

2.7 GHz FREQUENCY COUNTER *with TCXO*

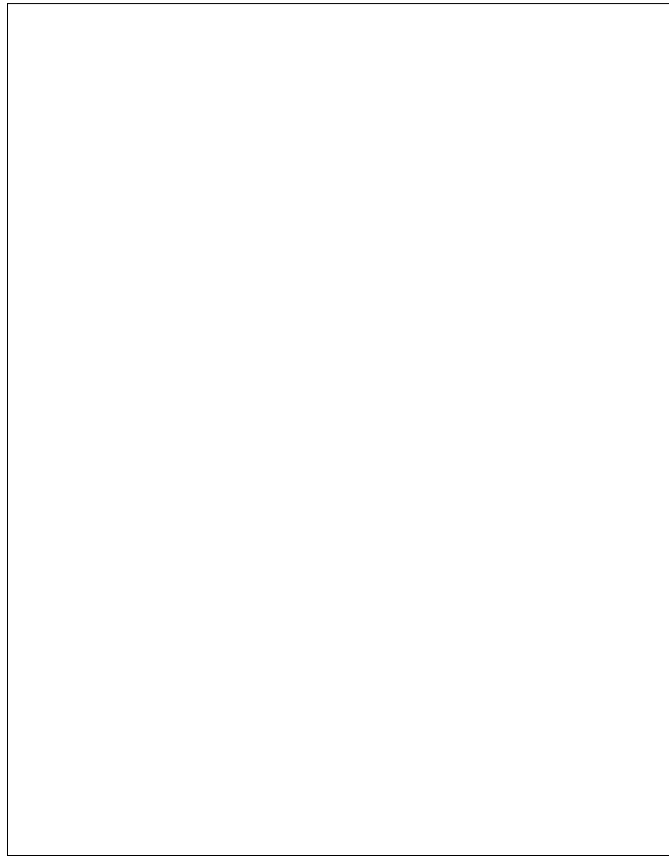


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1. FEATURES

- * TCXO (temperature compensated crystal oscillator) time base, high stability & accuracy.
- * High sensitivity for the VHF & UHF frequency measurement, useful for the CB amateur.
- * Wide measuring range up to 2.7 GHz.
- * Used the exclusive Microprocessor IC offered the intelligent function: Frequency, Period, Multi resolution, Data hold, Relative measurement, Data record (Max., Min., Average reading).
- * 8 digits, 18.3 mm large LCD .
- * 0.1 Hz resolution for 10 MHz.
- * LCD display for low power consumption & clear read-out even in bright ambient light condition.
- * Power supply from battery or AC to DC 9V adapter.
- * RS 232 PC serial interface.

2. SPECIFICATIONS

2-1 General Specifications

Display	18.3 mm (0.72") LCD (Liquid Crystal Display), 8 digits.	
Measurement	Frequency, Data hold, Relative, Memory (max., min., average), Period.	
Range	2.7 GHz	100 MHz to 2700 MHz
	100 MHz	10 MHz to 100 MHz.
	10 MHz	10 Hz to 10 MHz
	Period	10 Hz to 10 MHz
Resolution, Sample Time	Ref. the following "Table for Resolution & Sample Time".	

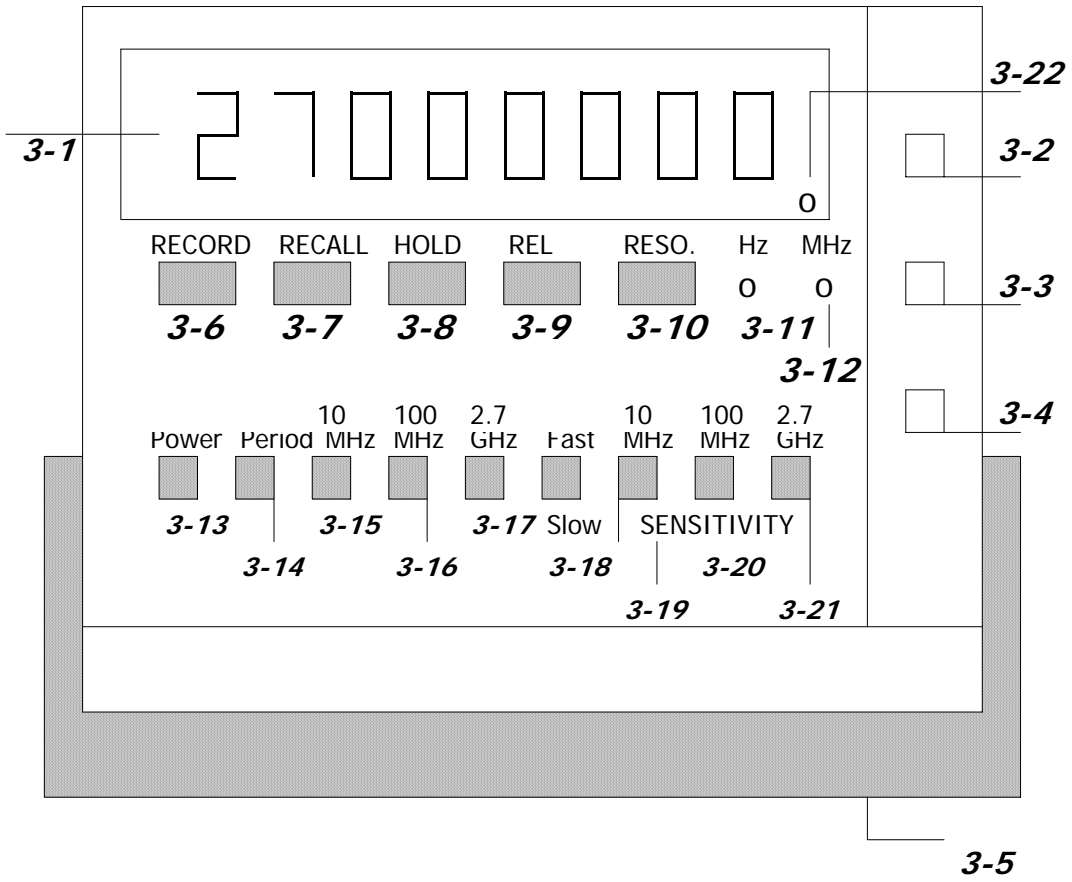
Sensitivity (<i>Sensitivity Sw. set to high position</i>)	10 MHz	30 mV rms. (10 Hz to 10 MHz)
	& Period	<i>Typical : 15 mV rms. (10 Hz to 9 MHz)</i>
	100 MHz	50 mV rms. (10 MHz to 100 MHz)
		<i>Typical : 25 mV rms. (30 MHz to 100 MHz)</i>
	2.7 GHz	50 mV rms. (100 MHz to 2.5 GHz)
		<i>Typical : 35 mV rms. (300 MHz to 2.4 GHz)</i>
Max. functional signal input (<i>Sensitivity Sw. set to normal position</i>)	10 MHz & Period	15 V rms.
	100 MHz	4 V rms.
	2.7 GHz	4 V rms. (400 MHz to 2.7 GHz)
Over-input (Max. signal will not hurt the circuit)	<i>10 MHz & Period range :</i> Max. 15 V rms.	
	<i>2.7 GHz & 100 MHz range :</i> Max. 4 V rms.	
Time Base Stability vs. Temp.	1.5 PPM (10 𠄎 to 30 𠄎).	
Frequency Accuracy	(2 PPM + 1 d) <i>23.5 𠄎, after calibration.</i>	
Time Base circuit	16.777216 MHz, TCXO (temperature compensated crystal oscillator).	
Input Connector	<i>10 MHz & Period range :</i> BNC connector.	
	<i>100 MHz range :</i> N coaxial connector.	
	<i>2700 MHz :</i> N coaxial connector.	

Case	Durable & strong ABS-plastic housing with handle.	
Operating Temp.	0 𠄎 to 50 𠄎 (32 蚌 to 122 蚌).	
Operating Humidity	Less than 80%.	
Power Supply	6 x 1.5 V AA (UM-3) battery or AC to DC 9V adapter.	
Power Consumption	<i>2700 MHz & 100 MHz range :</i> Approx. DC 105 mA.	
	<i>10 MHz & Period range</i> Approx. DC 45 mA.	
AC Adapter Power Input	Optional, 9V DC , 300 to 500 mA rating, central positive for socket.	
Dimension	280 x 210 x 90 mm (11.0 x 8.3 x 3.5 inch).	
Weight	1200 g/0.27 LB (including battery).	
Standard Accessories	Instruction Manual 1 PC.	
Optional Accessories	PB-21	Direct probe with BNC connector & alligator clip pairs, available for 10 MHz range
	BB-22	Direct probe with double BNC connector, available for 100 MHz & 10 MHz range.
	NN-23	Direct probe with double N coaxial connector, available for 100, 2700 MHz range.
	NB-24	N coaxial connector to BNC connector adapter.
	UPCB-0202	Isolated RS232 cable.
Remark	Spec. tested under the environment RF Field Strength less than 3 V/M & frequency less than the 30 MHz only.	

2-2 Table for Resolution & Sample Time

Range	Gate Time Select	Resolution	Sampling Time
10 MHz	FAST	10 Hz	0.5 SEC
	SLOW	1 Hz	1.25 SEC
	SLOW (select 1)	0.2 Hz	6 SEC
	SLOW (select 2)	0.1 Hz	11 SEC
100 MHz	FAST	100 Hz	0.75 SEC
	SLOW	10 Hz	6 SEC
	SLOW (select 1)	20 Hz	5 SEC
	SLOW (select 2)	50 Hz	1.5 SEC
2700 MHz (2.7 GHz)	FAST	1000 Hz	0.5 SEC
	SLOW	100 Hz	2.75 SEC
	SLOW (select 1)	200 Hz	1.5 SEC
	SLOW (select 2)	500 Hz	0.75 SEC

3. FRONT PANEL DESCRIPTION



Rear Panel

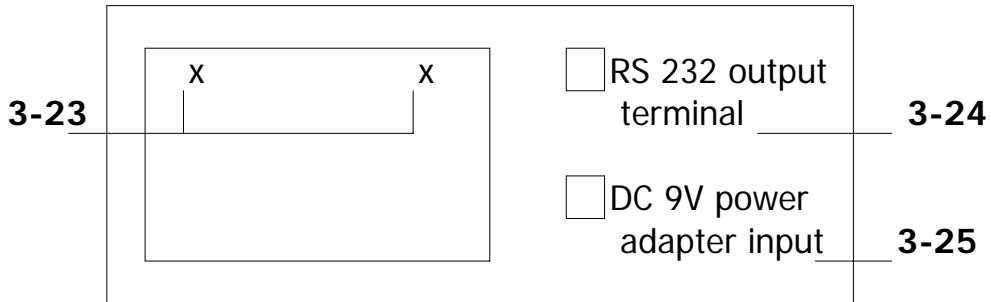


Fig. 1

- 3-1 Display
- 3-2 10 MHz (LF, Channel A) input, BNC Socket
- 3-3 100 MHz (RF, Channel B) input, N type Socket
- 3-4 2700 MHz (RF, Channel C) input, N type Socket
- 3-5 Handle
- 3-6 RECORD Button (Memory Record)
- 3-7 RECALL Button (Memory Data Call)
- 3-8 HOLD Button (Data Hold)
- 3-9 REL. Button (Relative Measurement)
- 3-10 RESO. Button (Resolution selecting)
- 3-11 Hz indicator
- 3-12 MHz indicator
- 3-13 Power Switch
- 3-14 Period Switch (Range Switch)
- 3-15 10 MHz Switch (Range Switch)
- 3-16 100 MHz Switch (Range Switch)
- 3-17 2.7 GHz Switch (Range Switch)
- 3-18 FAST/SLOW Switch (Gate Time Switch)
- 3-19 10 MHz range Sensitivity Switch
- 3-20 100 MHz range Sensitivity Switch
- 3-21 2.7 GHz range Sensitivity Switch
- 3-22 Gate Indicator
- 3-23 Battery Cover Screws/Battery Compartment
- 3-24 RS232 output Terminal
- 3-25 AC/DC 9V Adapter Socket

4. MEASURING PROCEDURE

4-1 Frequency Measurement

- 1) Push the " Power Switch " (3-13, Fig. 1), all the display segments will bright then show 0 or some random values. Now the instrument is ready for measurement.

Considering :

** If no signal input (or short circuit), for " Period Range " the display will show " --- oL --- "*

** If no signal input (or short circuit), for " 10 MHz Range " the display will show " 0 "*

** If no signal input (or short circuit), for " 100 MHz and 2.7 GHz Range " the display will show certain random value due to the environment noise for input circuit, it is normal. However after the signal input, those noise will be suppressed.*

- 2) Push the " Range Switch " (3-15, 3-16, 3-17, Fig. 1) to the " 10 MHz ", " 100 MHz " or " 2.7 GHz " position according to the measurement required.

Considering :

Always to select the suitable range to get high sensitivity & good resolution.

- 3) a. Input the measured signal to Channel A/BNC socket (3-2, Fig. 1) via. BNC cable (optional, PB-21 or BB-22) if the measured frequency is within 10 MHz.
b. Input the measured signal to Channel B/N type socket (3-3, Fig. 1) via N type cable (optional, NN-23) if the measured frequency is within 10 MHz to 100 MHz.
c. Input the measured signal to Channel C/N type socket (3-4, Fig. 1) via N type cable (optional, NN-23) if the measured frequency is within 100 MHz to 2700 MHz.

- 4) According the different input range, select the Sensitivity Switch (3-19, 3-20, 3-21, Fig. 1) to the " HIGH " (high sensitivity) or " NORMAL " (normal sensitivity) position.
- 5) Slide the Gate Time Switch (3-18, Fig. 1) to the " FAST " or " SLOW " position to determine the convenient sampling time & display resolution.
- 6) The display unit is Hz for 10 MHz range. The display unit is MHz for 100 & 2.7 GHz range. The Gate Indicator (3-22, Fig. 1) will be flashed one for each sampling time passed.

Considering :

- * Select to " Gate Time Switch " to " Fast " position normally.
- * If select to " SLOW " position, then push The RESO. button (3-10, Fig. 1) at once 3 times will result 3 kinds Sampling Time & Resolution combination. For more details please see the following table :

Range	Gate Time Select	Resolution	Sampling Time
10 MHz	FAST	10 Hz	0.5 SEC
	SLOW	1 Hz	1.25 SEC
	SLOW(select 1)	0.2 Hz	6 SEC
	SLOW(select 2)	0.1 Hz	11 SEC
100 MHz	FAST	100 Hz	0.75 SEC
	SLOW	10 Hz	6 SEC
	SLOW(select 1)	20 Hz	5 SEC
	SLOW(select 2)	50 Hz	1.5 SEC
2700 MHz (2.7 GHz)	FAST	1000 Hz	0.5 SEC
	SLOW	100 Hz	2.75 SEC
	SLOW(select 1)	200 Hz	1.5 SEC
	SLOW(select 2)	500 Hz	0.75 SEC

4-2 Data Hold Measurement

During the measurement, it will hold the display values, if push the " HOLD Button " (3-8, Fig. 1) at once.

Considering :

- * *When push the HOLD button at once, then the display will show "- - HoLd - -" & holding values alternately.*
- * *It will release the hold function if push the HOLD button at once again.*

4-3 Relative Measurement

- 1) During the measurement, the circuit will memorize the last measured values if push the " REL. Button " (3-9, Fig. 1) at once, then LCD will show "0" & a "REL" marker appear on the right down corner.
- 2) The new measured frequency values will deduct above memorized "last measured values" automatically.
- 3) It will release the Relative Measurement function if push the REL. button at once again, at same time the " REL " marker will disappear.

Considering :

When making the " Data Hold " & " Data Record " measurement, the Relative function is prohibited.

4-4 Data Record(Max., Min., Average reading)

- 1) The DATA RECORD function displays the maximum, minimum and average readings. To start the DATA RECORD function, press the RECORD button once. An " R.C. " marker should appear on the top right corner of the display.
 - a) Push the RECALL button once and "- - - HI - - -" should appear on the display followed in about a second by the maximum reading. The " R.C. " marker will be flashing.
 - b) Push the RECALL button again and "- - - Lo - - -" should appear on the display followed by the minimum reading.
 - c) Push the RECALL button again and "- - - A - - - " should appear on the display followed by the average reading.

The average reading will be continually updated every ten samples.
 - d) Push the RECALL button again will stop the " R.C. " marker from flashing and normal reading will be.

4-5 Period Measurement

- 1) Input the measured signal to Channel A/BNC socket (3-2, Fig. 1) via. BNC cable (optional, PB-21 or BB-22)
- 2) Select the " Period Switch " (3-14, Fig. 1) Select the " 10 MHz range Sensitivity Switch " Switch (3-19, Fig. 1) to the " HIGH " (high sensitivity) or " NORMAL " (normal sensitivity) position.

** To select the " HIGH " sensitivity normally.*

- 3) Slide the Gate Time Switch (3-18, Fig. 1) to the " FAST " or " SLOW " position to determine the convenient sampling time & display resolution.

** To select the " FAST " gate time normally.*

Consideration :

- a. *The input frequency range for period function is from 10 Hz to 10 MHz.*
- b. *The display will show 5 digits then following the unit :
"-S" represent milli-seconds
"uS" represent micro-seconds.*
- c. *The principal of period display is calculated from the measured frequency (Hz), the formula are following :*

$$\frac{1000 \text{ mS}}{\text{period (mS) frequency (Hz)}}$$

$$\frac{1000000 \text{ uS}}{\text{or period (uS) frequency (Hz)}}$$

- d. *The period range accuracy are based on the digit no. + 1 (max. 5 digits) of measured frequency.
For example if measured frequency is 615 Hz (3 digits), then the period values accuracy will be on the leading four digits (1.626 mS).*
- e. *If no signal input (0 Hz), the display will show over range (---oL---).*

4-6 Over Range Indicator

The display will show the over range indicator "---oL---" along with the " BI BI ... " sound, if

- a. Input signal frequency over 10 MHz for 10 MHz range.
- b. Input signal frequency over 500 MHz for 100 MHz range.
- c. Input " 0 Hz " for the period range.

5. REPLACEMENT OF BATTERY

1) If the meter used the battery power source, when the display values flashed, it is necessary to replace the batteries.

3-23 Battery Cover Screws/Battery Compartment

2) Loose the Battery Cover Screws (3-23, Fig. 1), take the battery cover away from the instrument and remove the batteries.

Replace with 6 x 1.5 V AA (UM-3) batteries and reinstate the cover.

3) Make sure the battery cover is secured with the screws after changing battery.

6. RS232 PC SERIAL INTERFACE

The instrument features an RS232 output via 3.5 mm Terminal (3-24, Fig. 1).

The connector output is a 13 digits data stream which can be utilized to the user's specific application.

An RS232 lead with the following connection will be required to link the instrument with the PC serial input.

Meter (3.5 mm jack plug)	PC (9W 'D" Connector)
Center Pin.....	Pin 4
Ground/shield.....	Pin 2
	2.2 K resistor
	Pin 5

The 13 digit data stream will be displayed in the following format :

D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

Each digit indicate the following status :

- D0 End Word = 0D
- D1 & D8 Display reading, D1 = LSD, D8 = MSD
 For example :
 If the display reading is 1234, then D8 to D1 is :
 00001234
- D9 Decimal Point(DP), position from right to the left
 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP
- D10 Polarity 0 = Positive 1 = Negative
- D11 & D12 Annunciator for Display
 MHz = 67 KHz = 33 Hz = 31
 m Sec = 74 u Sec = 75 Sec = 76
- D13 1
- D14 4
- D15 Start Word = 02

RS232 FORMAT : 9600, N, 8, 1