sisco

RF FREQUENCY COUNTER
FC-3000

Operation Manual

sisco

Warranty

Warranty service covers a period of one year from the date of original purchase.

In case of technical failure within one year, our service center or sales outlet will provide repair service free of charge.

We charge customers for repair after the one-year warranty period has been expired. Provide that against any failure resulted from the user's negligence, natural disaster or accident, we charge you for repairs regardless of the warranty period.

For more professional repair service, be sure to contact our service center or sales outlet.

Note

1. To fully maintain the precision and reliability of the product use it within the range of standard setting(temperature 10 ℃, humidity 45%-85%)
2. After turning of power, please allow a pre-heating period of as long as some 30mins before use.
3. This equipment should be used with a triple line power cord safety.
4. For quality improvement the exterior design and specification of the product can be changed without prior notice.
5. If you have further questions concerning use, please contact sisco service center or sales outlet.

Safety Summary

Please take moment to read these operating instructions thoroughly and completely before operating this instrument. Pay particular attention to WARNINGS used for conditions and actions that pose hazard to the user and CAUTIONS used for conditions and actions that may damage the instrument.

- Always to inspect the instrument and other accessories for any sign of damage or abnormality before every use.
- Never ground yourself and keep your body isolated from ground
- Never touch exposed wiring, connections or any live circuit conductions
- Do not install substitute parts or perform any unauthorized modification to the instrument
- Use caution when working above 60V DC or 30V AC rms. Such voltages pose shock hazard
- Remember that line voltage is present on some power input circuit points such as on-off switches, fuse, power transformers, etc., even when then equipment is turn off
- Also, remember that high voltage may appear at unexpected points in defective equipment.

CONTENT

1. PRODUCT DESCRIPTION

1-1. Introduction

This reciprocal FREQUENCY COUNTER is microprocessor controlled instrument for frequency measurement at high resolution within a short period of 7 digit display with one second gate time due to uniquely developed LSI as well as the expanding/reciprocal system. It covers a frequency range from 0.1Hz to 3.7GHz based on 10MHz time base T.C.O and also featuring.

FC-3000 frequency counter

- ●RPM (Rotation Per Minute) measuring function
- ●EXT. frequency standard input with 9digit LED display
- ●Attenuator
- ●Check
- ●Period
- ●Total
- ●Low pass filter
- ●Line filter

A self-test mode is also provided for a quick check of several facts of operation. Each operating mode can be selected by front push button switches with automatic decimal points and indicators. The high accuracy, sensitivity and versatility of this counter make is an extremely valuable instrument to the scientist, engineer, experimenter and communications technician. Light weight and compact size make it practical for use by the hobbyist or field technicians.

1-2. Technical specifications

■Input A characteristics

-Frequency range: 0.1Hz - 100MHz(DC coupled)

30Hz-100MHz (AC coupled)

-Sensitivity: 0.1Hz to 100MHz: 30mV

-Coupling: AC or DC selectable

-Impedance: 1MΩ resistance, shunted by <40pF

-Attenuator: X1 or X 10 switch selectable

-Low pass filter: -3dB point of 100KHz, switch selectable

Note: Trigger error is typically ±0.3% of reading by the number of cycles averaged for input signal having better than 40dB S/N radio and greater than 100mV amplitude.

-Resolution and number of display digit

Time base selector	INT	EXT	INT	EXT	INT	EXT	INT	EXT
Gate time	0.01S		0.1S		1S		10S	
Number of displayed digit	5	6	6	7	7	8	8	9
Frequency(input A)	resolution							
0.1Hz-0.99Hz	10uHz	1uHz	1uHz	0.1uHz	0.1uHz	10nHz	10nHz	1nHz
1Hz-9.9Hz	0.1mHz	10uHz	10uHz	1uHz	1uHz	0.1uHz	0.1uHz	10nHz
10Hz-99Hz	1mHz	0.1mHz	0.1mHz	10uHz	10uHz	1uHz	1uHz	0.1uHz
100Hz-999Hz	10mHz	1mHz	1mHz	0.1mHz	0.1mHz	10uHz	10uHz	1uHz
1KHz-9.9KHz	0.1Hz	10mHz	10mHz	1mHz	1mHz	0.1mHz	0.1mHz	10uHz
10KHz-99KHz	1Hz	0.1Hz	0.1Hz	10mHz	10mHz	1mHz	1mHz	0.1mHz
100KHz-999KHz	10Hz	1Hz	1Hz	0.1Hz	0.1Hz	10mHz	10mHz	1mHz
1MHz-9.9MHz	100Hz	10Hz	10Hz	1Hz	1Hz	0.1Hz	0.1Hz	10mHz
10MHz-99MHz	1kHz	100Hz	100Hz	10Hz	10Hz	1Hz	1Hz	0.1Hz
100MHz	10kHz	1kHz	1kHz	100Hz	100Hz	10Hz	10Hz	1Hz

-Accuracy: ±Time base error ± resolution (table 1)

-Period range: 10ns to 10s

-Display: n. u. m., sec with decimal point

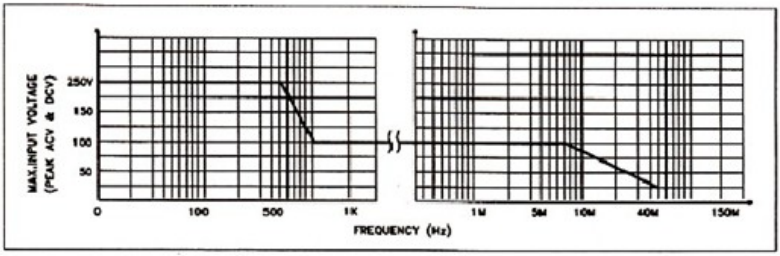
-Total range: DC to 30MHz

-Capacity: 0 - 999 999 999

-Over flow: ‘OF’

-RPM rang: 6 to 600X10^7 RPM, over flow: “of”

-Max. input voltage level



■Input C characteristics

-Frequency range: 80MHz to 3.7GHz

-Sensitivity: 10mVrms from 80MHz to 2.0GHz

20mVrms from 2.0GHz to 3.0GHz, 35mVrms from 3.0GHz to 3.2GHz

40mVrms from 3.2GHz to 3.5GHz, 70mVrms from 3.5GHz to 3.7GHz

-Coupling: AC only

-Impedance: 50Ω ±5%

-Max. input level: 3Vrms sine wave

- Number of displayed digit

Time base selector	INT	EXT	INT	EXT	INT	EXT	INT	EXT
Gate time	0.01S		0.1S		1S		10S	
Number of displayed digit	5	6	6	7	7	8	8	9

■Time base characteristics

-Type: TCO(temperature controlled oscillator)

-Frequency: 10.000000MHz

-Stability: ±1PPM(±1 count)

-Line voltage stability: less than ± 1PPM with ±10% line voltage variation

-Temperature stability: ± PPM from 0℃ to 50℃

-Max. aging rate: ±PPM/year

-INT.STD.OUT: 10MHz(internal standard frequency output)

-Level: 1Vpp or more

-Impedance: approx. 600Ω

Display characteristics

-Display: Nine digit 0.56'' LED with M/n, K/u, Hz, m, Sec, G.T, Hold, and "OF" indicators. Function and Gate time: User selected.

-Hold: in frequency and period, TOTAL. MODE measurement in progress is stopped, and the last completer measurements is displayed. When Hold is released, a new measurement begins.

-Gate time: depending on input frequency

<10mS---------Somewhere between 0.9 and 9mS

<0.1S----------Somewhere between 9 and 90mS

<1S---------- Somewhere between 90 and 900mS

<10S----------Somewhere between 0.9 and 9S

Note: Last measurement display will remain for 10 seconds after signal off

■Dimension and weight

-Dimension: 260*395*100mm

-Weight: approx. 4kg

1-3. Equipment ratings

●Power & fuse ratings

Input voltage	Fuse	Power max.
103-126V AC (50/60Hz)	F 0.5A 250V	10W
206-252 V AC (50/60Hz)	F 0.25A 250V	

●Operating environment

Temperature: 0℃ to +40℃(accuracy specified at±25℃±5℃)

Humidity: up to 85% to 40℃ without temperature extremes

Causing condensation within the instrument

●Storage environment

Temperature: -20℃to + 70℃

Humidity: below 85%

●Insulation category II: portable equipment of local level

●Pollution degree: 2

●Protection to IEC 529: ordinary

1-4. Supplied accessories

- operation manual----------1
- BNC cable----------1
- power cord----------1
- spare fuse----------1

Specifications are subject to change without notice

2. INSTALLATION

2-1. Initial inspection

This instrument was carefully inspected both mechanically and electrically before shipment. It should be physically free of damage. To confirm this,the instrument should be inspected for physical damage in transit. Also, check for supplied accessories.

2-2. Connecting AC power

This instrument requires ac 220V, 50/60Hz power through 3-conductor ac power cable to be fit into three-contact electrical outlet to secure grounding.

CAUTION

This instrument is set to AC 220V. Before powering on this instrument, make sure the voltage of the power source is AC 220V.

2-3. Cooling and ventilation

No special cooling and ventilation is required. However, the instrument should be operated where the ambient temperature is maintained.

2-4. Position

This instrument is built as a bench-type instrument with rubber feet and tilt stand in place. Stand-up angle can be adjusted by angle of carrying handle.

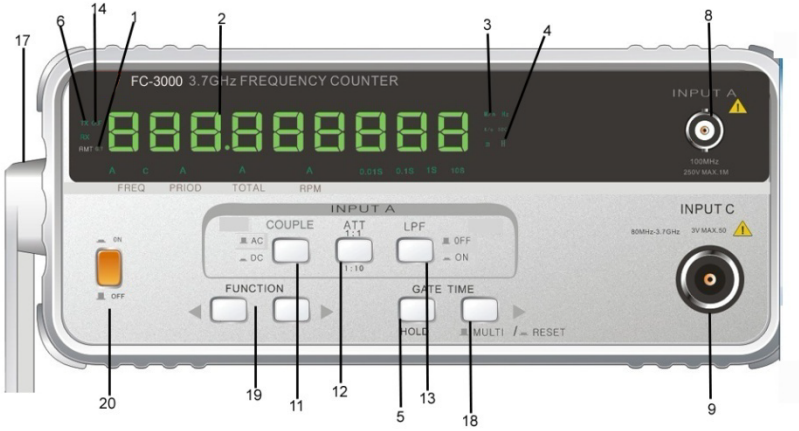
2-5. Warming-up

Allow more than 20minutes for the unit to warm up so that it is stabilized and ready to use.

ready to use.

3. OPERATION

3-1. Controls, indicators and connectors



(1)Gate indicator: The gate light, when lit, indicates the main gate is open and measurement in progress.

(2)Display: 9digit LED display used for all read readings

Note: Last measurement display will remain for 10seconds after signal off

(3)Unit indicator: when lit, indicates that the frequency displayed is in KHz or MHz, and period is in n, u or m, Sec

(4)Hold indicator: when lit, engaged the hold function

(5)Hold switch: In hold function the display is held but the counter goes on increment. When the hold is released, the display is updated and resumes counting.

(6)RS-232C indicator: TC(transmitting), RX(receiving) linking(option)

(8)Input A, BNC: input for frequency measurements below 100MHz

Female BNC connector terminated in 1MΩ input resistance, shunted by < 40pF capacitance.

(9)Input C,BNC: input for frequency measurements above 80MHz,female BNC connector terminated in 50Ω

(11)Couple switch: the switch is used to select the input-coupling mode AC or DC

(12)ATT. Switch: when this switch is set to X10 (Pushed in)the input A is attenuated 10:1 before application to the counter with the switch set to X1(pushed out), the input A signal is applied. The attenuator has no effect on the input C

(13)Low pass filter: with this switch pushed in, the input A is routed through a SWITCH(LPT) low pass filter with -3dB point of approximately 100KHz. When it is released, the input A signal is applied to the counter.

(14)Over flow indicator: OF is displayed when overflow

(17)Tilt stand: pull out to adjust tilt

(18)Gate time switch: this switch is to select the degree of resolution of the display in all modes except TOTAL.

(19)Function switch: select the desired operating mode

a. FREQ. A: when this mode is selected, the counter reads the frequency of the input A. Resolution is selected using the gate time

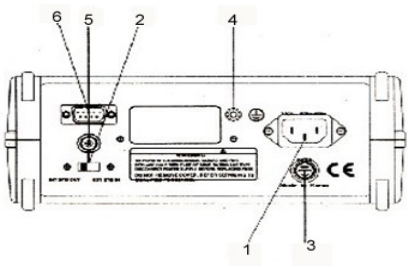
b. FREQ. C: when this mode is selected, the counter reads the frequency of the input C. All readings are in MHz.

c. PERIOD A.: when this mode is selected, the counter read the period of the input A. Resolution is selected using the gate time.

e. TOTAL A.: when this model is selected, the unit counts cycles of the input A signal and continuously displayed that count.

f. RPM A.: when this mode is selected, the unit displays the RPM(rotation per minute) of the input A signal.

(20)Power switch: push in the unit ON and push out the unit power OFF.



① AC inlet: for connecting of the supplied AC power

② INT/EXT time base selector: select the time base, switch position EXT.STD.IN provide a nominal 600Ω input impedance path for an external 10MHz time base. Switch position INT.STD.OUT monitors the internal time base signal

③ Ground terminal

④ Fuse holder: replacing fuse with unscrewing

⑤ INT/EXT time base BNC: serves as a monitoring point for the internal time base signal, or provides an input path for an external time base signal depending on the INT/EXT switch setting. The external signal should have a voltage range of 1.5V~5Vrms

⑥ RS-232C connector: connector for serial interfacing with computer

3-2. Operating introductions

Below is the basic operating information needed for frequency counter.

a. Connect the unit to AC power cord into receptacle on rear panel and plug into AC inlet.

b. To turn on equipment, push power on-off switch on

c. Set the function indicator position to FREQ A and Gate time indicator to 1Sec position

CAUTION：

1. Application of input voltages higher than the limits listed in the specification section may damage the counter. Before applying any signal to the inputs, make certain that it does exceed these specified maximums
2. Frequency counter ground points are connected directly to earth ground. Always connect frequency counter ground only to ground pponits in the circuit under test.

3-3.Frequency measurements

3-3-1. Input A(0.1Hz-100MHz)

a. Apply the signal to be measured to the input A BNC

b. Set the FREQ.A of function switch.
c. Select the degree of resolution desired, using the gate time selector switch
d. Frequency is given by the display. The gate indicator lights while each measurement is in progress, and the display is updated at the end of each measurement interval.
e. Engaging the hold switch “freezes” the display at the exiting reading, when hold is released, the display is updated and resumes counting
f. If necessary, engage the attenuator switch when set to X1(pushed in), this switch attenuates the input A signal by a factor of approximately 10 before application to the counter. This helps prevent miscounting caused by noisy or improperly terminated high amplitude signals
g. If necessary, engage the LPF (low pass filter) switch this route the input A through a low pass filter (-3dB point of approximately100KHz) before application to the frequency counter. This helps eliminate counting errors in low frequency measurements by minimizing efforts of high frequency noise present on the input
h. When measurement the lower cut-frequency (10Hz), pushed in DC coupling position

3-3-2.Input C ： FC-3000: 80MHz- 3.7GHz

CAUTION：

The maximum input limit to this input is 3Vrms maximum over the input frequency range. The X10 attenuator does not apply.

a. Apply the signal to be measured to the input C. BNC
b. Set the function indicator to the FREQ. C position
c. Select the degree of resolution desired, using the gate time switch
d. Frequency is given by the display. The indicator lights while each measurement in progress.
e. Engaging the hold switch “freezes” the display at the existing reading. When hold is released, the display is updated and resumes counting
f. The attenuator and LPF coupling switch have no effect in input C.

3-4. Period measurements

a. Apply the signal to be measured to the input A BNC
b. Select the degree of resolution desired, using the gate time switch
c. Period is given by the display .The gate indictor lights while each measurement is in progress
d. Attenuator, low pass filter, coupling switch application is same as frequency measurements mode.

3-5. Total measurements

The totalize mode is used to count the total number of events occurring during a specific time period. Maximum frequency is 30MHz

a. Set the totalize mode, any gate and units setting is ignored
b. Apply the signal to be measured to input A, and then the counter display is the count continually. Maximum count is 999999999. If this is exceed the overflow message display as “OF”
c. Low pass filter and attenuator, coupling switch application is same as frequency measurements mode

Note: The hold switch may be used to be latch the display. However, the counter to increment and when the hold is released, the update count is display.

3-6.RPM (Rotation per minute) measurement

a. Apply the signal to be measured to the input A BNC, and then the counter displays the RPM. Maximum count is 9999999. If this is exceed, the overflow message displays as “OF”
b. Low pass filter and attenuator, coupling switch application is same as frequency measurements mode

4.MAINTENANCE

CAUTION

It is essential for safety to properly maintain and service this instrument

Warning

Voltages within this instrument are sufficiently high to endanger life. Covers must not be removed except by persons qualified and authorized to do so and these persons should always take extreme care once the covers have been removed.

4-1. Fuse replacement

- ●Disconnect and remove all connections from any live power source
- ●Unscrew fuse holder by screw driver
- ●Locate the defective fuse and remove it by gently pulling- out
- ●Install a new fuse of the SAME SIZE AND RATING
- ●Screwing fuse holder

CAUTION

Make sure that the rated and specified fused are used for replacement

4-2.Adjustment and calibration

It is recommendable to regularly adjust and calibrate this instrument. Qualified and authorized personnel only should execute performance and procedures

4-3. Cleaning and decontamination

The instrument can be cleaned with a soft clean cloth to remove any oil, grease or grime. Never use liquid solvents or detergents. If the instrument gets wet for any reason, dry the instrument using low pressure clean air at less than 25 PSI. Use care and caution around the window cover areas where water or air could enter into the instrument while drying.

5. OTHERS

5-1. BNC cable considerations

Accuracy of radio frequency measurements can be affected by connections between signal source and counter. Main considerations are standing waves and shunt cable capacitance

Standing wave is usually present due to reflections when a transmission line is not terminated in its characteristic impedance. Theses standing waves may cause damage to the signal source or produce inaccurate measurements, and their effects increase as cable length reaches one-fourth of the wavelength for the frequency being measure. Standing wave can be minimized by keeping cable lengths short, and more important, providing a proper termination

The cable's characteristic impedance and the terminating impedance should match the source impedance. For example, for a source impedance of 50Ω, use 50Ω coaxial cable terminated with a 50Ω resistive load

5-2. Use of attenuator probes

Input A resistance (1MΩ) and input capacitance (<40pF) are independent of the ATT switch. To decrease loading, a high impedance oscilloscope probe such as the following may be used with input A. Use the probe in the X10 position whenever possible for less circuit loading

Note:

Do not use a 10:1 probe with the input C, the probe is designed for 10:1 attenuator with a counter input resistance of 1MΩ. The 50Ω termination of the input C would result in unacceptable high attenuator.

5-3.Line frequency measurements

Use of the attenuator, low pass filter, and /or X10 probe is advisable when measuring line frequency because the high amplitude signal and noise can cause wrong counting.

Warning

Use caution in measuring the line frequency of an AC outlet. Using the probe tip only, measure both sides of the line. The ground side will give zero reading

and the hot side will provide the desired measurement. Do not use the “GROUND” lead of the probe. Remember that the chassis of the counter and the “GROUND” lead of the probe are already at earth ground(via the 3-wire power cord of the instrument). Touching the “GROUND” lead to the “HOT” side of the line would place a direct short on the power line through the probe cable, resulting in possible injury and damage to the probe cable.