



## **Frequency Counter**

**HC-F1000L**

# **Operation Manual**



## TABLE OF CONTENTS

Introduction & specification-----	1
Introduction-----	1
Specification-----	1
Operation-----	5
Introduction-----	5
Preparation for use-----	5
Front panel features -----	5
Measurement-----	8
Frequency measurements-----	8
Period measurements-----	9
Calibration-----	10
Introduction-----	10
Test instruments required-----	11
Time base frequency adjustment-----	11
Trigger level adjustment-----	12



## SECTION 1 INTRODUCTION & SPECIFICATION

### 1. INTRODUCTION

The HC-F1000L is a 10Hz to 1000MHz multiple-function Frequency Counter (max. up to 1.3GHz).

It features an eight digit high brightness seven segment LED display, four function performance, low power consumption circuit design, small size, light weight, high stabilized crystal oven oscillator for measurement of accuracy and full input signal conditioning.

The four functions are frequency, period, totalize and self check.

This is accomplished by a single LSI integrated circuit. The input signal can be conditioned by attenuation.

The location of controls, indicators connectors and all of information for this model are provided in this manual. It is recommended that whole information and details should be read and understood before attempting to operate the instrument for correct operation and best results.

### 2. SPECIFICATIONS

The pertinent specifications are listed as follows:

#### A. Measuring Mode

Frequency measurements



### CHANNEL A

Range:	1Hz-100MHz
Resolution:	Max. 1Hz
Gate time:	0.01s/0.1s/1s selectable
Accuracy:	$\pm 1$ count $\pm$ time base error x frequency

### CHANNEL B

Range:	100MHz-1GHz-1.3GHz
Resolution:	Max. 100Hz
Gate time:	0.01s/0.1s/1s selectable
Accuracy:	$\pm 1$ count $\pm$ time base error x frequency

### Period Measurements (Channel A)

Range:	1Hz to 10MHz
Resolution:	Max. $10^{-9}$ s
Accuracy:	$\pm 1$ count $\pm$ time base error x period



## B. Input Characteristics

### CHANNEL A

Input sensitivity	: 1Hz~10Hz	30mVrms
	10Hz~80MHz	20mVrms
	80MHz~100MHz	30mVrms
Attenuation	: x 1, x 20 fixed	
Filter (CH-A only)	: Low pass : ~100KHz~3dB	
	~150KHz~3dB	at 20dB ATT
Impedance	: Approx. $1M\Omega$ , $<3pF$	
Maximum voltage without damage:	250Vrms (DC+AC)	

### CHANNEL B

Input sensitivity	: 100MHz~1GHz	20mVrms
	1GHz~1.3GHz	50mVrms
Impedance	: Approx. $50\Omega$	
Maximum voltage without damage :	3V	

### C. Time Base

Frequency:	10MHz
Stability:	Better than $\pm 2 \times 10^{-6}$ / day
Output:	“0” level: 0V~0.8V “1” level: 3V~5V

### D. General

Display	: 8 digit 7mm red LED display with decimal point, gate, overflow, kHz, MHz and $\mu$ s indication.
Check	: Counts internal 10MHz time base oscillator
Power requirement:	Line 115/230V $\pm$ 15% 45Hz~70Hz
Warm-up time :	20 minutes when cold started at 25 °C
Temperature :	In operation : 0 °C ~ +50 °C
Storage and transport:	-40°C ~ +60°C
Humidity:	In operation: 10 ~ 90%RH Storage : 5~95%RH
Dimension:	207mm(H) X 85mm(W) X 255mm(D)
Weight:	2kg

**E. Supplied Accessories:** Power cord  
Operating Manual

### **3. OPERATION**

#### **3.1 Introduction**

This section provides complete operating information needed for this multifunction counter. This section includes a description of all front panel controls, -connectors and indicators, operating instructions, operator's maintenance.

#### **3.2 Preparation For Use**

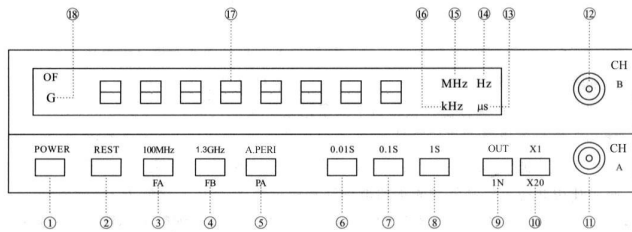
1) Line Power Requirements

It requires a Line Power of 115 or 230VAC 45 to 65Hz single phase. Power consumption is 10 watts maximum.

2) Wait about 20 minutes until the crystal oven oscillator gets stable for accurate measurement.

#### **3.3 Front Panel Features**

**Fig.2-1 shows the front panel**



- 1) Power switch : Press the push-button to turn it on, and press the push-button again to turn it off.
- 2) REST : When the button is pressed, the counter is reset to original state.
- 3) FA : Channel A selection. With selecting one of the Gate Times, frequency measurement can be done from CH-A.



- 4) FB : Channel B selection. With pressing this key and selecting one of the Gate Times, frequency of signal connected to CH-B can be measured.
- 5) PA : With pressing this key, Period Measurement mode for CH-A is selected.
- 6) 0.01s : 0.01 second selection of GATE TIME.
- 7) 0.1s : 0.1 second selection of GATE TIME.
- 8) 1s : 1 second selection of GATE TIME.
- 9) X20 :20dB attenuation.
- 10) OUT :With pressing the key, a Low-Pass filter is introduced into measuring circuit, which provides higher accuracy for measuring low frequency signal of 0~100kHz.
- 11) CH-A : Input terminal of Channel A. Signal within 1Hz~100MHz can be measured with this channel. To ensure accuracy, when the amplitude of input signal is higher than 300mVrms, ATT button should be pressed, when measured frequency is lower than 100kHz, the Low-Pass filter should be activated.
- 12) CH-B : Input terminal of Channel B. Signal over 100MHz can be measured with this channel.

- 13)  $\mu$ s : Micro-second indicator. It turns on when in Period measurement.
- 14) Hz : Hertz indicator. It turns on when measured frequency is lower than 1kHz.
- 15) kHz : Kilo-Hertz indicator. It turns on when measured frequency is  $\geq 1$ kHz and  $< 1$ MHz.
- 16) MHz : Mega-Hertz indicator. It turns on when measured frequency is  $\geq 1$ MHz.
- 17) : Digital display.
- 18) G : GATE indicator. It turns on when counting start, and turns off when counting stop.(The processed data will be shown on display after the indicator switch off.

## **4. MEASUREMENT**

### **4.1 Frequency Measurement.**

Perform frequency measurement as follows:

- 4.1.1 Press the POWER switch to the ON position.
- 4.1.2 Press the PA or PB to select input channel according to frequency of tested signal.
- 4.1.3 Select the desired Gate Time, Connect the input signal to the front - panel BNC connector.

- 4.1.4 When using CH-A, set ATT. at X20 if input signal level is greater than 300mV. Turn Low-Pass filter on, if frequency of input signal is lower than 100kHz.
- 4.1.5 Read the frequency on display, and observe the unit of measurement indication to the right of the display.

#### **4.2 Period Measurement.**

Perform period measurements as follows:

- 4.2.1 Press the POWER switch to the ON position
- 4.2.2 Press the A. PERI switch to select the Period Measurement operation.
- 4.2.3 Set Attenuator and Low-Pass filter referring 4.14.
- 4.2.4 Select the desired Gate Time, connect the input signal to the front-panel A.INPUT BNC connector.
- 4.2.5 Read the period time on display and observe the unit if measurement indication to the right of the display.



## 5. CALIBRATION

### 1. INTROUCTION

Calibration of Time Base Oscillator Frequency and Trigger Level is needed after a certain time of usage. Time base oscillator adjustment should be made whenever the oscillator is repaired. Or whenever it is determined that accuracy of the counter is not within the accuracy desired. Perform time base oscillator adjustment in an environment having an ambient temperature of +22 °C to +25°C (72°F to 77°F). Allow the instrument to warm up at least 30 minutes without cases on before adjusting the time base.

#### **WARNING**

**MAINTENANCE DESCRIBED HEREIN IS PERFORMED WITH LINE POWER APPLIED TO THE INSTRUMENT, AND PROTECTIVE COVERS REVOMED. SUCH MAINTENANCE SHOULD BE PERFORMED ONLY BY TRAINED PERSONNEL WHO HAS KNOWLEDGES OF THE HAZARD INVOLVED(FOR EXAMPLE , FIRE AND ELECTRICAL SHOCK ). IN CASE MAINTENANCE CAN BE PERFORMED WITHOUT POWER APPLIED, THE POWER SHOULD BE REMOVED\***

## 2. INSTRUMENTS REQUIRED

INSTRUMENT	BRIEF SPECIFICATION
1) Quartz oscillator	Range : 10MHz,1GHz,1.3GHz Temperature coefficient: $\pm 1 \times 10^{-8}$
2) Sine wave generator	Range:1KHz-1GHz-1.3GHz

## 3. TIME BASE FREQUENCY

### ADJUSTMENT

#### CH-A Time Base

- 1) Remove the counter from the case.
- 2) Select a 10MHz output on the quartz oscillator < i.e. house standard> and connect the 10MHz signal to the counter A. INPUT
- 3) Set the front panel controls as follow:

POWER -----ON  
 NOR/HOLD -----NOR  
 GATE TIME-----1s  
 FUNCTION-----FA, 10MHz  
 ATT. ----- X 1



4) While observing the counter display, adjust the time base oscillator control (C25 located on the oven) to obtain a reading of  $10000.00 \pm 1$  digit.

### **CH-B Time Base**

1) Remove the counter from the case.  
2) Select a 1GHz output on the quartz oscillator (i.e. house standard) and connect the 1GHz signal to the counter B. INPUT.

3) Set the front panel controls as follow;

POWER-----ON  
NOR/HOLD-----NOR  
GATE TIME-----1 s  
FUCTION ----- FB

4) With observing the counter display, adjust the time base oscillator control (C28 located on the oven) to obtain a reading of  $1000.0000 \pm 1$

### **4. TRIGGER LEVEL ADJUSTMENT**

1) Remove the counter from the case  
2) Set sine wave generator controls for 10MHz at exactly 30 mV rams amplitude.  
3) Connect generator to A. INPUT connector of the front panel.

4) Set the front panel controls as follow:

POWER----- ON

NOR/HOLD----- NOR

GATE TIME----- 1s

FUNCTION-----PA, 10MHz

ATT-----X 1

5) With observing the counter display, adjust the trigger level to proper value.