

WARRANTY

We warrant to the original purchaser that the instrument is free from defects in material and workmanship for a period of one year from the delivery date. Any instrument found defective within the warranty period and returned to us with transportation charges prepaid will be repaired, adjusted, or replaced at no charge to the original purchaser.

This warranty shall not cover expendable items such as batteries or fuses. If the defect has been caused by a misuse or abnormal operating conditions, accidental damages, unauthorized modifications or miscalibration, this warranty shall not apply, and the repair will be billed at a nominal cost.

- Note :
1. Do not ship to us the returned goods by courier, as the post office will refused it.
 2. Attach proper documentation to indicate the unit is being returned for repair
 3. Please pack carefully to avoid breakage in transit

Due to our policy to refine the products continuously, this manual may contain minor differences in specification, components, parts and circuit design to the instrument actually delivered.

SEOWON FAMILY CO., LTD.
15-5, Jamwon-Dong, Seocho-Gu,
Seoul, Korea
TEL. 82-2-546-4101
FAX. 82-2-546-4101
Homepage: www.imetex.com

7.2003
Printed in Korea

FUNCTION GENERATOR

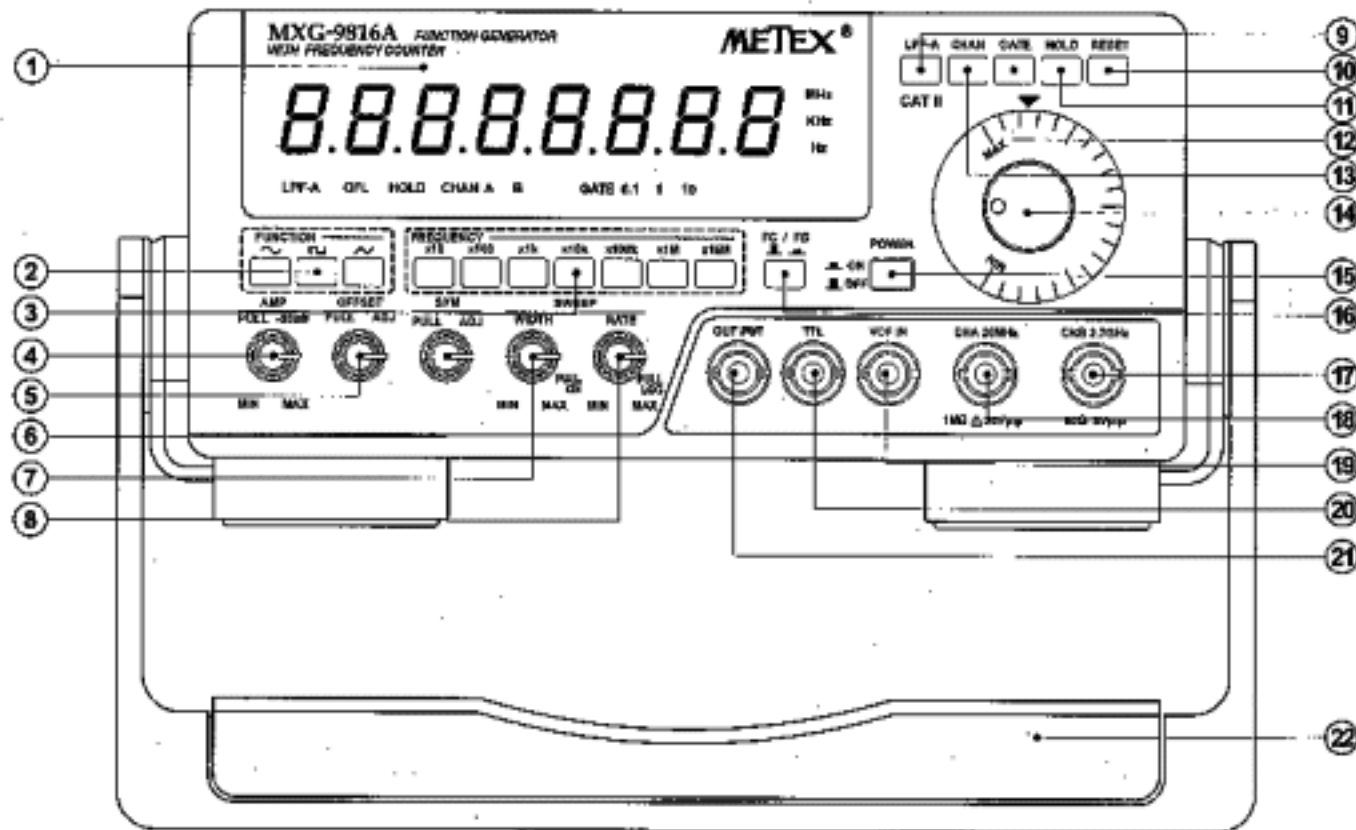
MXG-9802A
MXG-9810A
MXG-9816A

OPERATING MANUAL



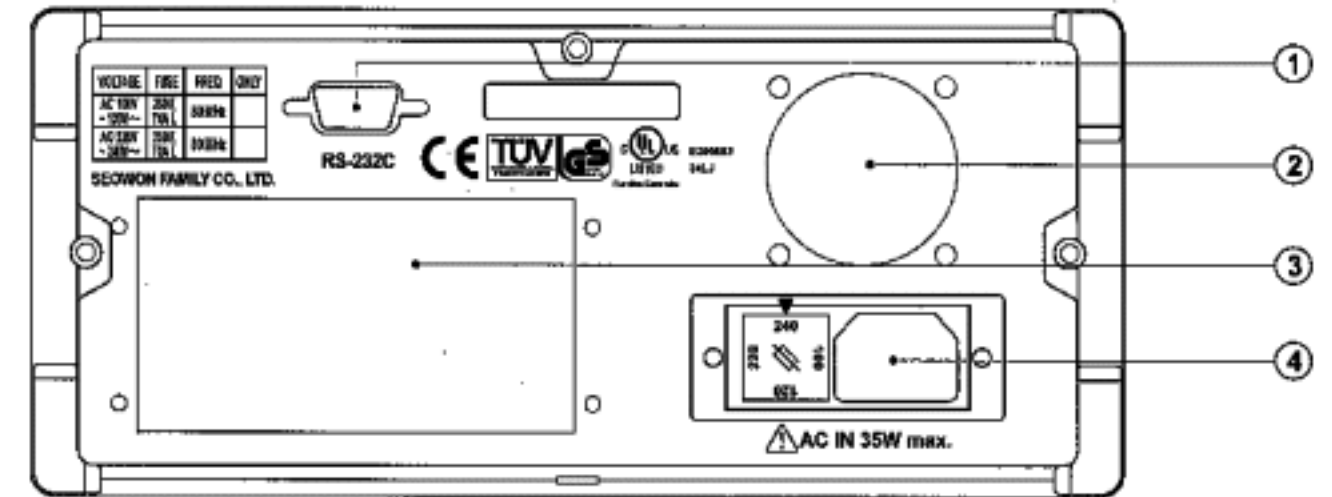
METEX[®]

LEGEND Front Side View



- | | |
|----------------------------------|-------------------------------|
| 1. LED display (8 digit segment) | 2. FUNCTION Switch |
| 3. FREQUENCY Switch | 4. AMPLITUDE Control Knob |
| 5. OFFSET Control Knob | 6. SYM(Symmetry) Control Knob |
| 7. Sweep Width Control Knob | 8. Sweep Rate Control Knob |
| 9. LPF-A(CH-A) | 10. RESET Switch |
| 11. Data Hold Switch | 12. Gate Time Switch |
| 13. Channel Select Switch(A&B) | 14. FREQ Control Dial |
| 15. Power Switch | 16. FC/FG Switch |
| 17. CH B Input Connector | 18. CH A Input Connector |
| 19. VCF Input Connector | 20. TTL Output Connector |
| 21. F/G Output Connector | 22. Tilt-Stand |

Rear Side View



- | | |
|--------------------------|---------------------------------------|
| 1. RS232C Interface Port | 2. Fan |
| 3. Heat Sink | 4. Power Supply Inlet with Power Fuse |

CONTENTS

SECTION 1	5
SECTION 2. SAFETY INFORMATION	6
2-1. Safety Precautions	
2-2. Safety Symbols	
SECTION 3. INSTALLATION	8
3-1. Unpacking and Inspection	
3-2. Preparation for Operation	
SECTION 4. OPERATING THE MXG-9802A/MXG-9810A/MXG-9816A	9
4-1. Using the function Generator	
4-1-1. Specifications	
4-1-2. Start-Up	
4-1-3. Wave Forms	
4-1-4. Frequency Ranges	
4-1-5. Features	
4-2. Using the frequency Counter	
4-2-1. Specifications	
4-2-2. Start-Up	
4-2-3. Features	
SECTION 5. USING THE SOFTWARE SUPPLIED	17
5-1. Interfacing the instrument with a Computer	
5-2. Using the supplied software	
5-3. Technical Information	
SECTION 6. CARE & MAINTENANCE	19
6-1. Fuse Replacement	
6-2. General Maintenance	

SECTION 1. INTRODUCTION

Please read this operating manual very carefully prior to operating the instrument.

The Function Generator MXG-9802A/MXG-9810A/MXG-9810A are compact and powerful performance instruments, capable of complying with various needs of laboratories, service work-shop, technical training, engineering and manufacturing fields, etc.

This instrument is characterized by a Two-in-One instrument with Function Generator and Frequency Counter built-in in single unit.

This instrument is supplied with the following accessories.

Standard	AC Power cable, Operating Manual, Coaxial Cable with BNC connector
Optional	RS232C Interface cable & Software in Windows

Environmental Conditions

This part applies to your Function Generator designed to be safe at least under the following conditions.

- Indoor use only
- Altitude up to 2000m
- Temperature 5°C to 40°C
- Maximum relative humidity 80% for temperature up to 31°C decreasing linearity to 50% relative humidity at 40°C.
- Main power supply voltage fluctuations not to exceed +10% of the nominal voltage
- Transient overvoltage according to installation categories(Overvoltage Category)11.
- Pollution Degree 2

SECTION 2. SAFETY INFORMATION

2-1. Safety Precautions

The following safety precautions must be observed at all times during operation, service and repair of this product to ensure safe operation of the product and eliminate the danger of serious injury due to short-circuit(arching).

Damages resulting from failure to observe these safety precautions are exempt from any legal claims whatever.

- ▶ Prior to connection of the instrument to the main outlet, check that the available main voltage corresponds to the voltage setting of the instrument.
- ▶ Connect the main plug of the instrument only to a main outlet with earth connection.
- ▶ Do not place the instrument on damp or wet surface.
- ▶ Do not subject the instrument to direct sunlight or extreme temperatures.
- ▶ Do not subject the instrument to extreme humidity or dampness.
- ▶ Replace a defective fuse only with a fuse of the original rating. Never short-circuit fuse or fuse housing.
- ▶ Do not exceed the maximum permissible input ratings.
- ▶ Conduct measuring works only in dry clothing and in rubber shoes, i.e. on isolating mats.
- ▶ Comply with the warning labels and other information on the instrument.
- ▶ Check the probes for faulty insulation or bare wires before connection to the instrument.
- ▶ Disconnect the probes from the measuring circuit before switching modes or functions.
- ▶ Do not cover the ventilation slots of the cabinet to ensure that the air is able to circulate freely inside.
- ▶ Do not insert metal objects into the instrument by way of the ventilation slots.

- ▶ Do not place water-filled containers on the instrument(danger of short-circuit in case of knockover of the container).
- ▶ Do not operate the instrument near strong magnetic fields (motors, transformers etc.)
- ▶ Do not subject the instrument to shocks or strong vibrations.
- ▶ Keep hot soldering irons or guns way from the instrument.
- ▶ Allow the instrument to stabilize at room temperature before taking up measurement.
- ▶ Do not modify the instrument in any way.
- ▶ Do not place the instrument face-down on any table for work bench to prevent damaging from controls at the front.
- ▶ Opening the instrument, service and repair work must only be performed by qualified service personnel. Repair work should be performed in the presence of a second person trained to administer first-aid, if needed.
- ▶ If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- ▶ The socket-outlet shall be installed near the equipment and shall be easily accessible.

-Measuring instruments don't belong to children's hands-

2-2. Safety Symbols

Pay your special attention to Warning symbols printed on the instrument.



Caution(Refer to the operating manual)



Protective conductor terminal

CAT II Overvoltage Category II

SECTION 3: INSTALLATION

3-1. Unpacking and Inspection

Every care is taken in the choice of packing materials to ensure that your instrument will reach you in perfect condition.

Unpack the instrument and check out external damage on the case, sockets, keys, etc. If damage is found, notify the carrier and your sales representative immediately.

The standard accessories supplied with the instrument are described in the Section 1.

3-2. Preparation for Operation

Under no circumstance should users touch any of the front terminals, unless they are first assured that no dangerous voltage is present.

Power Input

The recess power plug, power fuse and line voltage indicator are contained in an integral module on the rear panel.

Power cable

The detachable supply cable. Comprising of 3-core PVC cable permanently molded to a fully shrouded 3-pin socket, fits in the power input plug recess and should be fitted fully. The supplied lead should be connected to a grounded AC power receptacle ensuring that the ground lead is connected, to avoid electrical shock.

Line Voltage

MXG-9802A, MXG-9810A and MXG-9816A Function Generator are operative within the line voltage ranges.

AC220-240V ~ 50/60Hz in Europe

AC 100-120V ~ 50/60Hz in North America

Disconnect all test cables and power cord while changing the line voltage your desire.

Bench Mounting

This instrument is fitted with four rubber feet. It is intended to stand on a bench, located at least 30cm of free space at the rear.

In addition, plastic tilt-stand is provided to facilitate the viewing angle of the instrument from the bench level.

SECTION 4. OPERATING THE MXG-9802A/MXG-9810A/MXG-9816A

Prior to operating the instrument, it is important to check that it is correctly installed as specified in the Section 3.

The operating instructions are divided into two major groups; Function Generator and Frequency Counter.

Throughout these sections, warnings identify potentially dangerous procedures. Instructions contained therein must be observed.

4-1. Using the Function Generator

Check the line voltage and the fuse ratings before connecting to the power outlet.

For stabilizing the counter, warm-up time of at least 20 minutes is required, before performing measurements.

4-1-1. Specifications

Wave Forms	Sine, Square, Triangle, Skewed Sine, Ramp, Pulse and TTL Level Square
Frequency	
MXG-9802A	2Hz to 2MHz in 7 ranges
MXG-9810A	10Hz to 10MHz in 7 ranges
MXG-9816A	10Hz to 15MHz in 7 ranges
VCF Voltage Level	0 to 10V DC(Max.Input voltage : $\pm 15V$)
Output Impedance	50ohm +/-10%
Output Amplitude	1Vpp to 10Vpp at 50ohm load
LPF-A	Below 300kHz
Frequency Variable Range	20:1 or more
Symmetry Variable Range	3:1 or more
Offset Variable Range max	+/- 10V DC at open load
Sine wave	
Distortion	Less than 1% (at 1KHz)
Flatness	+/- 0.3dB

Square wave

Symmetry Less than +/- -3%(at 1KHz)
 Rise & Fall time Less than 150ns(at 1KHz)

Triangle

Linearity Less than 1%(up to 100KHz)
 Less than 5%(100KHz to 2MHz,
 10MHz, 15MHz)

TTL Output

Rise & Fall Time Less than 30ns at 1KHz
 Output Level More than 3V

Frequency Sweep

Sweep Time 20ms to 2s
 Internal Sweep Mode Linear
 Logarithmic
 Sweep Width More than 100:1
 External sweep by means of VCF input
 Line voltage range AC 220-240V~+/-10%, 50/60Hz
 AC 100-120V~+/-10%, 50/60Hz
 Power consumption 35W max.

4-1-2. Start-Up

Check the conductors of Channel A and B in good condition. Connect the AC power cable to the recess power receptacle and plug it into three-contact electrical outlet. Turn on the power switch. "0" will be displayed. Push FREQUENCY SELECTOR switch to select the frequency range at your desire. Set all the variable controls, as follows;

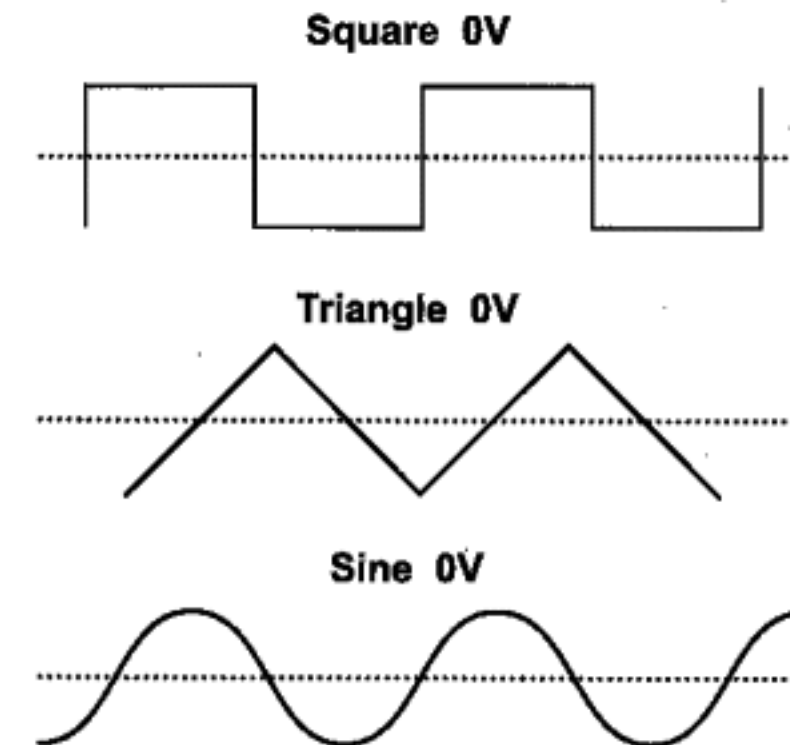
Variable Controls	Setting Position
FUNCTION	Sinewave
FREQ.Range Select	X 1K
Freq.Control Dial	In the center
Amplitude Control Knob	Switch off position
Offset Control Knob	
Symmetry Control Knob	
Sweep-Width Control Knob	
Sweep-Rate Control Knob	

If you want to measure frequency under process, please refer to section 4-2-4 for further information.

4-1-3. Wave Forms

The basic ramp signal has been operated by the OP Amp. Based on this basic signal, the square wave has been formed by the line receiver IC. And, the sine wave has been formed by the quadruple TR IC.

The output wave forms and phase relationship are as follows



4-1-4. Frequency Ranges

The MXG-9802A, MXG-9810A and MXG-9816A can supply the frequency in the 7 ranges as shown in the following table.

Frequency Range Assigned to each Select Switch

Select Switch			Assigned Range			Maximum Output		
MXG-9802A	MXG-9810A	MXG-9816A	MXG-9802A	MXG-9810A	MXG-9816A	MXG-9802A	MXG-9810A	MXG-9816A
X 1	X 10	X 10	0.1Hz-2Hz	1Hz-10Hz	1Hz-10Hz	2Hz	10Hz	10Hz
X 10	X 100	X 100	1Hz-20Hz	10Hz-100Hz	10Hz-100Hz	20Hz	100Hz	100Hz
X 100	X 1K	X 1K	10Hz-200Hz	100Hz-1KHz	100Hz-1KHz	200Hz	1KHz	1KHz
X 1K	X 10K	X 10K	100Hz-2KHz	1KHz-10KHz	1KHz-10KHz	2KHz	10KHz	10KHz
X 10K	X 100K	X 100K	1KHz-20KHz	10KHz-100KHz	10KHz-100KHz	20KHz	100KHz	100KHz
X 100K	X 1M	X 1M	10KHz-200KHz	100KHz-1MHz	100KHz-1MHz	200KHz	1MHz	1MHz
X 1M	X 10M	X 15M	100KHz-2MHz	1MHz-10MHz	1MHz-15MHz	2MHz	10MHz	15MHz

Note;

The output frequency can be read by multiplying figures optioned by the frequency control dial, and the frequency Range Select Switch.

4-1-5. Features

Voltage Controlled Frequency

Output frequency can be varied with an external voltage input from the VCF Input Terminal.

For 0-10V DC VCF input voltage, the frequency is changed by 1:2, depending on activation of the Frequency Range Select Switch.

To operate the VCF function, turn the Frequency Control Knob, fully CCW, and connect the external voltage to be VCF Input Terminal.

Amplitude Control

The maximum amplitude of output voltage is more than 20V under the open load, but it is reduced by half under the 50ohm load.

The amplitude of output voltage can be varied continuously with operating the Amplitude Control Knob, in the range of -20dB. If the Amplitude Control Knob is pulled out, the output signal is set to the -20dB fixed.

OFF-SET Control

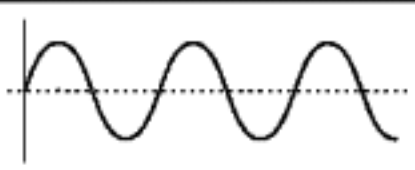
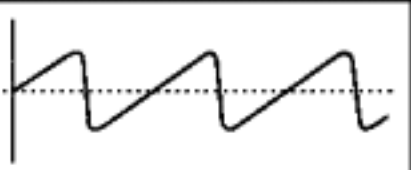
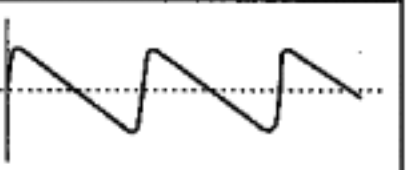
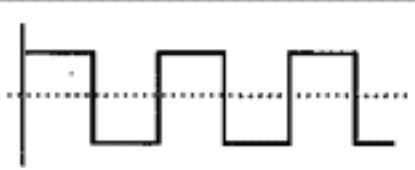
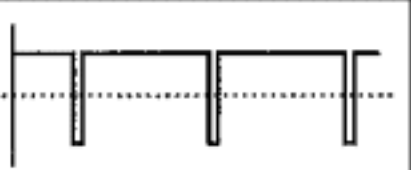

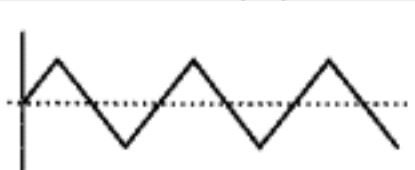
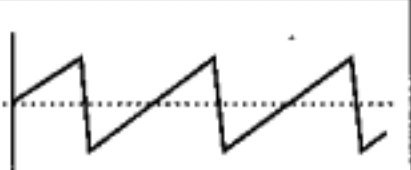
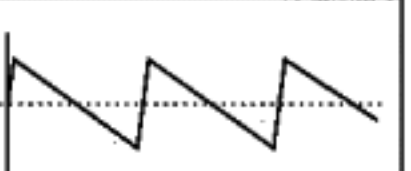
The DC level of output signal can be varied continuously with operating the OFF-SET Control Knob in the range of +/-10V. To adjust the DC level, pull out the OFF-SET Control Knob then turn slowly(positive volt) or CCW(negative volt). If the OFF-SET Control Knob is pushed in, there is no DC level, but only AC voltage exists in the output signal.

Symmetry Control

The duty cycle of output signal can be varied continuously with the Symmetry Control Knob in the range of 1:3 or 3:1. To adjust the symmetry of the waveforms, pull out the Symmetry Control Knob, then turn it slowly to the CCW direction. The following table shows such variations under the mode.

Note;

After setting the Symmetry Control Knob, the output frequency will decrease and the operator should re-adjust the frequency.

Basic Wave Forms	Clock Wise	Conter Clock Wise
		
Sine	Skewed Sine	Skewed Sine
		
Square	Pulse	Pulse
		
Triangle	Sawtooth	Sawtooth

Sweep Control

To enable the internal frequency to sweep, pull out the Sweep Width Control Knob. The width of the frequency sweep can be varied continuously in the range of 100:1. To maximize the sweep width, set the Frequency Control Knob fully to CW.

To adjust the rate of frequency sweep, turn the Sweep Rate Control Knob slowly CW or CCW for linear frequency sweep. Logarithmic frequency sweep mode is operative with by pulling the Sweep Rate Control Knob.

TTL Output

The TTL level signal output is available at the TTL Output Terminal.

The TTL output can drive 30 units loads in the HIGH state and 20 unit in the LOW state. One unit in the HIGH state is defined as 40 uA and 1.6mA in the LOW state.

4-2. Using the Frequency Counter

4-2-1. Specification

Input Frequency Measurement

Measuring Range

Channel A	1Hz to 20MHz LED display depending on Gate Time and Input Signal. At least 7 digits are displayed per each second of gate time.
Channel B	20MHz to 2.7GHz

Input Sensitivity

Channel A	40mV RMS Sinewave or 100m Vp-p
Channel B	40mV RMS Sinewave for 20MHz to 1.3GHz 70mV RMS Sinewave for 1.3GHz to 2.7GHz

Maximum Input Voltage

Channel A	35Vp-p
Channel B	3Vp-p

Input Impedance

Channel A	1 Mohm
Channel B	150 ohm

Time Base

Channel A,B	Switch selectable
-------------	-------------------

Resolution

CH A	0.1Hz (Gate 10s)
	1 Hz (Gate 1s)
	10 Hz (Gate 0.1s) * Gate 0.1S -> 1kHz~20MHz only.
CH B	10 Hz (Gate 10s)
	100 Hz (Gate 1s)
	1 KHz (Gate 0.1s)

Operating Temperature

10°C to 40°C

Storage Temperature

-10°C to 50°C

Line Voltage Range

AC 220 ~ 240V, +/-10%, 50/60Hz or
AC 100 ~ 120V, +/-10%, 50/60Hz

Power Consumption

35W max.

Coaxial Cable

RG-58C/U, Impedance 50ohm, with 1 meter in (w/BNC connector) length.

4-2-2. Start-Up

Check the conductors of Channel A and B in good condition.

Connect the AC power cable to the recess power receptacle and plug it into three-contact electrical outlet.

Turn on the power switch. 0 will be displayed.

Gate time at 1Sec.position.

Channel at Channel A position.

The Data-Hold and the LPE-A at off position.

Now "GATE 1", "CHAN A", "0" and "Hz" indicators are lit up at frequency LED display.

4-2-3. Features

LPE-A Switch

This switch is used for noise removal in case of measurement of frequency lower than 300KHz with high frequency noise in CH-A.

Channel Select Switch

The channel A covers your measurement of the frequency from 1Hz to 20MHz with auto range. The channel B covers your measurement of the frequency from 20MHz to 2700MHz.

Gate Time Switch

For a better resolution in your measurements, your selection for a proper gate time is recommended. The following table will help you refer to the optional frequency resolution. In case the input signal is lower than 1KHz, we recommend you to select gate time 1s or 10s. If you select 0.1s, the counted data has to be multiplied by 10times for and actual measuring value. But their errors maybe 10% or more.

Frequency Resolution Table

GATE TIME	0.1s	1s	10s
Low Range	10Hz	1Hz	0.1Hz
High Range	1KHz	100Hz	10Hz

Data-Hold Switch

Upon activation of this mode, a read-out on the LED display will be captured and remained even after disconnecting the test connector from a measuring point.

Reset Switch

If you want to clear the displayed data, press RESET button.

OFL indicator LED

When the counted data is over 8th digit, the OFL LED flickers.

4-2-4. Measuring the output frequency generated by F/G

If you want to measure the output frequency of the Function Generator, press the Display Option Key at F/G position.

Because the maximum output frequency of F/G is 2MHz(MXG-9802A) or 10MHz(MXG-9810A) or 15MHz(MXG-9816A), the Range Select Channel should be set at CHA which can read the frequency.

SECTION 5. USING THE SOFTWARE SUPPLIED

Lets you interface the Frequency Counter with your IBM PC compatible computer to log and graph measurements.

5-1. Interfacing the instrument with a Computer

Follow these steps to connect the instrument to a computer

1. Connect the supplied RS232C Interface cable between the instrument's and the computer's serial port

Note; You can use any commercial type of RS-232C Cable with 9 pin D-Sub connector.

2. Press Power switch to ON position
3. Turn on the computer

5-2. Using the Supplied Software

We included software program in Windows to log and display data collected with your instrument. The program is called BenchViwe.

Follow these steps to install and run the software.

Note; The following steps assume a basic knowledge of Microsoft Windows. Refer to windows user's guide of your computer for information about using Windows. This software requires Micorsoft Window, version WINDOW95 and above with VGA display.

1. Start your computer and run Window
2. Insert the supplied diskette in your computer's driv
3. Click the START button and select the RUN menu
4. At the prompt, type
A:\setup[ENTER] (If you placed the diskette in drive A)
B:\setup[ENTER] (If you placed the diskette in drive B)
5. Follow on-screen prompts to complete the installation

5-3. Technical Information

Communication Parameters

- Transmission rate : 9600 baud
- Character Code : 8 bit
- Parity : None
- Stop bits : 1

Hints for Writing your Own Software

If you write your own program, the host computer must give the instrument the D command to activate data transmission.

```
10 OPEN COM2:9600, N, 8, 1, RS, CS, DS, CD AS#2
20 PRINT #2, D
30 IN $=INPUT $(24, #2)
40 PRINT IN$
50 CLOSE #2
```

SECTION 6. CARE & MAINTENANCE

Your instrument is a precise electronic device. Do not tamper with the circuit. To prevent electric shock hazard, turn off power and disconnect the probes or connectors and from the mains before removing the cabinet, if needed.

6-1. Replacing the Fuse

Caution ; For continued protection against fire or other hazard, replace only with the fuse of the specified voltage and current ratings.

Line Voltage	Fuse
AC100~120V~, 50/60Hz	250V, T1AL
AC220~240V~, 50/60Hz	250V, T1AL

Follow these steps to replace the fuse.

1. Press power switch to turn off and disconnect all test cables and power cord from the instrument
2. Remove the defective fuse by taking off the fuse holder
3. Install a new fuse in a fuse holder and replace it

6-2. General Maintenance

Any adjustments, maintenance or repair of the instrument, except fuse replacement should be done only by qualified service personnel.

*Use and store your meter only in normal temperature environments. Extreme temperatures can shorten the life of electronic devices and distort or melt plastic parts.

*Keep your instrument dry. If it get wet, wipe it dry immediately. Liquids might contain minerals that can corrode the electronic circuits.

*Handle your instrument gently and carefully. Dropping it can damage circuit boards and cases and cause the instrument to work improperly.

*Keep your instrument away from dust and dirt, which can cause premature wear of parts.

*Prior to cleaning the cabinet, disconnect the mains plug from the power outlet. Clean only with a damp, soft cloth and a commercially available mild household cleaner. Ensure that no water gets inside the instrument to prevent possible shorts and damage to the instrument.

Modifying or tampering with your instrument's internal components can cause a malfunction and might invalidate its warranty.