -- Display the external input high frequency signal, Set at this position to strain out DC signal and low frequency harmonic signal. Input only the expected high frequency signal.
 EXT - DC / LF 100KHz Filter -- Display the external input low frequency signal, Set at this position to strain out the signal higher than 100KHz make the low frequency signal more stable.
17. TRIG PULL INPUT *20 -- Trigger level adjustment from +2V to -2V, when pull out the switch, the input signal will be attenuate 20 times, thus the input voltage can be 300Vp-p Max.
18. EXT-INPUT -- External signal input BNC. The input frequency 0.2Hz to 60MHz, Max. input voltage 300Vp-p (when (17) was at "PULL" position) .
19. VCF-INPUT -- External input DC signal to control the frequency generated.
 External input AC sweep signal to make it as External sweep.
 External input AC sine wave to make it as frequency modulation.
 Input signal 0 ~ 10V, < 1KHz.
 Input impedance - 1K Ω .

IX. 4003 OPERATION INSTRUCTIONS

WARNING : Before applying power to your 4003, make sure that the input voltage setting is correct for your power source.

CAUTION : All the knobs are set at " PUSH " position on operation if not special marked to be set at " PULL " .

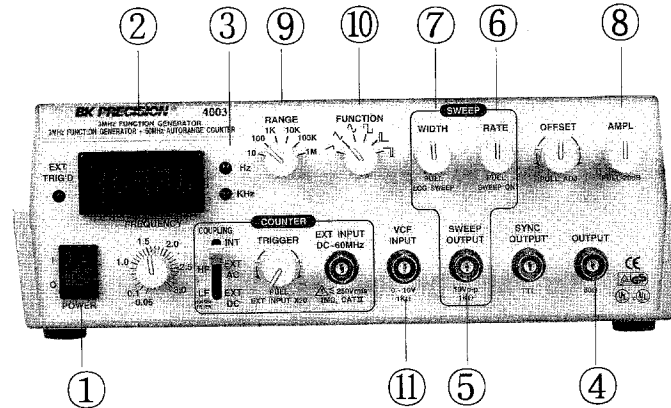
(A). Function Generator and Inspection (Ref. to Fig.9-1)



(Fig9-1)

1. Push the power switch on and make sure that the LED of the 5 digits are lit.
2. Connect OUTPUT BNC of 4003 to the CH1 input BNC of your Oscilloscope, and the SYNC OUTPUT BNC to CH2, and set the trigger source of your oscilloscope at CH2.
3. Turn the FREQUENCY knob from 0.05 ~3.0. You will find the display of 5 digits LED and oscilloscope will be changed slightly on each step.
4. Turn the RANGE knob from 10 ~1M. You will find the display of 5 digits LED value will change 10 time on each step and the oscilloscope too.
5. Turn the FUNCTION knob to select the wave form output to CH1 of your Oscilloscope. CH2 will be TTL square wave only.
6. Turn the AMPL knob to adjust the amplitude of the signal output to CH1, and when " PULL " out the switch, the amplitude will be reduced 10 times (-20dB) but the display of CH2 (Sync output signal) will keep unchanged.
7. Turn the OFFSET knob. You will find both CH1 and CH2 will not changed. This switch will operated only at " PULL " position. PULL out the offset switch and turn to set DC offset voltage (from +10V to -10V) of the main output signal. But the sync output signal will not affected.

(B). SWEEP GENERATOR (Ref. to Fig 9-2)



(Fig9-2)

1. Switch on the 4003 and lit the 5 digits LED.
2. Connect the main OUTPUT BNC to the CH1 input BNC of you Oscilloscope.
3. Connect the SWEEP OUTPUT BNC to the CH2 input BNC of your Oscilloscope and set the trigger source of the oscilloscope at CH2.
4. Turn the SWEEP RATE knob, the CH2 of the oscilloscope will display a linear saw - tooth wave, the frequency will be variable from 5sec to 10mS by turn the switch. CH1 will display the wave according to the FUNCTION switch position.
PULL out the switch to set "SWEEP ON". the display of CH2 will keep unchange, the display frequency will be variant by turn the knobs. But the display of CH1 will be sweep wave, and the sweep speed will depend on the sweep rate.

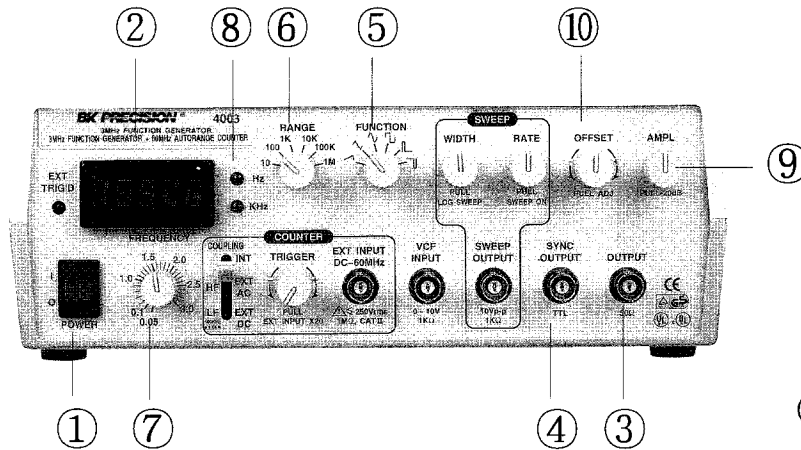
NOTE : After "PULL SWEEP ON", the trigger source of the oscilloscope must be changed from CH2 to CH1.

5. Turn the SWEEP WIDTH knob to adjust the sweep width by the display of CH1.

NOTE : Be sure that the SWEEP RATE SWITCH was at " PULL " position.
When PULL out the sweep width switch, the sweep mode will changed from linear to log sweep. The wave form display of CH1 will becomes log form.

6. AMPL and FUNCTION knobs will operate as Generator.
7. Frequency display on 5 digits LED as Generator, before "PULL SWEEP ON". this frequency will be the start frequency. After "PULL SWEEP ON", the sweep condition include frequency, wave form and sweep mode etc. will be observed from the CRT of the Oscilloscope. The display on LED will continuous variety.
8. VCF INPUT -- Set the sweep rate switch at "PUSH" position to set 4003 at normal generator mode. connect the sweep output BNC to VCF INPUT BNC and check the wave form display on the scope CH1. the wave form display would be the sweep wave. When input a sine wave from another generator to VCF INPUT to obaerve the FM display. Be sure the frequency of the basic wave (4003) are higher than the external input signal.

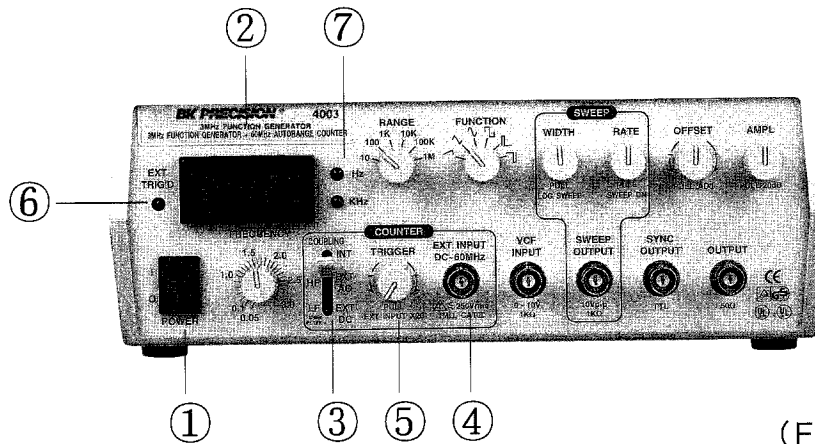
(C). PULSE wave Generator (Ref. to Fig.9-3)



(Fig9-3)

1. Push the power on and lit the 5 digits LED.
 2. Connect the main output to CH1.
 3. Connect the SYNC output to CH2 and set the trigger source of the Oscilloscope on CH2.
 4. Set the FUNCTION knob on positive pulse position.
 5. Set the FREQUENCY and RANGE to the desired frequency display on (2) LED.
 6. Pulse width : the pulse width equals to 15% of the countdown of the frequency. The unit of frequency in Hz then the pulse width will be in Sec. If the frequency in KHz. the pulse width will be in mS etc.
- EXAMPLE : The frequency display on LED (2) are 1KHz then pulse width = $1/1\text{KHz} * 15\% = 0.15\text{mS}$.
7. Set the FUNCTION knob on negative pulse position and test the negative pulse as positive pulse.
 8. Turn the AMPL to adjust the amplitude of the signal output from the main output BNC (3). The signal will be -20dB when " PULL " out the switch. But the signal output from " SYNC " output BNC (4) will not affect by this switch. the output signal of " SYNC " output will keep on TTL level.
 9. Set the DC offset voltage by pull out the " OFFSET " switch and turn to adjust the DC offset voltage from +10V to -10V.

(D). Frequency counter (Ref. to Fig. 9-4)



(Fig 9-4)

1. Switch on the power switch, lit the LED digits.
2. COUPLING : The coupling provide 3 steps.
 - (a). INT -- to be used as internal counter from 0.5Hz to 3MHz.
 - (b). EXT AC / HF : To use as External Counter for high frequency (100KHz to 60MHz).
 - (c). EXT DC / LF : To use a External counter for low frequency (0.2Hz ~ 100KHz).
3. Connect the EXT INPUT BNC to the external signal source.
4. Set the TRIG level to meet the input signal from 20Vp-p to 600Vp-p. If the input signal are very large. Pull out the switch (PULL INPUT *20) to have a stable counting.
5. EXT TRIG'D -- The green LED will indicate the operating condition of 4003
 - LED LIT -- the trigger level higher than the input signal.
 - LED DARK -- the trigger level lower than the input signal.
 - LED FLASH -- Under triggering.
6. Display unit : The display unite of the 4003 will be on Hz or KHz automatically controlled by CPU.

ADJUSTMENT PROCEDURE

⚠ CAUTION: The following instructions are for use by qualified service personnel only. To avoid electrical shock, do not perform any servicing other than contained in the operation instructions unless you are qualified to do so.

WARM UP :

Before calibrating and adjusting, make sure that the instrument has been warm up more than 20 minutes.

A : Function ∇ , (triangle wave) adjustment

1. Test TP-8 and adjust VR65 till DC=0V (± 0.05 v).
2. Set AMPL at MAX. position and FREQ at 30KHz, adjust VR99 till the MAX. output=21Vp-p ± 1 V at no load .
3. Set AMPL at MIN. position and FREQ at 30KHz, adjust VR84 till the Min. output DC=0V (± 0.05 V).

B : Function \sim , (Sin. wave) adjustment.

1. Set FREQ at 50KHz, adjust VR46 to adjust the symmetry of positive half and negative half wave.
2. Adjust VR45 to adjust the wave form appearance.
3. Set FREQ at 50KHz, AMPL at Max. position, adjust VR64 till DC offset = 0V (± 0.5 V), adjust VR62 till Max. output 21Vp-p ± 1 V (no load).

C : Function \sqcap , (Square wave) adjustment

1. Set FREQ at 30KHz, AMPL at MAX. position. Adjust VR40 till DC offset = 0V (± 0.5 V), and VR41 till MAX, output 21Vp-p ± 1 V.

D : Accuracy Adjustment

1. Set FUNC at \sim and FREQ at Min. (x0.05) RANGE at x100KHz, adjust VR11 till counter display 5.0KHz (± 0.1 KHz).
2. Set FUNC at \sim and FREQ at Max. (x3.0) RANGE at x1MHz adjust VR2 till counter display 3020KHz (± 20 KHz).
3. Set FUNC at \sim and FREQ at Max. (x3.0) RANGE at x100KHz adjust VR3 till counter display 302KHz (± 2 KHz).
4. Set FUNC at \sim and FREQ at Max. (x3.0) RANGE at x10KHz adjust VR4 till counter display 30.2KHz (± 0.2 KHz).
5. Set FUNC at \sim and FREQ at Max. (x3.0) RANGE at x1KHz adjust VR5 till counter display 3.02KHz (± 0.02 KHz).
6. Set FUNC at \sim and FREQ at Max. (x3.0) RANGE at x100Hz adjust VR6 till counter display 302Hz (± 2 Hz).
7. Set FUNC at \sim and FREQ at Max. (x3.0) RANGE at x10Hz adjust VR7 till counter display 30.2Hz (± 0.2 Hz).

E : Rise time adjustment :

Set FUNC at \sqcap , FREQ at Max. (x3.0), RANGE at x1MHz and AMPL at Max. (20Vp-p) position. Connect the output BNC to the Oscilloscope and set the Oscilloscope at 5V/DIV and 0.1us/DIV position. Adjust VC99 till Rise time < 60nS and the wave form smoothly.

F : Negative pluse adjustment :

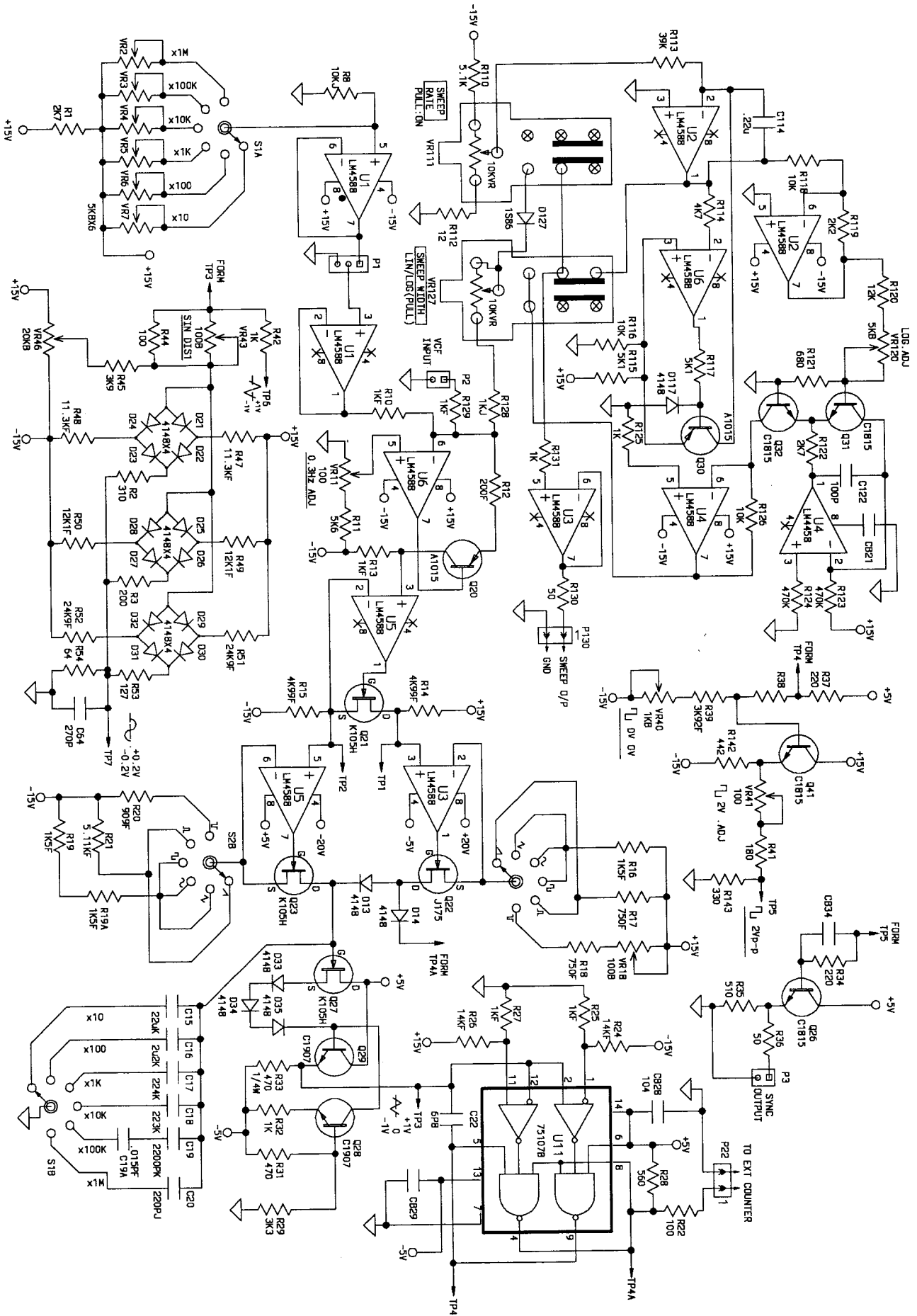
Set FUNC at \sqcap ; FREQ at Max. (x3.0), FANGE at x1MHz, adjust VR18 till counter display 2550KHz (± 50 KHz).

G : Sweep adjustment :

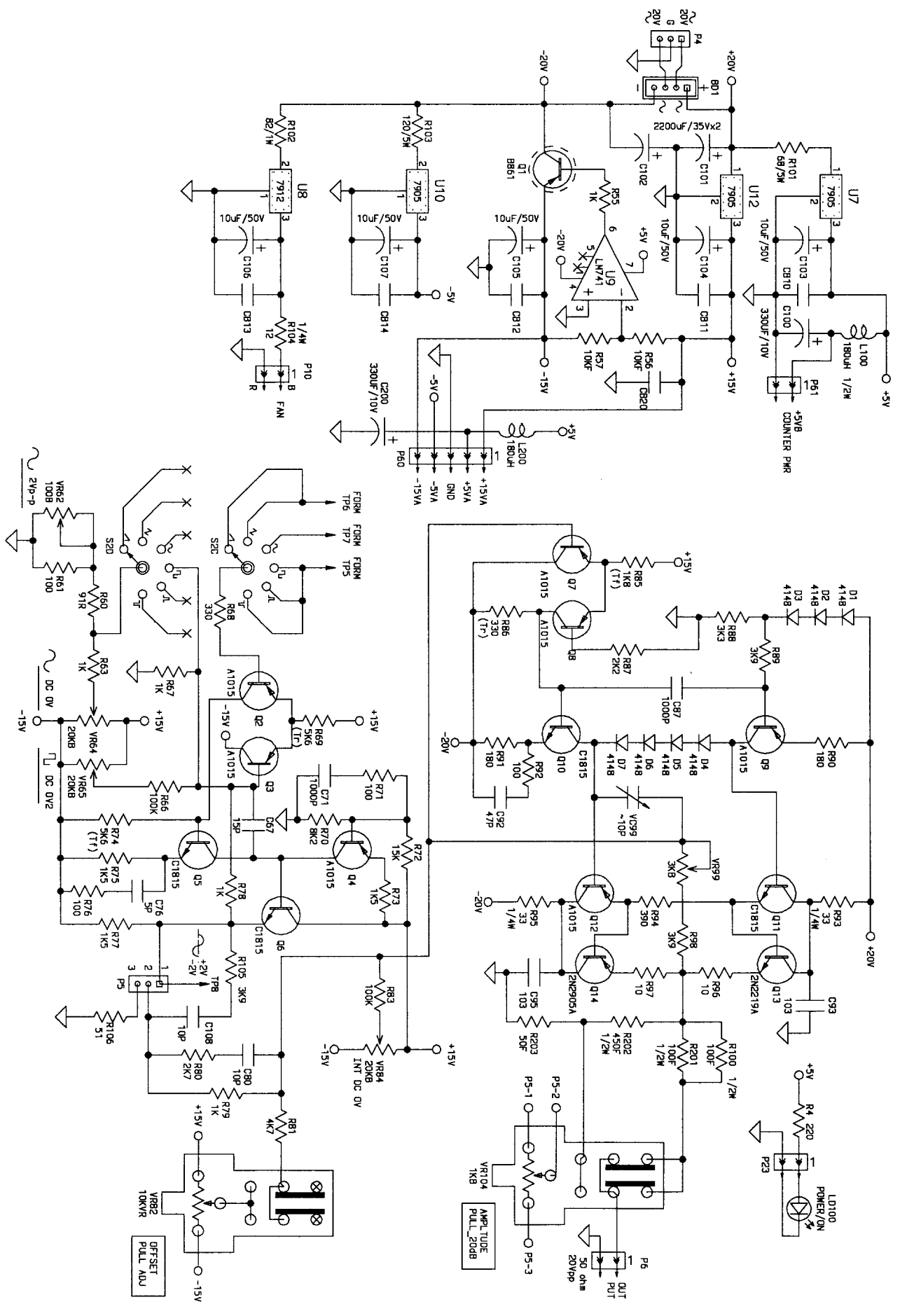
Connect sweep output BNC to Oscilloscope. Set the sweep at log sweep, Adjust VR120 till the sweep output 10Vp-p (± 1 V).

H : Counter Adjustment :

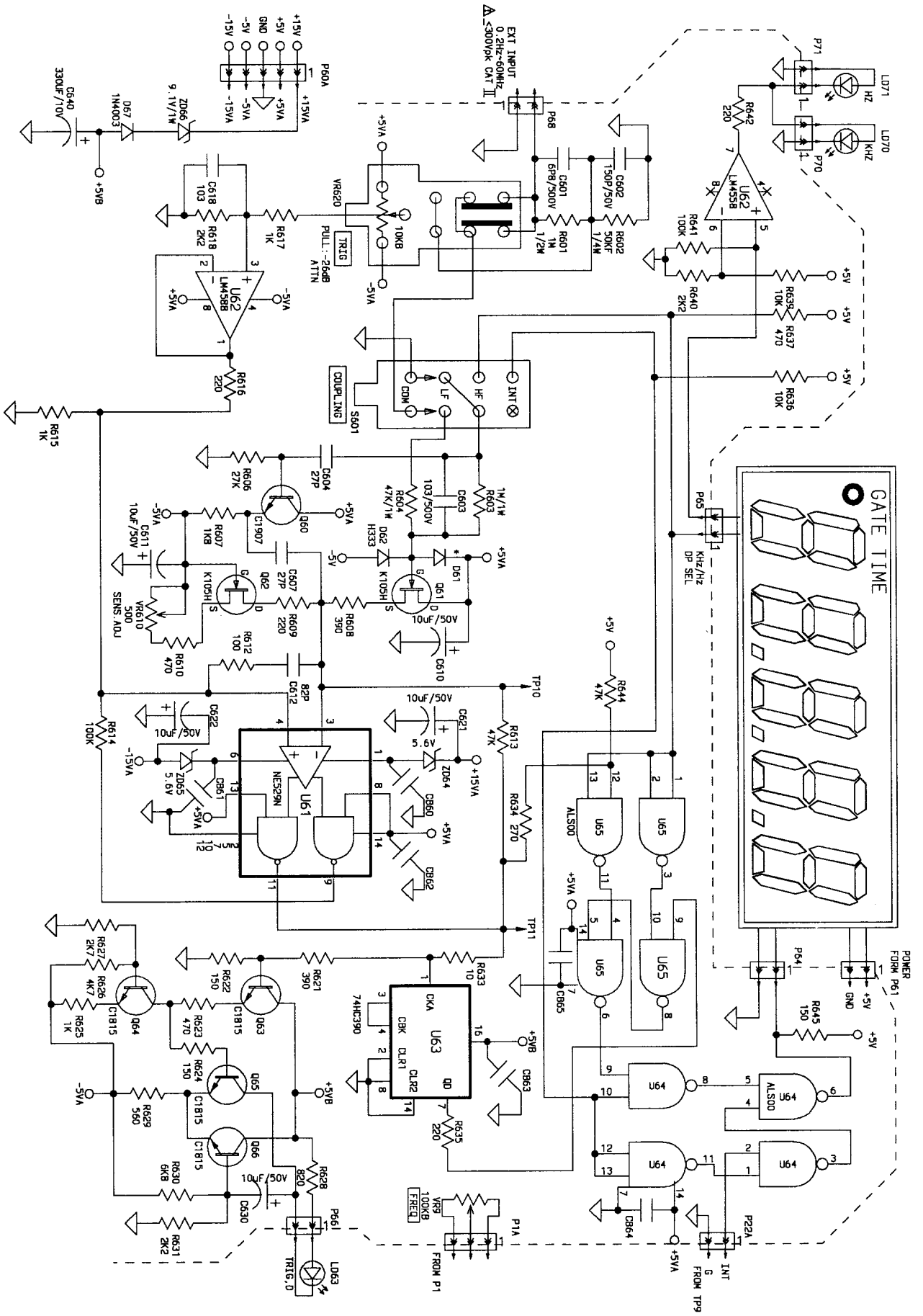
Set the COUPLING at EXT DC, TRIGGER at the middle, and input put a 1KHz 30mV Sin. wave.
Adjust VR610 till the counter display the same as the input frequency.
Then move out the input signal, the counter will display 0.00.



Name	Model 1	Date	Dwg No.
SWEEP GENERATOR & WAVEFORM GENERATOR CKT	4001 4003	09/27/99	FG32-1



Name	Model	Date	Dwg No.
POWER SUPPLY & FINAL AMPLIFIER CKT	4001	09/27/99	FG32-2



Name	Model 1	Date	Dwg No.
COUNTER & PRE-AMPLIFIER CKT	4003	09/27/99	FG32-3

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