

**Sciencetech Arc Lamp System:  
500-200 Series Power Supply,  
500-IG Ignitor,  
&  
201 Series Lamp Housing**

**User's Manual**

**Version 4.3**

**Sciencetech Inc.**

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## **1. INTRODUCTION**

Sciencetech 201 Series Arc Lamp System produces bright output UV-VIS-IR. The spectral output approximately follows a black body of 5800 K with spectral picks of fill gases.

It can be operated in a horizontal or vertical position (although this sometimes depends on lamp type; some lamps cannot be operated horizontally).

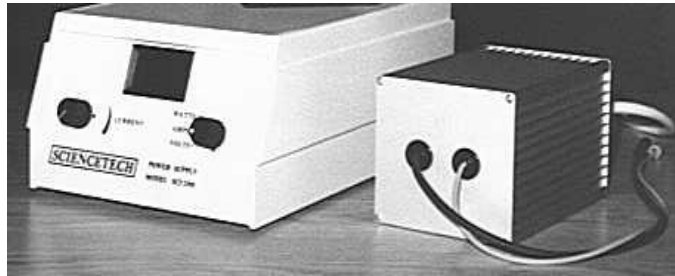
Sciencetech 201 Series Arc Lamp System is designed for arc lamps of 50 – 250 W: Xenon or Mercury Xenon. The light source includes lamp, socket, back reflector, housing.

All housings are alignment adjusted before shipment.

Sciencetech offers DC stabilized power supplies with current regulation. Current regulated power supplies are excellent for radiometer applications.

**Please read this manual completely before operating the unit.**

## **2. POWER SUPPLY AND IGNITOR**



The Sciencetech 500-200 series of power supplies deliver power for lamps up to approximately 250 W. The power supply is a constant current unit, and the power is not the parameter being controlled. They can drive lamps with a voltage of up to approximately 30V and a current of up to 10A. A digital LCD display located on the front panel indicates current, voltage, or power delivered to the lamp. These power supplies are fully adjustable and offer a protected output against short circuit or abnormal operating conditions.

Sciencetech 500-200 series power supplies automatically select the appropriate voltage for the lamp. The power of the lamp is adjusted by means of varying the current. These power supplies offer highly stable and reliable DC “current regulated” output.

A double voltage regulation mechanism produces excellent current regulation: an SCR controls the voltage on the main storage capacitors; a linear regulator does the final electrical polishing. With this setup, the voltage across the regulating transistor is maintained at approximately 1.5V independently of the lamp operating voltage and set current.

This novel line of power supplies are designed to provide the advantages of both linear and pulsed power supply operation: low noise as in a linear supply and low electrical dissipation at the same order as pulsed supplies. The current regulation is actually even better than in standard linear power supplies because the regulation transistor always operates at the same voltage and, therefore, can be better optimized than one that has to perform under widely variable conditions. AC input and DC output are fully isolated.

Model 550-200 is a power supply for air-cooled housing. The 550-200 power supply has electrical specifications similar to model 500-200, but also provides power and connections for the lamp housing with fan. It has a safety interlock that allows power to the housing only if the fan cable is connected. It is also capable to work at either 115V or 230V ac input voltage.

### 3. POWER SUPPLY SPECIFICATIONS

<b>Models 500-200, 550-200</b>	
<b>Input:</b>	110-115 Vac or 220-230 Vac (selectable), 50 to 60 Hz
<b>Power:</b>	0-approx. 250W
<b>Operating Voltage:</b>	0-approx. 30 V
<b>Operating Current:</b>	0-10 A (max. current range +/- 5%)
<b>Pre-Ignition Voltage:</b>	> 80 V
<b>Ripple at Maximum Current:</b>	< 1 mV
<b>Stability after Warm-Up:</b>	0.05%
<b>Line Voltage Regulation:</b>	0.02% current variation for 5 V line change
<b>Display:</b>	digital LCD
<b>Optical Feedback:</b>	all units with connection at back for optional feedback system
<b>Dimensions:</b>	5.8" x 9.5" x 14.4" (12.9 cm x 20.9 cm x 31.7 cm)
<b>Weight:</b>	9.86 kg
Additional Exclusive Features of 550-200 (Air cooled housing): <ul style="list-style-type: none"> <li>• fan power supply and cable</li> <li>• safety interlock</li> </ul>	
<b>Input Voltage Supply Line:</b>	36 V on, < 32 V off
<b>Nom. Ignition Voltage:</b>	20 kV
<b>Dimensions:</b>	4.8" x 5.0" x 7.6" (10.5 cm x 10.9 cm x 16.8 cm)
<b>Weight:</b>	1.04 kg

## **4. SHIPPING AND UNPACKING**

### ***4.1 Unpacking***

The instrument is packaged in such a way as to minimize damage during transport. If the package is damaged or if after unpacking any signs of damage become apparent, a claim should be filed with the carrier immediately.

If the instrument must be returned, contact Sciencetech Inc. for approval prior to shipping. A full description of the reason for return should be included.

Inspect the exterior of the monochromator for any noticeable defects. If any are present, contact Sciencetech Inc. immediately.

The lamp uninstalled before shipment. The cathode lead is under the anode base plate.

### ***4.2 Included Components***

The packing box should contain the following components:

- Sciencetech arc lamp housing
- Sciencetech arc lamp power supply
- Sciencetech igniter with cables
- Power supply cable
- Interlock/fan cable
- Requested lamp

To prevent damage during shipment the arc lamps are shipped in a separate box and must be installed before operating the unit.

## 5. LAMP HANDLING AND WARNING

**<!> WARNING <!>**

**Before servicing the lamp housing be sure to disconnect the electrical connections and completely drain the cooling system (if water cooled). Make certain the lamp is at room temperature. Also remember to wear eye protection when working around arc lamps. Follow the manufacturer's general information sheets for handling and operating the bulb.**

### *5.1 Arc Lamps*

**Note: Lamps purchased directly from other manufacturers may not meet our specifications for operation and may cause permanent damage to the housing and to the reflector. Use of such lamps will void the warranty.**

**<!> WARNING <!>**

**Arc lamps can be used for a MAXIMUM of 1000 hours. Exceeding 1000 hours can cause damage to the quartz bulb and may result in explosion of the lamp.**

The gases inside arc lamps are under extreme pressure, especially during operation (from 10 atmospheres for large lamps, up to 30 atmospheres for small lamps). Therefore the lamp housing must be closed at all the times in operation. Furthermore, precautions must be taken to ensure protection from ultra-violet radiation emissions. Special storage cases are provided to eliminate possible hazards during shipping and handling. **Safety goggles and soft cotton gloves should be worn when removing and installing lamps. Never touch the quartz envelope with bare hands; such handling may lead to the deterioration and premature failure.** If accidentally handled, clean the lamp surface with an alcohol swab to remove any residue.

**<!> WARNING <!>**

**Never look directly at an operating lamp; severe eye injury will result. Wear UV protective lenses, such as welder's goggles, when working on or around lamps.**

## 5.2 Mechanical Handling

A short arc high-pressure xenon lamp is used. The arc lamps are extremely robust. They must withstand the mechanical stresses exerted by their heavy electrodes – especially the anode, which can weigh up to 400g – and the high internal pressure of up to 30 bar (even more in low-wattage lamps). However, they are still made of glass and need to be handled accordingly; in other words they must be protected against shock, impact and excessive force. Certain precautions must be observed when handling them.

Arc lamps are supplied in a safety cover. This protects users from possible spontaneous or induced bursting of the lamp. There is enough energy stored in the lamp bulb to send quartz splinters flying several meters across a room.

**When the lamp is installed, its safety cover must not be removed until after it has been fitted in the lamp housing and shortly before the housing is closed.** It goes without saying that **you should wear protective goggles or complete face protection covering the arteries and veins of your neck, such as a transparent plastic mask.** If the design of the lamp housing does not permit the lamp to be fitted together with its safety cover, it should be wrapped in strong cloth.

In some types of lamps the safety cover acts a tool for screwing the lamp into its holder at the cathode end. **Under no circumstances must force be exerted on the lamp during installation.** For example, screwing in the cathode base by holding and turning the lamp at its anode base is grossly negligent.

The lamp may only be clamped in position at one end in order to allow for expansion and distortion of the housing. Small (short) lamps can be left free and unsupported at the other end. Larger (longer) lamps must have a soft, flexible support, which calls for a mechanical solution. It should support the lamp but allow unrestricted expansion, including expansion perpendicular to the lamp axis.

Lamps may only be stored if suspended freely from their bases in their safety covers. Leaving them to roll around unprotected on a desk or shelf can result in microcracks in the surface of the quartz glass, causing lamps to burst later on.

**If the lamp is inadvertently operated inside its safety cover the sleeve will melt within a few seconds and the lamp will be unusable.**

When removing lamps the reverse procedure must be followed: first put the safety cover on the lamp, then remove the lamp.

Similar precautions must be observed for connecting arc lamps electrically as for handling them mechanically. **All electrical connections must fulfill the criteria for high-current**

**connections.** Connecting components must be clean and offer the maximum contact area. In cases of doubt, it is better to recondition or preferably replace the contacts rather than risk lamp failure due to corroded and overheated contacts. In most cases good electrical contact is synonymous with good thermal contact to dissipate the heat produced by the lamp.

**Care must be taken to ensure that the lamp is connected with correct polarity; the positive pole of the rectifier must be connected to the base marked (+), the negative pole to the base marked (-). Incorrect polarity results in total lamp failure within a few seconds; the cathode fuses over immediately as a result of being overloaded while acting as the anode.**

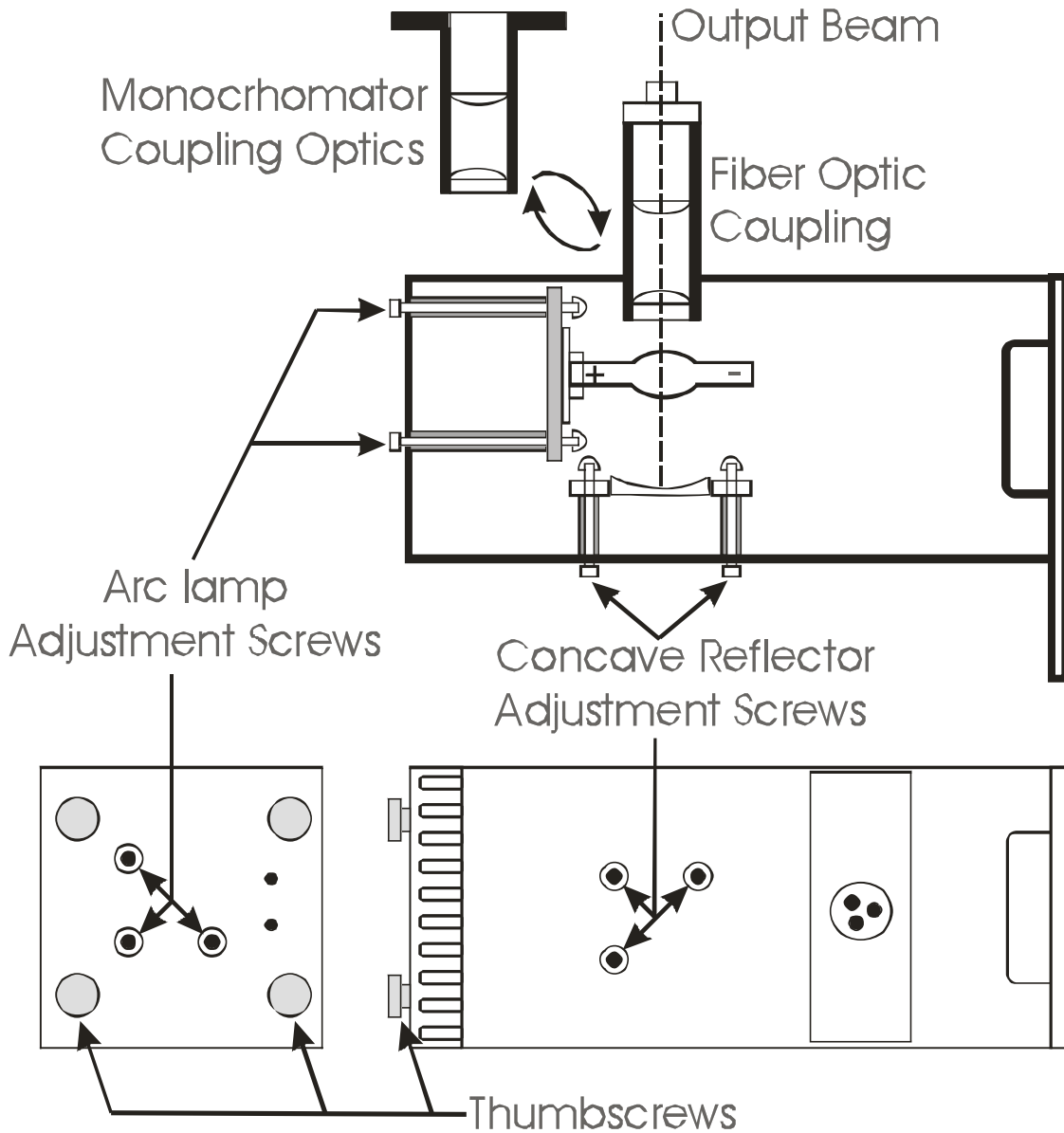
**Arc lamps must only be held by the base. Damage to the glass may cause the lamp to break during later operation.**

If the quartz bulb or the shafts should ever be inadvertently touched with bare fingers (which should never happen because unprotected lamps should only ever be handled with soft cotton gloves), the fingerprints must be removed immediately. A lint-free moistened cloth is best for this, after which the lamp should be rubbed dry, taking care not to scratch the quartz glass surface. If fingerprints are not removed they burn into the quartz glass surface where they act as a seed for ever-expanding recrystallization of the glass. This causes the glass to lose its strength and increases the risk of bursting.

## 6. BULB INSTALLATION PROCEDURE

### 6.1 Xenon and Mercury Xenon Lamp Installation

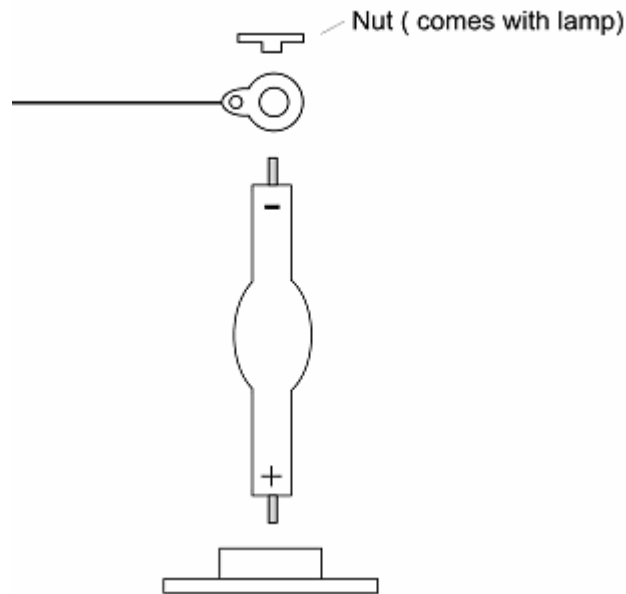
(1) Remove the four thumbscrews on the TOP of the lamp housing (see diagram below).



*Fig. 1*

(2) Very carefully pull the top off of the lamp housing (being VERY gentle if a lamp is already installed).

- (3) (REFER TO SECTION #4 FOR PROPER HANDLING OF ARC LAMP)
- (4) Install the lamp by screwing anode (+) into the brass base. Hold the lamp by anode base.
- (5) Attached the cathode connector with the wire lug (*refer to Fig. 2*)



**Fig. 2**

- (6) Screw the nut hand-tight. Support the lamp cathode base against the turn so that no stress is transferred to the glass.
- (7) Ensure PROPER POLARITY of the lamp (i.e. RED to ANODE and BLACK to CATHODE).
- (8) CAREFULLY replace the top panel of the lamp housing and ENSURE that nothing comes into contact with the internal mirror.
- (9) Align the lamp using the following alignment procedure (also see Fig. 1):

## **6.2 Lamp Alignment Procedure**

Place the lamp on a flat surface before aligning the bulb and reflector. Also, remove the coupling optics casing from the lamp housing before realigning the lamp.

### **6.3.1 Bulb Alignment**

Align the bulb using the 3 bulb alignment screws on the back of the lamp housing. (see Fig. 1) When turning the adjustment screws make only progressive  $\frac{1}{2}$  turns on each of the screws at a time before adjusting the other screws in a like manner. This will keep all screws properly aligned and will avoid swaying the lamp from side to side, which could damage the lamp or jam the adjustment mechanism.

Adjust the bulb so that the lamp center point (between electrodes), when viewed from the coupling optics output window, is in the center of the window both horizontally and vertically.

### **6.3.2 Reflector Alignment**

Align the reflector using the 3 reflector alignment screws on the side of the lamp housing. (see Fig. 1) When turning the adjustment screws make only progressive  $\frac{1}{2}$  turns on each of the screws at a time before adjusting the other screws in a like manner. This will keep all screws properly aligned and will avoid jamming the adjustment mechanism.

Adjust the reflector so that the reflection of the lamp center is aligned with the actual lamp center (between electrodes) when viewed from the coupling optics output window. Also ensure that the arc size matches that of the reflection in the elliptical reflector. If the arc size reflection is larger than the actual arc size then the mirror is too close to the bulb. If the arc size reflection is smaller than the actual arc size then the mirror is too far from the bulb.

## 7. OPERATING PROCEDURE FOR THE POWER SUPPLY/IGNITER/ARC LAMP SYSTEM

Before operating the system one has to make the proper connections between the power supply (PS), igniter, and lamp housing units. First, connect the igniter to the PS (yellow bulky cord). Next, connect the two HV connectors of the igniter to the lamp housing, black plug to black socket, red plug to red socket. Finally, connect the fan cord between the PS, and the lamp housing assembly. This cable incorporates an interlock, which will prevent the power supply from being powered on without lamp being connected. ***IMPORTANT: ensure the lamp fan is operating whenever lamp is on!***

The voltage selector is adjacent to the ON/OFF switch on the rear panel of the PS. It will show “115” or “230” depending on setting. Ensure that the voltage setting is correct for the intended line voltage, verify that the unit is OFF, and then connect the power cord to the PS. Finally, plug the other end of the power cord to the line outlet. Always keep PS, optical feedback unit, computer, if any, as far from the igniter as possible, to limit the undesirable effects of arc lamp ignition. Also make sure that the Optical Feedback unit and the PC, if any, are turned off during the lamp ignition. The interference caused by HV pulses used during ignition may harm those devices. User may safely turn them on after the lamp has successfully ignited and stabilized, which usually takes 10-20 seconds.

Set the current control knob about  $\frac{3}{4}$  of maximum CW (clock-wise) position (some power supplies have a dot sticker indicating preferred starting position for the lamp being shipped with the order), and attempt to ignite the lamp by switching on the PS using main power switch on the back of the unit. The igniter will generate several HV pulses in an attempt to ignite the lamp. If the lamp does not ignite, increment the knob clock-wise (approximately 20 degrees) and repeat the procedure until successful ignition results. It is preferable to ignite the lamp at lower power setting, since this reduces the magnitude of potential HV spikes and reduces wear on the unit. Immediately after successful ignition bring the power up to the desired operating level (for maximum operating parameters (power, current) refer to the lamp spec sheet).

NOTE: After the successful ignition, if for any reason lamp current has to be decreased, the user has to know that if the current goes down below the value necessary for sustaining the arc, the lamp will turn off. Then, if desired, it needs to be restarted in the way described above ie. turn the PS off, set the current control knob to starting position, and turn the PS on.

The power supply display will not be operational during, and for a few seconds after, the ignition. This is normal. However if after ignition you notice erratic behaviour of the display (it may display 1 followed by 2, and 3, or 2, 4, 6 etc.) or no display at all, please turn the system off, wait a few seconds and attempt the ignition again. Do not operate the power supply if the display is not working properly.

**LAMP POWER-OFF PROCEDURE:**

1. With the lamp operating at desired power level, quickly turn the current control knob to minimum (CCW). This will stop the current flow through the lamp, and will switch off the lamp.
2. Do not turn off the main POWER SWITCH!!! This will make the lamp cooling fan (which is power from the PS) operate and cool the lamp to safe, low temperature after the experiment.
3. After the lamp cooled down (approx. 10 minutes, and not less than 5 minutes) switch the PS off.

## **8. OPTIONS AND ACCESSORIES**

### ***Fiber Optic Adapter***

This attachment allows the lamp to be coupled to a fiber optic cable, which will transmit the output light to the sample or detection system.

### ***Monochromator Mounting Adapter***

This attachment allows the lamp to be directly mounted to the input window of a monochromator. The arrangement of the 4 mounting screws is a 40mm x 52mm rectangle (width x height) with screws at each corner.

### ***Focusing Optics (Quartz or Glass)***

This optical arrangement allows the output light to be focused on a target 30 mm from the edge of the output window.

### ***Collimating Optics (Quartz or Glass)***

This optical arrangement produces a collimated beam of light. The beam size can be either 25.4mm (1") or 50.8mm (2") in diameter.

### ***Quartz Lenses***

Quartz lenses are used for transmission of light with wavelengths above 250 nm.

### ***Glass Lenses***

Glass lenses are used for transmission of light with wavelengths above 375 nm.

### ***Achromatic Condensers***

This optical arrangement is used for visible wavelengths of light. It uses 25.4 mm (1") diameter optics.

## **9. IMPORTANT NOTICE**

All electrical instruments may be dangerous if not handled in accordance with proper instructions and common precautions. Sciencetech Inc. will not be responsible for any damage caused by such units if instructions herein are not followed and repairs are not attended to or performed by company-trained or licensed personnel. All instruments should be operated with proper grounds on power line and should not be opened or handled as to electrical or electrically operated components without being switched off and disconnected from power receptacle.

Sciencetech Inc. reserves the right to make adjustments or improvements in its product without notice and without obligation to subsequent purchasers and without being required to make corresponding changes or improvements in products theretofore manufactured and sold.

We have done our very best in the manufacture and packing of this material. The transportation carrier is now responsible for delivering it to you in its original good condition, since all purchases are FOB London.

If the shipment is NOT delivered in good order and in accordance with quantity shown on Bill of Lading or Packing Slip, have the shortage or damage noted by the Carrier on both the delivery receipt and the freight bill, or by special form provided by United Parcel or the Post Office.

The Interstate Commerce Commission has ruled that Transportation Companies will not honor any losses or shortage claims unless exceptions are noted on the freight bill at the time of delivery. It is the buyer's responsibility to make a complete inspection immediately upon receipt of purchased goods.

If you accept shipment from the Transportation Carrier short of what is enumerated on the Bill of Lading – or in damaged condition – without having proper notation made by the Carrier, you do so at your own risk.

If bundles or crates are in apparent good order, but on opening contents are found to be damaged, call Carrier for adjuster to view same and have the Transportation Company/United Parcel/Post Office mark the freight bill or packing slip relative to such concealed damage. Make your claim at once for the Transportation Company/United Parcel/Post Office has a limited time for presentation of claims.

We are willing to assist you in every possible manner in collecting claims for loss or damage on this shipment, but this willingness on our part does not make us responsible for filing or collecting claims or replacing materials. Claims for Loss or Damage on shipment may not be deducted from our invoice, nor pay of the invoice withheld awaiting adjustment of such claims, as we cannot guarantee safe delivery.

**Important:** Do not return goods without written authority.

Contact factory for return material authorization.

Returned goods will not be accepted by us from the Transportation Company/United Parcel/Post Office unless written authorization has been issued by Sciencetech Inc.

Return of special or non-stock items cannot be authorized. Credit for goods returned - under authorization - will depend on the value to us based on our selling price, less a fair charge to cover the expense of shipping - re-handling - transportation - refinishing, etc, providing material is received in good condition - transportation charges prepaid - credit rendered to be used against future purchases.

All equipment manufactured by Sciencetech Inc. has been subjected to extensive performance and quality control testing. In order to constantly improve our product, we ask your assistance. Upon installation of our equipment, please fill out the attached card and return to us.

By completing the card and returning it to Sciencetech, you will register your instrument in warranty and enable us to provide you with the best possible service.

## **10. WARRANTY AND ASSISTANCE**

All Sciencetech products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, or, in the case of certain major components listed in the operating manual, for the specified period. Products sold or resold, but not manufactured by Sciencetech, carry the warranty, if any of the original manufacturer. We will repair or replace products that prove to be defective during the warranty period or employ our best efforts to effect repair or replacement of equipment sold, but not manufactured, by Sciencetech. No other warranty is expressed or implied.

We are not liable for consequential damages.

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