Impulse Generator SMIMP10.0-10/700



User Manual

scientiFic

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1. Introduction

This Manual describes the operation of the SMIMP10.0-10/700 Impulse Generator. The SMIMP10.0-10/700 is a high-performance Impulse/surge immunity test system from the SMIMP/SMSUG series, designed to evaluate the immunity of electrical and electronic equipment against surge voltages. It is engineered to meet the stringent requirements of the IEC 62368-1 standard, ensuring reliable and consistent testing. It delivers standard-compliant surge pulses of up to 10 kV with a defined 10/700 µs waveform, simulating lightning-induced transients that can affect telecommunication and signal lines. This intelligent lightning Impulse/surge generator features user-friendly controls, advanced programming options, and a 7-inch TFT colour touchscreen for seamless operation.

2. Safety Information



- Before using the SMIMP10.0-10/700 Impulse Generator immunity test system, it is essential to thoroughly read and understand the accompanying user manual. This ensures safe operation, prevents damage to the equipment, and safeguards the operator.
- The safety rules and precautions in the manual need to be observed.
- Scientific and its representatives are not liable for any damage to persons or equipment resulting
 from failure to observe the safety rules and precautions outlined in the manual or from improper
 operation.

2.1. Overview

The SMIMP10.0-10/700 Impulse generator immunity test system is a sophisticated device designed for high-voltage and high-current applications. It is crucial to adhere to the following safety guidelines to ensure the safe operation of the equipment and the protection of users:

General Safety:

- Only qualified and trained personnel should operate or maintain the device.
- Ensure the equipment is installed and operated in compliance with the provided user manual and all applicable safety standards.

Electrical Safety:

- Always ensure the device is properly grounded to prevent electrical shock.
- Before connecting or disconnecting cables, ensure the power supply to the equipment is turned off.
- Avoid contact with live terminals or test points during operation.
- Regularly inspect all cables, connections, and protective systems for damage or wear.

Operational Safety:

- Do not exceed the specified voltage, current, or impedance limits during testing.
- Ensure all test setups are secure and insulated to prevent accidental exposure to high voltage.

Environmental Safety:

- Operate the equipment within the specified ambient temperature range (15°C to 45°C) and humidity (≤ 75%).
- Avoid using the equipment in a damp, dusty, or explosive atmosphere.

Display and Controls:

- Operate the system only via the provided 7-inch touchscreen interface or remote communication interfaces (USB, LAN).
- Do not tamper with internal components or attempt unauthorized repairs.

Emergency Protocols:

- In case of a fault or abnormal operation, immediately turn off the power supply through emergency stop and disconnect the device from the mains.
- Notify maintenance personnel for troubleshooting and repair.

Maintenance:

- Periodically check the device for calibration and ensure it is functioning within the specified parameters.
- Clean the exterior with a dry, non-abrasive cloth. Avoid using solvents or liquids that may damage the device.

Warnings: 🔼



- High-voltage Impulses generated by this device can be lethal. Handle with extreme caution.
- Do not operate the system without a clear understanding of Impulse immunity testing protocols.
- SMIMP10.0-10/700 test system must be used for the purposes specified by the manufacturer.

Adhering to these safety guidelines will help ensure safe and effective operation of the SMIMP10.0-10/700 system while maintaining the integrity of your testing environment.

2.2. Installation

The installation of a 10kV Impulse generator must comply with local regulations and prioritize safety, especially concerning leakage current discharge. Ensure the installation adheres to the local electrical and safety codes, such as IEC standards or national equivalents.

- Always ensure a safety ground is in place. The test system should be connected to a permanently installed or stable grounding cable.
- Avoid sharing the power supply with other high-power devices to prevent electrical interference.
- Install the system in a clean, dry, and well-ventilated area.
- Place the equipment on a stable, level surface, free from mechanical shocks or tilting.
- Maintain a minimum clearance of 50 cm around the unit to allow proper airflow and easy access for operation and maintenance.

- Connect all cables securely, following the guidelines provided in the manual.
- Use only the recommended accessories and connectors to prevent damage or malfunction.
- Double-check polarity and impedance settings before powering on the device.
- Ensure the EUT is securely connected according to the test configuration.

2.3. Execution Alerts and Testing Anomalies

- Always wear appropriate personal protective equipment (PPE) during testing. The test area should be restricted to authorized personnel only and prohibit irrelevant persons.
- The system generates Impulse voltages up to 10 kV and currents more than 200A for very short duration. Direct contact with live components can result in severe injury or death.
- Tests must only be conducted by trained and qualified operators familiar with Impulse/surge testing and high-voltage safety procedures.
- Thoroughly understand the operation and safety guidelines in the manual before initiating any test. The operator needs to do the test according the standards.

2.4. Usage Precautions and Considerations

- Do not touch the cables, connectors, or EUT during the test.
- Be prepared to use the emergency stop function if a hazardous situation arises.
- Continuously observe the system's indicators and the EUT's response during the test. Stop the test immediately if abnormal behaviour is observed.
- Do not stand close to the EUT or the surge generator while the test is in progress.
- Do not touch the ground reference during the test. Some tests that meet the standard will be conducted with a ground reference, and high voltage may couple to this reference, making it dangerous to touch the ground reference.

2.5. Potential Hazards Associated with EUT (Equipment Under Test)

Surge immunity testing with the SMIMP10.0-10/700 can expose the Equipment Under Test (EUT) to high voltages and currents. Improper handling, configuration, or setup can lead to dangerous situations. The user needs to know the follow dangerous notes:

- The high voltage (up to 10 kV) and current (up to ±250 A) applied during testing can exceed the EUT's design limits, causing component failure, overheating, or even permanent damage.
- Surge exposure can cause temporary or permanent malfunctions, such as loss of functionality, data corruption, or unexpected behaviour.
- Backup any critical data or settings on the EUT before testing. Isolate non-essential systems to prevent cascading failures.
- A poorly grounded EUT can create leakage currents, leading to electric shocks or erratic test

results. Ensure the EUT is securely grounded and the grounding path is consistent with the system's requirements.

- Surges can generate EMI, which might disrupt nearby electronic devices or systems. Perform
 the test in a controlled environment, ideally in a shielded area, to limit EMI effects on surrounding
 equipment.
- Components like capacitors, batteries, or sealed devices in the EUT may rupture or explode under high voltage or current stress. Remove or bypass components prone to explosion, or use dummy loads for initial testing.
- Failure of the EUT during a test can result in hazardous debris, sparks, or exposed high voltage.
 Maintain a safe distance from the EUT during testing and wear appropriate personal protective equipment (PPE).
- General Safety Measures:
 - Verify the EUT is properly configured and securely connected to the surge generator.
 - Conduct pretest evaluations to identify potential vulnerabilities in the EUT.
 - Use a protective enclosure or barriers for the EUT during high-risk tests.
 - Monitor the EUT's performance in real-time and terminate the test if abnormal behaviour is detected.

3. Specifications:

3.1. Technical Specifications

Technical Specifications	SMIMP10.0-10/700	
Output Voltage	0.5 - 10kV	
Waveform parameter of Open-circuit voltage	Rise time: 10µs ±30%; Duration: 700µs ±20%, Voltage range: ±0.5 to ±10kV ±10%	
Surge polarity	Positive/ Negative / Alternate	
Surge count	1 - 9999	
Surge interval	(5 – 9999s) ^a	
Display Screen	7 Inches TFT colour touch screen	
Mains supply	AC 230V, ±10%, 50 Hz / 60 Hz	
Communication	USB & LAN	
Ambient Temperature	15°C to 45°C	
Relative Humidity	≤ 75%	

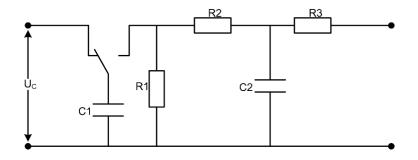
Note:

a) A surge interval of 5 seconds is applicable only up to 1 kV. For surges above 1 kV and below 3 kV, a minimum interval of 30 seconds is recommended. For surges 3 kV and above, it is compulsory to maintain a minimum surge interval of 60 seconds.

3.2. Component specifications

The list of Component used in the waveform generation for the SMIMP10.0-10/700 Impulse Generator, as per IEC 62368-1 and associated circuit diagram is given below:

C1	R1	R2	R3	C2
20µF	50Ω	15Ω	25Ω	0.22µF



4. Front and Rear Panel Overview

4.1. Front panel of SMIMP10.0-10/700 Impulse Generator

Illustrated below is the front panel of the SMIMP10.0-10/700, showcasing its thoughtfully arranged controls and display for streamlined operation.



- 1) HV Indication lamp: The red LED illuminates to indicate that the HV surge is active in the system. It is a visual warning for user safety during surge operation.
- 2) Touch screen panel: Displays all functions and parameters and allows for setting all parameters from this interface.
- 3) Mains ON/OFF switch: The Mains ON/OFF switch is used to control the power supply to the system, allowing users to turn the mains power on or off. The inbuilt LED glows when turned on
- 4) Emergency Stop button: Press the emergency stop button in case of an emergency or hazardous situation. An emergency stop is a safety mechanism designed to immediately halt machinery or processes in the event of an emergency to prevent harm or damage.
- 5) Impulse Output Sockets: HV and COM (Common) terminals for applying surge impulse to the Device Under Test (DUT). It provides the connection interface between the impulse generator and the device under test. These sockets surge pulses to be coupled onto the DUT. This output is also used for waveform verification, allowing connection to an oscilloscope or measurement probe to observe and validate the impulse waveform (e.g., 10/700 μs) as per standard requirements.

- 6) Capacitor output voltage: HV and COM terminals for monitoring of charged capacitor voltage. Can be used for external measurements.
- 7) U_{Impulse} (Impulse voltage monitoring): The Impulse voltage waveform can be monitored through this port during the surge test to observe and analyse the surge behaviour.

4.2. Rear panel of SMIMP10.0-10/700 Impulse Generator



- 1) USB port: The USB communication port for remote control Operation. (Optional).
- 2) LAN port: The LAN communication port for remote control Operation/Data interface. (Optional).
- 3) DIP Switch: The 10-position DIP switch provides manual configuration for various internal settings of the surge generator. Each switch (S1 to S10) can be toggled ON or OFF to enable or disable specific functions, such as coupling path presets, communication settings, or service modes.
- 4) Fan Ventilation: Fan ventilation refers to the system of fans used to ensure proper airflow and cooling in equipment, preventing overheating and maintaining optimal operating temperatures during testing or operation.
- 5) Mains Input ON/OFF: The Mains ON/OFF switch is used to control the power supply to the system, allowing users to turn the mains power on or off.
- 6) Mains Input: The mains input is the primary power entry point for the surge generator system.

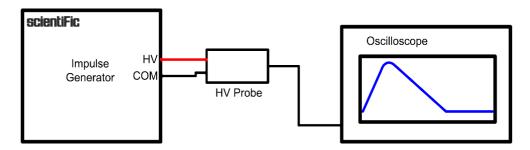
 The main power cord connects to this port, which is integrated with a mains filter to suppress electrical noise and ensure electromagnetic compatibility. The system supports both AC 220V

at 4A and AC 110V at 8A input, allowing for flexible operation in different regions. For safety and overcurrent protection, the input is fused with two 4A slow-blow (time delay) fuses—one each for the line (L) and neutral (N) connections. These fuses are part of the mains filter module and help protect against internal faults or abnormal conditions. Always ensure that the correct input voltage is supplied and disconnect power before replacing fuses or performing maintenance.

7) Earthing Connection: The Earth connection is essential during testing to ensure safety. The back panel features this connection, allowing it to be linked to the ground reference for proper grounding during the test.

5. Test Setup

• The Test Setup for Waveform Verification for the SMIMP10.0-10/700 Impulse Generator is illustrated below. This setup ensures that the impulse waveform (10/700 μs) is correctly measured and verified as per IEC 62368-1.



- To perform a compliant and safe test using the SMIMP10.0-10/700, follow the below setup procedure:
 - 1. **Placement**: Install the impulse generator on a non-conductive, stable surface.

2. Connections:

- Connect the DUT between the Impulse Output HV and COM terminals.
- Optionally connect the **Uimpulse** BNC output to an oscilloscope (1000:1 probe ratio recommended).
- 3. Power Supply: Plug in the mains cable and switch ON using the Mains ON/OFF key.
- 4. **Grounding**: Ensure the protective earth terminal is securely connected.

5. Configuration:

- Use the touchscreen display to set:
 - Surge voltage
 - Polarity
 - Trigger mode (Auto/manual)
 - Number of surges
 - Interval time

6. Test Area:

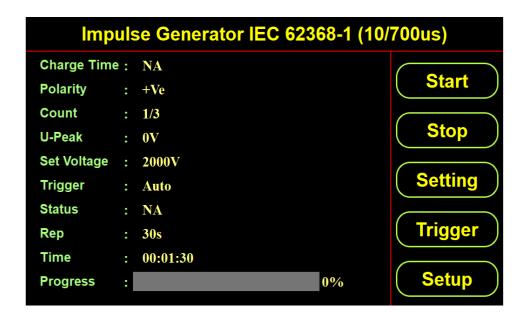
- Ensure the test area is clear of unauthorized personnel.
- Place warning labels or barriers if required.

7. Safety Verification:

- Verify all connections.
- Confirm emergency stop function is operational.

6. Display Interface and Operational Settings

6.1. Impulse Main Page



The impulse main page shows the selected parameters and other real time running status while execution of surge sequence

Charging Time: It displays the duration required to charge the high-voltage capacitor to its

specified voltage level, ensuring readiness for surge testing or energy discharge

operations.

Polarity: Indicates whether the surge voltage applied during testing is positive or negative,

simulating real-world surge events to evaluate the Equipment Under Test under

both polarities.

Count: It Indicates the number of surge pulses applied out of the total set for the test,

where the first value shows the completed surges, and the second value

represents the total surges planned.

U-Peak: Represents the peak voltage of the surge applied during testing, measured in

volts (V), indicating the maximum instantaneous voltage reached in the surge

waveform.

Set Voltage: The predefined voltage level configured for the surge test, determining the

amplitude of the surge applied to the Equipment Under Test (EUT).

Trigger: Refers to the method or condition used to initiate the surge or test sequence,

such as "Auto," "Manual," or "External," determining how the test system is

activated.

Status: It indicates the current state of the surge test, such as "Charging," "Ready,"

"Paused," or "Processing," providing real-time feedback on the progress and

outcome of the surge pulses applied to the Equipment Under Test (EUT).

Rep: The time gap between each surge pulse during a test (set by user), typically

measured in seconds (s). It determines how frequently the surge pulses are spaced, impacting the testing duration and stress on the Equipment Under Test

(EUT).

Time: The overall duration of the testing sequence, calculated based on the repetition

interval and the total number of surge pulses applied, etc.

Progress: A visual indicator that displays the completion status in percentage of the test

sequence, typically showing the proportion of surges applied or the elapsed time

relative to the total test duration.

Start: A control function that allows the user to both begin and temporarily pause the

test sequence, providing flexibility to start or halt the application of surge pulses

or testing procedures as needed.

Stop: A control function that halts the test sequence, stopping the application of surge

pulses or any ongoing testing processes to the Equipment Under Test (EUT).

Setting: Refers to the configuration options or parameters within the test system that allow

users to adjust test conditions, such as voltage, coupling, surge count, and other

relevant settings before starting the test.

Trigger: A function that allows the user to initiate a surge pulse manually at the desired

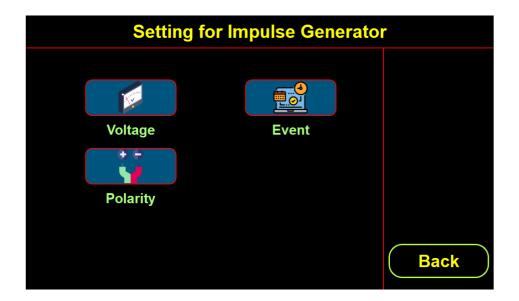
moment, providing control over the timing of the surge application during testing

Setup: Includes configuring various test parameters such as performing a factory reset,

enabling or disabling EUT protection, adjusting delay settings, and other system-

specific configurations to ensure the test system is properly prepared for testing.

6.2. Surge Setting



Voltage : Refers to the conf

: Refers to the configuration of the specific voltage level to be applied during the test. This setting determines the voltage range or value that the Equipment Under Test (EUT) will be subjected to for testing purposes.

Events

: Includes configuring the trigger mode selection (e.g., manual, automatic, or external), defining the surge count (the number of pulses), and setting the interval time in seconds (the time gap between each surge pulse) to customize the test sequence.

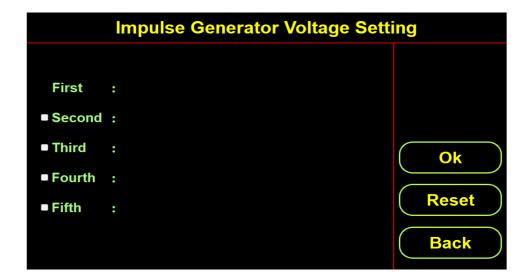
Polarity:

It allows the selection of the surge pulse polarity, typically choosing between Positive, Negative or Positive/Negative polarity, to simulate different surge conditions and assess the Equipment Under Test (EUT) under both scenarios.

Back:

Refers to a control option that allows the user to return to the previous menu or screen in the test system interface, typically used to navigate through settings or options.

6.3. Surge Voltage Setting



In this page it allows configuration of up to five voltage levels, with the first level being compulsory and the remaining four optional for user. The voltage levels can be set from 500V to 10000V to apply different impulse voltage amplitudes during the test.

First: The compulsory initial voltage setting in the impulse voltage configuration, this

level typically sets the baseline surge voltage by user, with values ranging from

500V to 10000V.

Second: The optional voltage setting for the second impulse voltage level, which can be

selected after setting the first level. It typically allows for fine-tuning the surge voltage to higher values, within the range specified by the test standard. It is

activated by checking the box on the left.

Similarly, the **Third, Fourth, and Fifth** Levels are optional voltage settings that allow for fine-tuning the surge voltage. Each level provides flexibility to adjust the surge voltage between the initial and maximum allowable values, helping to meet specific test requirements, with the fifth level typically reaching up to the system's maximum limit of 10000V

OK: A button that, when clicked, confirms and displays the selected voltage settings,

ensuring the chosen voltage levels are applied and displayed in the test system

interface.

Reset: A control function that restores the voltage settings to their default or initial values,

clearing any custom configurations and preparing the system for a new test or

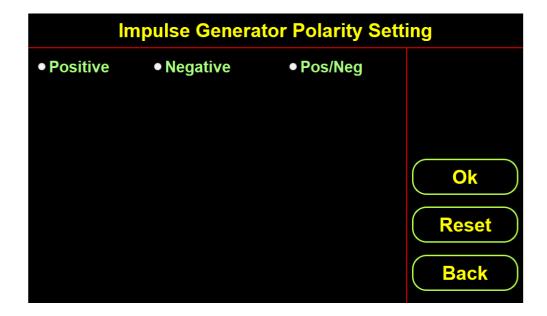
operation.

Back: Refers to a control option that allows the user to return to the previous menu or

screen in the test system interface, typically used to navigate through settings or

options.

6.4. Surge Polarity Setting



This setting allows the selection of the polarity for the surge pulses, with options including:

- Positive: Impulse pulses with positive polarity.
- Negative: Impulse pulses with negative polarity.
- Pos/Neg: Impulse pulses with both positive and negative polarities, alternating between the two.

OK: A button that, when clicked, confirms and displays the selected polarity settings,

ensuring the chosen polarity is applied and displayed in the test system

interface.

Reset: A control function that restores the polarity settings to their default or initial values,

clearing any custom configurations and preparing the system for a new test or

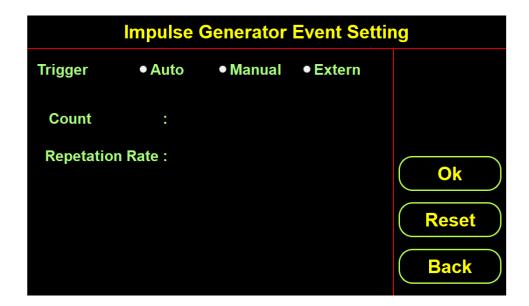
operation.

Back: Refers to a control option that allows the user to return to the previous menu or

screen in the test system interface, typically used to navigate through settings or

options.

6.5. Surge Event Setting



This setting allows the configuration of impulse pulse events, including the selection of trigger modes, the number of surge events (count), and the interval time between events. It defines how surge pulses are applied during testing, ensuring the test sequence meets specific requirements.

Trigger:

This setting determines the method used to initiate the surge pulses, with the following options:

- Auto: The surge pulses are triggered automatically based on predefined conditions or settings.
- Manual: The surge pulses are triggered manually by the operator when needed through trigger button on surge main page.
- Extern: The surge pulses are triggered by an external signal or event, allowing integration with other systems for synchronization.

Count:

This setting specifies the number of surge pulses to be applied during a test. The user can define the total number of surge events, allowing for precise control over the duration and intensity of the surge testing. The count can typically be set from 1 to 9999.

Repetition Rate: This setting allows the user to define the time gap between each surge pulse during a test, typically measured in seconds (s). It determines how frequently the surge pulses are spaced, impacting both the testing duration and the stress applied to the Equipment Under Test (EUT). The user can set the interval time from 5 second to 9999 seconds. (*Note: Refer to recommended repetition setting in section 3 technical specification)

OK: A button that, when clicked, confirms and displays the selected polarity settings,

ensuring the chosen polarity is applied and displayed in the test system interface.

Reset: A control function that restores the polarity settings to their default or initial values,

clearing any custom configurations and preparing the system for a new test or

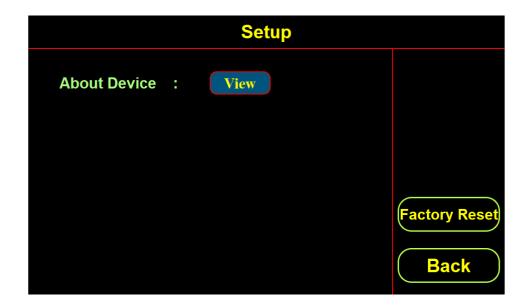
operation.

Back: Refers to a control option that allows the user to return to the previous menu or

screen in the test system interface, typically used to navigate through settings or

options.

6.6. Surge Other Setup



Refers to the configuration and initialization of various parameters for the surge testing system. It includes settings such as factory reset and device details to ensure proper functioning and safety during testing.

About Device:

Clicked on view, this section provides detailed information about the Impulse testing device, including its model number, firmware version, serial number, hardware version, etc. It serves as a reference for system identification and support.

Factory Reset:

This option restores the device to its original factory settings, erasing all userconfigured parameters and returning the system to its default configuration. It is typically used to troubleshoot issues or prepare the device for a fresh setup.

Back:

Refers to a control option that allows the user to return to the previous menu or screen in the test system interface, typically used to navigate through settings or options.

7. Error and Warning

• The interval between two consecutive impulses should be atleast 60s at 3kV and above as per standard IEC62368-1. If the interval between two consecutive Impulses at 3kV and above is less then 60s then the error message will be displayed prompting the user to increase the repetition rate atleast 60s. This ensures proper operation and prevents configuration errors during testing.

8. Maintenance

The SMIMP10.0-10/700 units are precision instruments that require careful handling and have no user-serviceable parts inside. The device is thoroughly tested and calibrated with standards traceable to National Laboratories. To ensure safety and prevent electrical shock, users must not remove the cover, as high-voltage points are present on the internal PCB circuitry.

For maintenance or operational queries, contact Scientific Customer Support or the nearest authorized dealer. The units do not require user calibration during their operational lifetime. If internal faults occur, only qualified and trained technicians familiar with potential hazards should handle them. For power supply failures, repairs or servicing must be carried out exclusively by the manufacturer or authorized service facilities, as no user replaceable parts are provided. Routine maintenance includes only external cleaning.

Regularly dust the exterior with a brush, and use a moist cloth (99% water, 1% mild detergent) for stubborn dirt. Greasy dirt can be cleaned with spirit or petroleum ether (washing benzene). Avoid letting cleaning fluids seep into the instrument, and note that some cleaning agents may damage plastic and painted surfaces.

Power Line Fuse Replacement

The power line fuse is located on rear panel on the main socket. 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 above the mains socket. Then replace the defective one. Turn the cap so that it locks in place. The rating of the fuse is 4A, 250 V, slow blow, 5x20 mm glass fuse for Surge Generator. Do not use a fuse with a higher value otherwise it may damage the instrument in case, the mains voltage goes much higher than the rating of the mains fluctuation of + 10%.

9. Dispatch procedure for service, E-Waste Management & warranty

9.1. Dispatch 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:

Before Before dispatching the instrument please write to us at following link giving full details of the fault noticed. https://www.scientificindia.com/services-support/service-request

After receipt of your communication, 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.

 Dispatch the instrument (only on the receipt of our advice) securely packed in original packing duly insured and freight paid along with accessories and a copy of the faults details noticed at our Service Centre or factory.

9.2. E-Waste

We support environmentally sustainable measures and solicit your cooperation in this endeavour by way of sending the equipment to us at the end of the life of the product. The equipment will be sent for recycling through authorised recyclers as per E-Waste Management Rules. Please write to us at support@scientificindia.com for this purpose. Your support will go a long way as each and everybody's action can lead to improve global environment.

9.3. Warranty conditions

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 authorized dealers.

The service during the warranty period will be rendered on return to factory / service centre basis.

- 1. 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, misapplication, alteration or attempt to repair, service or modify in any way.
- This warranty does not include display, 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.
- 3. 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.
- 4. Your Scientific instrument is a complex electronic device and deserves the best service available by technicians thoroughly familiar with its service and calibration procedures.