

**3 MHz Function generator  
Counter with Power Supply  
SM5076 & SM5076-1**

**User Manual**

**scientific**

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## 3 MHz Function generator Counter with Power Supply SM5076 & SM5076-1

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## 3 MHz Function generator Counter with Power Supply SM5076 & SM5076-1

- Frequency Range 0.3 Hz to 3 MHz
- 15MHz Frequency Counter
- Waveforms : Sine, Square, Triangle, DC
- Digital Frequency Readout
- DC-Offset Adjustment
- Internal Sweep and External FM modulation
- Square Wave Risetime Typ. 70 ns
- Counter Sensitivity 50 mV (rms)
- 2 x 15 V/ 1 A, 5 V/ 1 A DC Power Supply
- 3 digit switchable, simultaneous display for voltage & current (SM5076-1)

The new **SM5076 & SM5076-1** includes Function generator, Frequency counter and DC power supply. The function generator features high signal purity and constant amplitude flatness over entire range. Output waveforms are Sine, Square and Triangular.

An auto ranging frequency counter is included to measure the frequency of unknown signal. The measured frequency is displayed on 5 digit LED display. Frequency counter features 50 mVrms sensitivity with adjustable trigger level to ensure stable measurement.

A dual DC power supply of 2×15 V and 5 V, 1 A makes it an ideal test bench instrument for your lab applications.

# Technical Specifications

## Operating Modes

**Function Generator** : Sine, Square, Triangle, DC, Free running, internal sweep or external frequency modulation, with or without DC offset

**Frequency Counter** : Internal / External, Auto ranging

**DC Power Supply** : 1 x 5 V/1 A, 2 x 15 V/ 1 A isolated DC power supply

## Function Generator

**Frequency Range** : 0.3 Hz to 3 MHz

**Frequency Stability** : < 0.5% / hr or 0.8% / 24 hr at constant ambient temperature (medium position of frequency control)

## Waveform Characteristics

**Sinewave Distortion** : 0.3 Hz - 100 kHz : max. 0.5 %

0.1 MHz-0.5 MHz : max. 1.5%

0.5 MHz - 3 MHz : max. 3%

**Square Wave Risettime** : typ. < 70 ns

**Overshoot** : < 5%

**Triangular non-linearity** : < 1 % (up to 100 kHz)

**Frequency Display Accuracy**: Up to 3 Hz :  $\pm (1\% + 3 \text{ D})$

3 Hz - 3 MHz :  $\pm (5 \times 10^{-5} + 1 \text{ D})$

**Output** : (short-circuit-proof)

**Output Voltage** : 10 Vpp into 50  $\Omega$  , max. 20 Vpp open circuit

**Attenuation** : max. 60 dB, 2 steps : 20 dB  $\pm$  0.2 dB each  
Variable : 0 to 20 dB

**Amplitude Flatness** : (sine/triangle)

0.3 Hz - 0.3 MHz : max.  $\pm$  0.2 dB

0.3 MHz - 3 MHz : max.  $\pm$  0.5 dB

**Output Impedance** : switchable 50  $\Omega$  / 600  $\Omega$

**DC Offset** : Variable offset range : max.  $\pm$  2.5 V into 50  $\Omega$  ,  
max.  $\pm$  5 V open circuit

**Trigger Output** : Square Wave synchronous to signal output, TTL > 4 Vpp

**FM Input** : (VCF BNC connector on rear panel)

**Frequency Change** : 1 : 100 approx.

**Input Impedance** : 50 k $\Omega$  || 25 pF

**Input Voltage** :  $\pm$  30 V max.

**Internal Sweep** :

**Sweep Speed** : 20 ms to 4 s

**Sweep Range** : approx. 1 : 100

## **Frequency Counter**

**Frequency Range :** 10 Hz to 15 MHz

**Accuracy :**  $\pm(5 \times 10^{-5} + 1D)$

**Input Sensitivity :** 50 mV<sub>rms</sub>

**Max. Input Voltage :** 150 V<sub>rms</sub>

**Input Impedance :** 1 M $\Omega$  || 50 pF

## **DC Power Supply**

**Output voltage :** 2 $\times$ 15 V, 1 A, Adjustable from 2 to 15 V

+ 5 V, 1 A, Adjustable from 4.5 to 5.5 V

All supplies isolated from ground

**Output current :** 1 A each

**Regulation :**  $\pm 1\%$

**Ripple and Noises :**  $\leq 10$  mVrms

Overload indication is provided. Outputs are short circuit protected.

## **General Information**

**Display :** 4 digit for Function Generator and 5 digit for Frequency Counter, 0.5", 7segment LED display. 3 digit switchable, simultaneous display for voltage & current (SM5076-1)

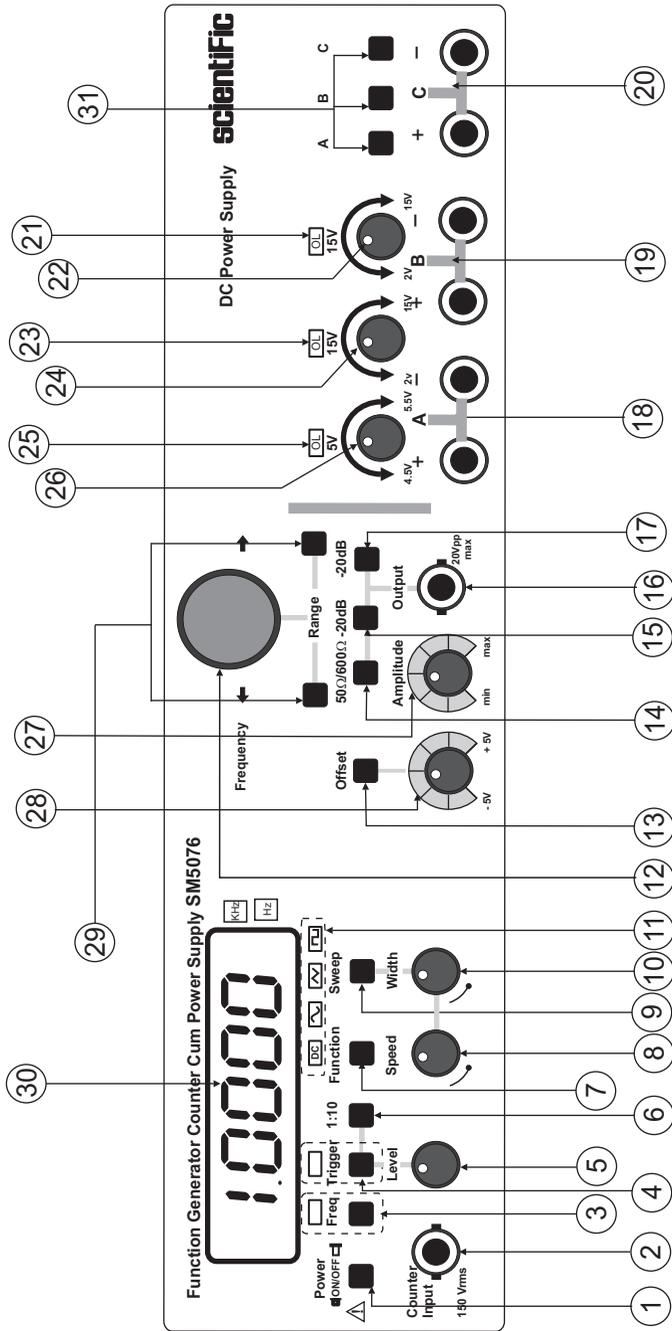
**Supply :** 230V  $\pm 10\%$ , 50 Hz (100/120/220/240 V available on request)

**Operating Conditions :** 0 to 50°C, RH 95%

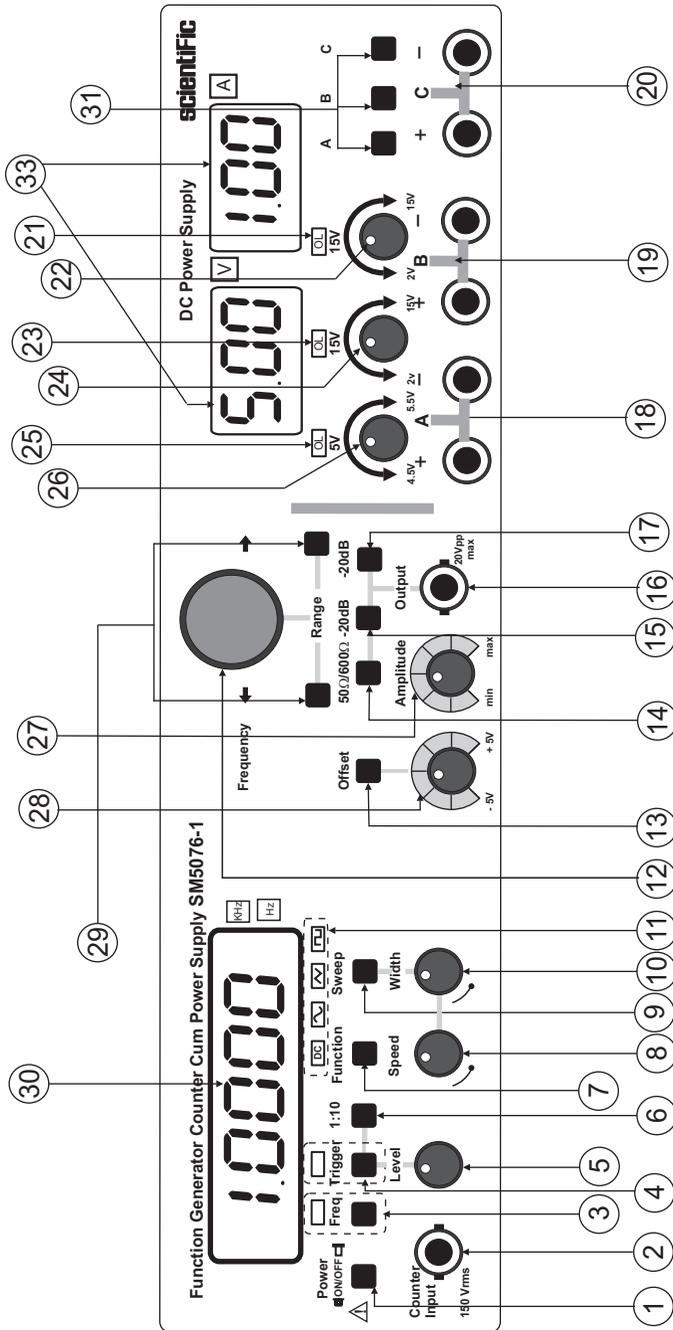
**Dimensions :** W:285, H:75, D:365 (mm)

**Weight :** 4.5 kg (approx.)

# Front Panel Control SM5076



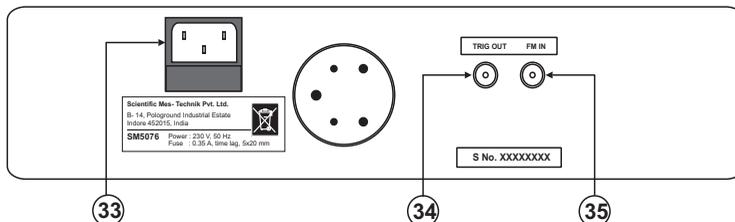
# Front Panel Control SM5076-1



- ① **Power**: Push button switch for supplying power to instrument.
- ② **Counter In** (BNC Connector) : Input to frequency counter.(Max 150 Vrms)
- ③ **FC** (push button) : If pressed, instrument reads frequency at the input of “EXT-IN” BNC connector. LED will lit when FC is selected.
- ④ **Trigger** (push button) : If pressed, the trigger level of counter can be adjusted with the help of “LEVEL” rotary knob ⑤. LED is lit if instrument is triggered.
- ⑤ **Level** (adjusting knob): Rotary knob to set the trigger level of the frequency counter.
- ⑥ **1:10** (push button): If pressed, the input signal to frequency counter ⑦ is attenuated 10 times.
- ⑦ **Function** (push button): Mode selection switch to select the output of function generator (DC-Sine-Triangular-Square)
- ⑧ **Speed** (adjusting knob) : Rotary knob to set the wobulation speed.
- ⑨ **Sweep** (push button): Activates the internal sweep.
- ⑩ **Width** (adjusting knob) : Rotary knob to set the wobulation width.
- ⑪ **LED Indicators** : Group of LEDs indicating the selected waveform available at the output of function generator.
- ⑫ **Frequency** (adjusting knob) : Rotary knob for continuous, linear fine adjustment of frequency, overlapping the ranges selected with ⑬.
- ⑬ **OFFSET** (pushbutton): Activates the offset function.
- ⑭ **50Ω/600Ω** (push button): Push button switch to select output impedance.
- ⑮ ⑰ **-20 dB** (push buttons) : 20 dB fixed attenuators. When both attenuator pushbuttons are activated, a total attenuation of 40 dB results. Including the amplitude control ⑱ the max. attenuation amounts to 60 dB (factor 1000).
- ⑯ **Output** (BNC connector) : Short-circuit-proof signal output of the generator. The output impedance is 50Ω /600Ω, and the max. output amplitude is 20 V<sub>pp</sub> (o.c.) or 10 V<sub>pp</sub> respectively when terminated with 50Ω.
- ⑰ **“A”** banana terminals : Output terminals of 5 volt DC power supply.
- ⑱ **“B”** banana terminals : Output terminals of 15 volt DC power supply.

- ②① “C” banana terminals: Output terminals of 15 volt DC power supply.
- ②①②③②⑤ **OL (LED)**: LED Indicators for respective power supplies indicating Overload.
- ②② **Adjusting knob** : Rotary knob to set the output of 15 V Variable DC power supply from 2 V to 15 V.
- ②④ **Adjusting knob** : Rotary knob to set the output of 15 V Variable DC power supply from 2 V to 15 V.
- ②⑥ **Adjusting knob** : Rotary knob to set the output of 5 V Variable DC power supply from 4.5 V to 5.5 V.
- ②⑦ **Amplitude** (adjusting knob) : Continuous adjustment of the output amplitude from 0 to -20 dB.
- ②⑧ **Offset** (adjusting knob) : Adjustment of the positive or negative offset voltage. This DC voltage can be superimposed on the output signal. The max. offset voltage is  $\pm 5$  V (o.c.) or  $\pm 2.5$  V respectively when terminated with 50 W .
- ②⑨ **Frequency** (2 push buttons) : Frequency range selection from 0.3 Hz to 3 MHz in 7 decade steps.
- ③① **Digital Display** (7-segment LED) : 5-digit frequency counter. LED indicators for Hz and kHz.
- ③① **Push Button A , B & C** : Pushbutton for switching the power supply among A, B or C .
- ③② **Digital Display** (7-segment LED) : Each 3-digit LED display for displaying voltage & current.(SM5076-1)

### Rear Panel Controls



- ③③ **AC Mains** : Mains input for Function Generator , 230V  $\pm$  10% , 50 Hz, **Fuse**: Mains Fuse , a spare fuse is kept inside.
- ③④ **TRIG OUT** (BNC output) : Trigger output, synchronous to the Function Generator output is available.
- ③⑤ **FM IN** (Input BNC) : Terminal for input for Frequency modulation.

# Operating Instructions

## General Information

The logical front panel layout of **SM5076 & SM5076-1** ensures rapid familiarization with the various functions. However, even experienced operators should not neglect to carefully read the following instructions, to avoid any operational errors and to be fully acquainted with the instrument when later in use.

After unpacking the instrument, check for any mechanical damage or loose parts inside. Should there be any transportation damage, inform the supplier immediately and do not put the instrument into operation.

## Safety

The case chassis and all measuring parts are connected to the protective earth contact of the inlet. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord without a protective conductor.

### **Warning!**

***Any interruption of the protective conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the instrument dangerous. Intentional interruption is prohibited. The mains/ line plug should be inserted before connections are made to measuring circuits.***

When removing the metal case or replacing, the instrument must be completely disconnected from the mains supply. If any measurement or calibration procedures are unavoidable on the opened-up instrument, these must only be carried out by qualified personnel acquainted with the danger involved.

## Operating Conditions

The ambient temperature range during operation should be between +0° to +50°C and should not exceed -40°C or +70°C during transport or storage. The operational position is optional, however, the ventilation holes on the **SM5076 & SM5076-1** must not be obstructed. Prior to calibration a preheat run of approx. 30 minutes is required

## First Time Operation

After unpacking the instrument check for any mechanical damages. The instrument should be plugged in mains-plug of proper mains supply  $230\text{ V} \pm 10\%$ . On switch ON no undue observation should be noticed. Once the instrument is switched ON, the power ON is indicated by lighting of displays.

## Function Selection

The type of output signal is selected with the function selection switch ⑦. A total number of 3 different waveforms - sine, square and triangle are available. The functions are marked with the corresponding symbols. If the "OFFSET pushbutton ⑳ is activated a DC voltage level is supplied by the SM5076 & SM5076-1 or superimposed on the output signal.

## Frequency Adjustment

Coarse adjustment is performed with the range keys ㉑. The desired frequency is selected by turning the FREQUENCY control ㉒. The selected frequency appears on the 5-digit display ㉓. Compared to knob scales, this display has a much higher resolution.

## Output Amplitude And Signal Connection

Adaptation in decade steps to the desired amplitude range is performed by the use of two attenuators with  $-20\text{ dB}$  each, which are activated by pushbuttons. Including the continuously adjust able AMPLITUDE control ㉔, the maximum attenuation amounts to  $-60\text{ dB}$ . With the maximum amplitude of  $10\text{ V}_{pp}$ , the minimum signal voltage to be supplied is about  $10\text{ mV}$ . These values are obtained when the generator output is terminated with  $50\ \Omega$ . In the open-circuit condition, the available signal amplitude is twice as high. Therefore the maximum output voltage of the output socket is specified with  $20\text{ V}_{pp}$ .

If exact square-shaped signals are required, care should be taken that only  $50\ \Omega$  coaxial cables are used. Furthermore, this cable must be terminated with a  $50\ \Omega$  through termination. If these precautions are not observed, overshoot may occur, especially when high frequencies are selected.

If test circuits having a  $50\ \Omega$  input impedance are connected, this termination is not required. In high signal voltage ranges it should be noted that the used terminating resistor must dissipate the corresponding effective power.

## The output terminal of the SM5076 & SM5076-1 is short circuit proof.

If the output of the **SM5076 & SM5076-1** unit comes into contact with components of the circuit under test, which are carrying DC voltage, an isolating capacitor of appropriate dielectric strength should be connected in series with the

output of the generator. The capacitance of this isolating capacitor should be selected in such way that the frequency response of the output signal is not affected over the whole frequency range of the **SM5076 & SM5076-1** unit.

### Trigger Output

In the sine, square and triangle modes, the trigger output (at back panel) supplies a square signal in synchronism with the output signal. An offset voltage adjusted at the 50  $\Omega$  output has no influence upon the trigger signal. The trigger output is short-circuit proof and can drive several TTL inputs.

### Sweep Facilities

#### 1 ) Internal Sweep

The internal sweep facility of the **SM5076 & SM5076-1** allows checking of filters and equipment in the frequency range from 0.3 Hz to 3 MHz. Operation is very easy and is confined to the setting of sweep-speed and sweep-width. Activation is by simply pressing the **SWEEP ON** pushbutton and can be combined with all available functions on the **SM5076 & SM5076-1**. The Stop- frequency is automatically given by the settings of the range selector and the frequency dial and is shown on the 4-digit display. Start frequency is related to the stop-frequency by the sweep-width factor. Latter is set by means of the (Sweep) Width potentiometer and is upto approx.100. The sweep speed is set by means of the (Sweep) Speed potentiometer and ranges from 20 ms to 4 s. For external wobulation please refer to "FM input".

#### 2) FM input

If a positive DC voltage is applied to the FM input on the rear BNC of **SM5076 & SM5076-1**, the generator frequency increases and is accordingly displayed. A negative DC voltage reduces the frequency.

The frequency displacement depends on the value and polarity of the DC voltage U and on the FREQUENCY setting. The set frequency No (DC voltage not included) can be selected at will.

Computation :  $N = N_o + A.U$  or  $U = (N-N_o)/A$

No = digit display without voltage U.

N = digit display including voltage U

U =  $\pm$  voltage at the FM input.

A = 740 (digits per volt).

It should be noted that only the displayed digits are valid; the decimal point is not taken into consideration (e.g. 100.0 1000 digit). The max. frequency (3 MHz) cannot and "000" should not be exceeded. Any zeroes preceding the decimal point are dropped.

**Limits** : If the highest displayed number is N = 3000 and the smallest No = 300,

then U will be +3.6 V max. The frequency increases by a factor of 10. If the smallest displayed number is  $N = 30$  (lower numbers are possible, but inaccurate) and the highest  $N_0 = 3000$ , then U will be -4 V max. The frequency changes by a factor of 100.

The frequency change is linear as a function of the voltage U and has the same value in all ranges.

### DC Offset

When the switch OFFSET <sup>⑬</sup> is depressed, a DC voltage can be superimposed on the output signal. The maximum offset voltage with open output is  $\pm 5$  V.

### Frequency Counter:

**1. Input Signal :** Input signal to the counter is given to EXT IN <sup>②</sup> BNC terminal. The minimum applied signal is 50 mVrms and maximum applicable signal is 150 Vrms.

**2. Trigger :** In normal mode counter is auto triggered. When TRIG <sup>④</sup> switch is pressed, instrument can be triggered externally by adjusting LEVEL <sup>⑤</sup> knob. When instrument is triggered trigger LED is ON.

**3. Attenuator:** The input signal to frequency counter can be attenuated 10 times by pressing 1:10 Switch .

**4. Function Generator/ Counter Mode:** When switched ON the instrument works as a function generator. By pressing FC <sup>③</sup> switch the instrument functions as a Frequency Counter <sup>⑥</sup> .

### DC Power Supply

The SM5076 is equipped with triple power supply isolated from each other. It has 5 V/ 1 A, 2 x 15 V/ 1 A. The power supply is short circuit protected and any overload is indicated by lighting LED indicator.

The 5 V power supply output can be adjusted from 4.5 to 5.5 V, similarly 15 V power supply output is adjustable from 14.5 V to 15.5 V.

For applications where positive and negative voltages are required with a common ground, e.g. in operational amplifiers power supply requirement 15 V power supplies can be used. Negative of one 15 V power supply may be connected with negative of another power supply, will result +ve - GND - -ve.

# Maintenance

There are no user serviceable part inside **SM5076 & SM5076-1**. Your **SM5076 & SM5076-1** 3 MHz Function Generator is thoughtfully engineered for ease of use, accuracy and reliability. The instrument is carefully tested and calibrated using standards traceable to National Laboratories.

Take care of your instrument by cleaning the exterior of the instrument regularly with a dusting brush. Dirt which is difficult to remove on the casing & plastic parts, can be removed with a moist cloth ( 99% water, 1% mild detergent) spirit or washing benzene(petroleum ether) can be used to remove greasy dirt. The display may be cleaned with water or washing benzene (but not with spirit-alcohol solvents), it must then be wiped with a dry clean lint-free cloth. Under no circumstances the cleaning fluid should get into the instrument. The use of cleaning agents can attack the plastic & paint surfaces.

## Power Line Fuse Replacement

The power line fuse is located on rear panel on lower right side. In case, the instrument does not show any sign of working, no LED is lit or there is no display immediately switch OFF the mains power switch of the instrument and unplug the mains cord from the mains socket. With the help of small flat blade screwdriver remove the fuse cap of the fuse holder, located just below the socket. There is one spare fuse kept in the fuse cap, replace it for the defective one. Press the cap so that it locks in place . The rating of the fuse is 350 mA , 250 V , slow blow , 5x20 mm glass fuse. Do not use a fuse with a higher value other wise it may damage the instrument in case, the mains voltage goes much higher than the rating of the mains fluctuation of  $\pm 10\%$ .

## Despatch Procedure for Service

No user serviceable parts are inside the instrument, should it become necessary to send back the instrument to factory for service, please observe the following procedure.

1. Before despatching the instrument please write to us giving full details of the fault noticed.
2. After receipt of your letter our service department will advise you whether it is necessary to send the instrument back to us for repairs or the adjustment is possible in your premises.
3. Despatch the instrument (only on the receipt of our advise) to us at our factory address, securely packed in original packing duly insured and freight paid along with accessories and a copy of the fault details noticed at our Service Center listed on last page of manual nearest to you.

## Warranty Conditions

1. Scientific warrants all its Instruments to be free from defects in material and workmanship when used under normal operating conditions in accordance with the instructions given in the manual for a period of 12 (Twelve) months from date of purchase from Scientific or its authorised dealers. The service during the warranty period will be rendered on return to factory /service centre basis.
2. Its obligation under this warranty is limited to repairing or replacing at its own discretion. This warranty shall not apply to any defect, failure or damage caused by accident, negligence, mis-application, alteration or attempt to repair, service or modify in any way.
3. This warranty does not include LED, fuses, batteries or accessories. This warranty is only valid with the original purchaser who must have properly registered the product within 15 days from date of purchase. No other warranty is expressed or implied.
4. When it becomes necessary to return the instrument to our Factory facility, kindly pack it carefully in the original carton or equivalent and ship it duly insured, transportation charges prepaid.
5. Your Scientific instrument is a complex electronic device and deserves the best service available by technicians thoroughly familiar with its service and calibration procedures.

**Notes:**

**Notes:**

<b>Major Service Centers</b>	<b>Phone / Fax / Email</b>
1. Scientific Mes-Technik Pvt. Ltd., 92, Electronics Complex, Pardeshipura, Indore M. P. 452 010	Ph : (0731) 2309741,2422330-31 Fax :(0731)2422334, 2561641 info@scientificindia.com
2. Scientific Mes-Technik Pvt. Ltd., B-13, D.S.I.D.C Packging Complex Kirti Nagar, New Delhil 110 015	Ph : (011) 65638100, 65638101 Fax:(011)26536298 ndelhi@scientificindia.com
3. Scientific Mes-Technik Pvt. Ltd., NO. 46, 4th Main Cross , MLA Layout, R. T. Nagar, Bangaluru 560 032	Ph : (080) 23437635 Fax:(080)23331478 bangalore@scientificindia.com
4. Scientific Mes-Technik Pvt. Ltd., No. 25 , 2 nd floor, 29 th Cross Street Indira Nagar, Adyar Chennai 600 020	Ph : (044) 24424598 Fax :(044) 24420421 chennai@scientificindia.com
5. Scientific Mes-Technik Pvt. Ltd., Room No. 308, Building No.2, 3rd Floor, Sundar Nagar Co-op. Hsg Society Ltd. Senapati Bapat Marg, Dadar (W) Mumbai 400 028	Ph. :(022) 24211171 Fax :(022)24333654 mumbai@scientificindia.com
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