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R E M O T E

2010/3010/5010/5100

Operating Manual

Lighthouse Worldwide Solutions

***REMOTE 2010/3010/5010/5100 Airborne Particle
Counter***

Operating Manual

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Lighthouse Part Number 248083200-1 Rev 5



EU DECLARATION OF CONFORMITY

Manufacturer's Name Lighthouse Worldwide Solutions, Inc.

Manufacturer's Address: Lighthouse Worldwide Solutions, Inc.
1221 Disk Drive
Medford, OR 97501

Declares that the product:

Product Name: Remote Airborne Particle Counter
Model Number(s): REMOTE 2010/3010/5010/5100

Conforms to the following Product Specifications:

<u>SAFETY</u>	EN61010-1:2001	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part I: General Requirements IEC 61010-1:2000
	CAN/CSA C22.2 No. 1010.1-1992	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part I: General Requirements
<u>LASER SAFETY</u>	IEC 60825-1 Am. 2 IEC 60601-2-22 (Laser Notice 50)	Guidance on Laser Products: Conforms to FDA 21 CFR Chapter I Subchapter J
<u>EMC</u>	EN61326	Electrical Equipment for Measurement, Control and Laboratory Use EMC Requirements Part I: General Requirements Includes Amendment A1:1998; IEC 61326:1997 + A1:1998

UL 61010A-1 – UL Standard for Safety Electrical Equipment for Laboratory Use; Part I: General Requirements.
Replaces UL 3101-1

Supplementary information: The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC amended by Directive 93/68/EEC and the EMC Directive 89/336/EEC amended by Directive 93/68/EEC, and carries the CE marking accordingly.

A handwritten signature in black ink, appearing to read "W L Shade".

Fremont, CA, May 15, 2007

William L. Shade – V.P. Engineering

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About this Manual

This manual describes the detailed operation and use of the Lighthouse Remote 2010, 3010, 5010 and 5100 Airborne Particle Counters.

Text Conventions

The following typefaces have the following meanings:

WARNING: A
*warning appears in a
paragraph like this one.
A warning tells you that
doing something
incorrectly could lead to
loss or improper storage
of data. A warning
paragraph is boxed and
begins with "Warning" in
boldface.*

<i>italics</i>	Represents information not to be typed or interpreted literally. For example, <i>file</i> represents a file name. Manual titles are also displayed in italics.
boldface	Introduces or emphasizes a term.
<code>Courier font</code>	Indicates command syntax or text displayed by the diagnostic terminal.
Bold Courier	Indicates commands and information that you type. You can use uppercase or lowercase letters; in this manual, commands are shown in uppercase.
<i>Helvetica Italics</i>	Indicates a comment on a command or text output.

Additional Help

For more information about Lighthouse Remote 2010/3010/5010/5100 Airborne Particle Counters, contact Lighthouse Worldwide Solutions.

www.golighthouse.com
techsupport@golighthouse.com

Sales & Support (800) 945-5905
Outside the USA (541) 770-5905

1 General Safety

Safety Considerations

Warnings and cautions are used throughout this manual. Familiarize yourself with the meaning of a warning before operating the particle sensor. All warnings will appear in the left margin of the page next to the subject or step to which it applies. Take extreme care when doing any procedures preceded by or containing a warning.

There are several classifications of Warnings defined as follows:

- Laser - pertaining to exposure to visible or invisible laser radiation
- Electrostatic - pertaining to electrostatic discharge

Laser Safety Information

This product contains a laser-based sensor that is a Class 1 product (as defined by 21 CFR, Subchapter J of the Health and Safety Act of 1968) when used under normal operation and maintenance. Service procedures on the sensor can result in exposure to invisible radiation. Service should be performed only by factory-authorized personnel.

The particle counter has been evaluated and tested in accordance with EN 610109-1:1993, "Safety Requirements For Electrical Equipment for Measurement, Control, and Laboratory Use" and IEC 825-1:1993, "Safety of Laser Products".

WARNING: *The use of controls, adjustments, or performance of procedures other than those specified within this manual may result in exposure to invisible (infrared) radiation that can quickly cause blindness.*



Figure 1-1 Warning label on unit

For further technical assistance, contact our Technical Support Team at (800) 945-5905.

Electrostatic Safety Information

WARNING: *Using a wrist-strap without an isolation resistor will increase the severity of an electrical shock. Use of control or adjustment or performance of procedure other than specified here may result in hazardous radiation exposure.*

Electrostatic discharge (ESD) can damage or destroy electronic components. Therefore, all service or maintenance work should be done at a static-safe work station. A static-safe work station can be created by doing the following:

- Use a grounded conductive table mat and resistor-isolated wrist-strap combination
- Earth-ground all test instruments to prevent a buildup of static charge

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Introduction

Overview

This operating guide introduces you to the Lighthouse REMOTE 2010/3010/5010/5100 Airborne Particle Counter family. Also included in this guide are instructions for inspecting, using, and maintaining the instrument. Any changes of instrument operation due to design changes are covered at the back of this guide.

Description

The 2010 instrument is manufactured to count particles at 0.2 micron at 0.1 CFM. The 3010 model counts particles at 0.3 micron at 0.1 CFM. The 5010 model counts particles at 0.5 micron at 0.1 CFM and the 5100 model counts particles at 0.5 micron at 1.0 CFM.

This instrument is effective in both ultra-clean areas (such as Class 1 or Class 10) and also in more traditional cleanzones rated as Class 100 or higher. Refer to Specifications in this manual for additional instrument information.



Figure 2-1 REMOTE 2010 Airborne Particle Counter

The particle counter uses a laser diode light source and collection optics for particle detection. The collection optics collect and focus light scattered by the particles onto a photo diode that converts the bursts of light into electrical pulses. The pulse height is a measure of particle size. Pulses are counted and their amplitude is measured for particle sizing.

The REMOTE 2010/3010/5010/5100 line of Airborne Particle counters was created for continuous operation 24 hours per day, 7 days per week.

Using an external vacuum source, the instrument provides versatile mounting options and can be installed where space is at a premium. The REMOTE 2010/3010/5010/5100 integrates seamlessly with large facility monitoring/management systems and transfers up to 2 channels of simultaneous particle count data using Pulse Output.

Accessories

You can order several accessories to tailor the instrument to your needs. These accessories are listed below.

- **Isokinetic Sampling Probe 0.1 CFM (for 2010, 3010 and 5010)**
- **Isokinetic Sampling Probe 1.0 CFM (for 5100)**
- **Sample Tubing**
- **Cabling**
- **0.2µm Purge Filter Assembly 0.1 CFM or 1.0 CFM Flow Rate with Tubing**
- **Vacuum tubing per foot**
- **Cable per foot**

REMOTE Specifications

Size Range	0.2 - 10.0 µm
REMOTE 2010 Channel Thresholds:	0.2, 0.5µm
REMOTE 3010 Channel Thresholds:	0.3, 0.5 µm
REMOTE 5010 Channel Thresholds:	0.5, 5.0 µm
REMOTE 5100 Channel Thresholds:	0.5, 5.0 µm
	Other sizes available; specify at time of order
REMOTE 2010 / 3010 / 5010 Flow Rate	0.1 CFM (2.83 LPM)

Table 2-1 Specifications

REMOTE 5100 Flow Rate	1.0 CFM (28.3 LPM)
Counting Efficiency	50% (per JIS)
Laser Source	Laser Diode
Zero Count Level	<1 count/5 minutes (per JIS)
Vacuum Requirements	External Vacuum >18" (45.72 cm) of Hg
Calibration	NIST Traceable
Communication Modes	Pulse Output
Supporting Software	Lighthouse Monitoring System
Enclosure	Stainless steel
Power	9-24 VDC
Dimensions: 2010	1.7" (L) x 4.2" (W) x 3" (H) [4.3 x 10.7 x. 7.6 cm]
Dimensions: 3010 / 5010	1.7" (L) x 4.2" (W) x 2.5" (H) [4.3 x 10.7 x. 6.3 cm]
Weight: 2010	14 oz (0.40 kg)
Weight: 3010 / 5010 / 5100	12.5 oz (0.35 kg)
Operating Temp/RH	50° F to 104° F (10° C to 40° C) / 20% to 95% non-condensing
Storage Temp/RH	14° F to 122° F (-10° C to 50° C) / Up to 98% non-condensing

Table 2-1 Specifications

Calibration

The manufacturer recommends that your Lighthouse instrument be calibrated annually by a Certified Lighthouse Service Provider, in order to ensure that your unit continues to perform within specification.

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Getting Started

Unpacking and Initial Inspection

The instrument is thoroughly inspected and tested at the factory and is ready for use upon receipt.

When received, inspect the shipping carton for damage. If the carton is damaged, notify the carrier and save the carton for carrier inspection. Inspect the unit for broken parts, scratches, dents, or other damage. Verify the contents of the package against the packing list.

If the carton is not damaged, keep for reshipment when you return the instrument for the annual factory calibration.

Shipping Instructions

Should it become necessary to return the unit to the factory for any reason, be sure to contact Customer Service and obtain a Return Merchandise Authorization (RMA) number. Reference this number on all shipping documentation and purchase orders. After receipt of the return number, follow the shipping instructions provided below:

1. Use the original container or carton and packing materials whenever possible.
2. If the original container and packing materials are not available, wrap the unit in "bubble pack" plastic; surround with shock-absorbent material and place in a double-wall carton.
3. Seal container or carton securely. Mark "FRAGILE" and enter Return Merchandise Authorization (RMA) number in any unmarked corner.
4. Return to the address instructed by your Lighthouse representative.

Operation

Interpreting Indicators

Both front-panel indicators have a specific meaning when illuminated. The figure below shows location of the indicators and gives a brief description of their meaning.

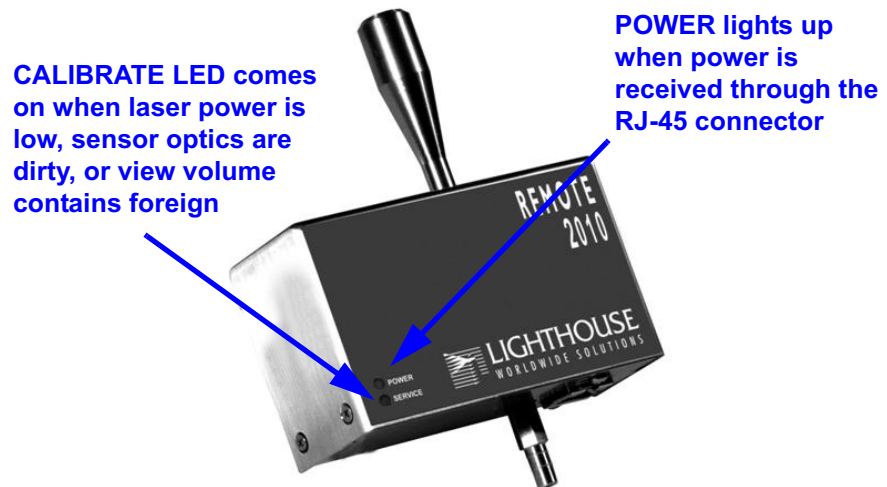


Figure 3-1 Front Panel Lights

Connections

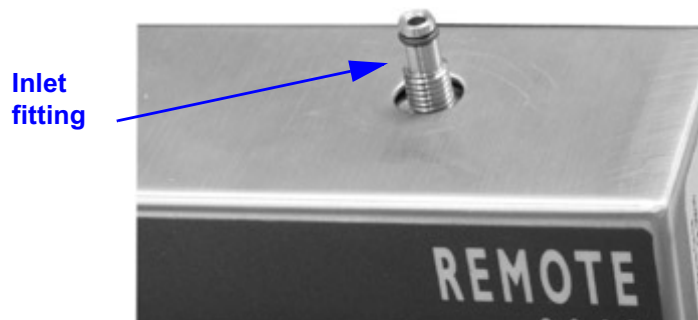


Figure 3-2 Connections on top of instrument

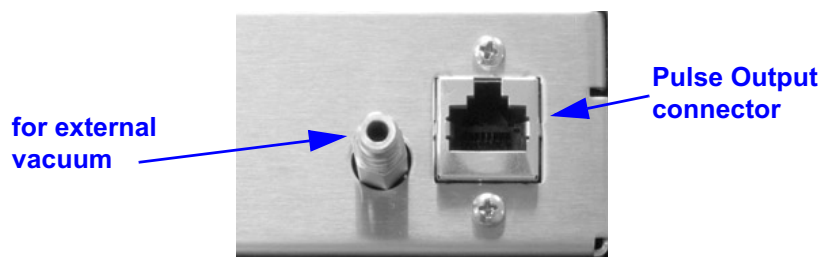


Figure 3-3 Connections on bottom of instrument

Installation

Your instrument(s) can be easily prepared for use by performing the steps below. Depending on the unit's output, each instrument can be located up to 1000 feet (330 meters) from the counting device.

1. Locate instrument(s) in areas to be sampled.
2. Attach barbed fitting to top inlet.



3. Attach sample tubing to barbed (top) fitting.



Figure 3-4 Attach sample tubing to inlet

4. Attach tubing from external vacuum source to the barbed fitting on the bottom of the unit.

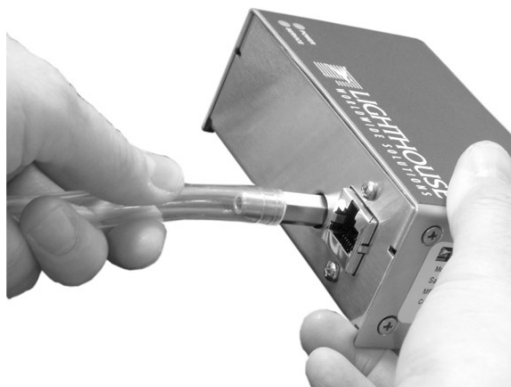


Figure 3-5 Attach external vacuum source

5. Connect cable fitted with a shielded RJ-45 plug at each end between the RJ-45 receptacle on the bottom of the instrument to the connector on the Sensor Interface Unit (SIU).

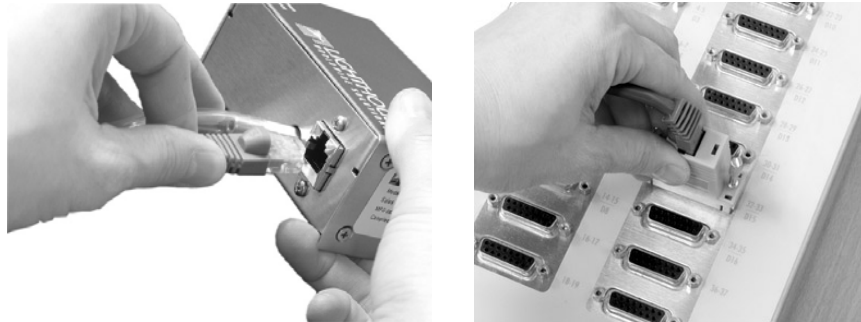


Figure 3-6 Connecting instrument to SIU

Note: *The unit is powered through the SIU.*

6. Power on the SIU.
7. Verify front-panel POWER light of the unit turns on. The instrument is now ready for use.

Installing an Isokinetic Probe

An isokinetic probe can be attached directly to the unit. Screw the probe directly onto the inlet.



Figure 3-7 Installing probe directly on barb

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Technical Data

Data Connector Signals

The data output of the REMOTE Airborne Particle Counter is presented as a balanced line output in full compliance with Balanced Voltage Interface Circuits standard EIA-422-A. According to these standards, a "binary 1" signal of not less than one microsecond indicates a detected particle, and a "binary 0" indicates no particles are being detected. There are two paired outputs, each representing the size channel data for the two size channels. A third paired output represents the calibration Status. Because the output is balanced, a (+) and (-) connection is required for each set of data.

"Status" indicates either a sensor failure due to contamination or low laser power. The following table gives the signals that are present on each pin of the RJ-45 output connector.

SIU DB15 Male Connector				REMOTE 3010 Sensor RJ45 EIA/TIA568B		
Color	Pin	Assignment		Assignment	Pin	Color
Blue	3	CH1 +	↔	CH1 B +	1	White Orange
Orange	2	CH1 -	↔	CH1 A -	2	Orange
Black	5	CH2 +	↔	CH2 B +	3	White Green
Red	6	ST1 -	↔	Sensor Cal A -	4	Blue
Green	7	ST1 +	↔	Sensor Cal B +	5	White Blue
Yellow	4	CH2 -	↔	CH2 A -	6	Green
Brown	14	24VDC	↔	Power (9-28V)	7	White Brown
White	15	Ground Return	↔	Ground	8	Brown

Table 4-1 RJ-45 Connector Pinout

Cumulative to Differential Output

This sensor is available with a voltage output signal that represents either a differential or cumulative count.

Differential count is the number of particles counted from the channel 1 size threshold up to (but not including) the channel 2 size threshold. Cumulative count is the total number of particles counted from the channel 1 size threshold and larger.

By default, the sensors are set at the factory for a differential count output. Sensors can be ordered for a cumulative count, but this must be specified when the order is first made.

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Maintenance Procedures

Introduction

This chapter provides instructions for routine maintenance that may be required for your REMOTE 2010/3010/5010/3100/5100 instrument.

The maintenance procedures described in this chapter are not required on regular or prescribed intervals and should be performed only if you have reason to question the data you are receiving from the instrument.

Safety

Before performing any of the maintenance tasks described in this chapter, read Chapter 1 of this manual and become familiar with the warnings and caution labels.

Maintenance

Calibration

To maintain optimum performance of this instrument, it should be re-calibrated annually by a Lighthouse Authorized Service Provider.

Purge Count Test

This section will provide you with the procedure to check the counter for zero counts. A purge filter must be attached to the instrument and six (6) five (5) minute samples must be taken. There should be no more than 1 count on average per five-minute sample.

1. Connect the Purge filter to the sample inlet.
2. Connecting Purge filter
3. Apply power to the instrument.
4. Configure the unit to sample for 30 minutes.
5. Allow the instrument to sample through a 30-minute period. This time allows the unit to warm up and purge any residual particles that might be inside it.
6. Configure the unit to sample for 5 minutes with a 10-second hold.

7. Allow the instrument to take 6 samples.
8. If an average of more than one count per five-minute period is reported, allow the instrument to sample for 30 minutes to purge it, then repeat the test.
9. After the instrument has met the requirement of the Purge Count test, return the instrument to its normal location and operating status.

Fault Isolation

If the instrument does not pass the Purge Count test, please perform the following procedure:

1. Check the data over the last 6 five-minute sample times.
2. If sporadic counts over all channels are occurring, the unit may still have particles inside it. Allow the unit to sample overnight with the purge filter attached before retesting it. If the counts are still high after the overnight purge, call Lighthouse Technical Support for assistance.
3. If the data shows consistent counts in the smallest channel only, the instrument may have electrical problems and may need to be returned to Lighthouse. Call your Lighthouse Service Representative for assistance.

A Limited Warranty

Limitation Of Warranties:

- A. Lighthouse Worldwide Solutions (LWS) warrants that all equipment shall be free from defects in material and workmanship under normal use for a period of two years from date of shipment to Buyer except that LWS does not warrant that operation of the software will be completely uninterrupted or error free or that all program errors will be corrected. Buyer shall be responsible for determining that the equipment is suitable for Buyer's use and that such use complies with any applicable local, state, or federal law. Provided that Buyer notifies LWS in writing of any claimed defect in the equipment immediately upon discovery and any such equipment is returned to the original shipping point, transportation charges prepaid, within two years from date of shipment to Buyer and upon examination LWS determines to its satisfaction that such equipment is defective in material or workmanship, i.e. contains a defect arising out of the manufacture of the equipment and not a defect caused by other circumstances, including, but not limited to accident, misuse, unforeseeable use, neglect, alteration, improper installation, improper adjustment, improper repair, or improper testing, LWS shall, at its option, repair or replace the equipment, shipment to Buyer prepaid. LWS shall have reasonable time to make such repairs or to replace such equipment. Any repair or replacement of equipment shall not extend the period of warranty. If the Instrument is modified or in any way altered without the explicit written consent of LWS then the warranty is null and void. This warranty is limited to a period of two years, except as noted below, without regard to whether any claimed defects were discoverable or latent on the date of shipment. The length of warranty for pumps in hand held particle counters is one (1) year. Batteries and accessories with all products are warranted for one (1) year. Fuses and purge filters carry no warranty. If a third party battery is used in the product, the product warranty is null and void. If the battery is charged by a third party battery charger the battery warranty is null and void.
- B. If Buyer shall fail to pay when due any portion of the purchase price or any other payment required from Buyer to LWS under this contract or otherwise, all warranties and remedies granted under this Section may, at LWS's option, be terminated.
- C. THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER REPRESENTATIONS, WARRANTIES AND COVENANTS, EXPRESS OR IMPLIED WITH RESPECT TO THE EQUIPMENT AND ANY DEFECTS THEREIN OF ANY NATURE WHATEVER, INCLUDING AND WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. LWS SHALL NOT BE LIABLE FOR, AND BUYER ASSUMES ALL RISK OF, ANY ADVICE OR FAILURE TO PROVIDE ADVICE BY LWS TO BUYER REGARDING THE EQUIPMENT OR BUYERS USE OF THE SAME. UNDER NO CIRCUMSTANCES SHALL LWS BE LIABLE TO BUYER UNDER ANY TORT, NEGLIGENCE, STRICT LIABILITY,

OR PRODUCT LIABILITY CLAIM AND BUYER AGREES TO WAIVE SUCH CLAIMS. LWS's SOLE AND EXCLUSIVE LIABILITY AND BUYERS SOLE AND EXCLUSIVE REMEDY, FOR ANY NONCONFORMITY OR DEFECT IN THE PRODUCTS OR ANYTHING DONE IN CONNECTION WITH THIS CONTRACT, IN TORT, (INCLUDING NEGLIGENCE), CONTRACT, OR OTHERWISE, SHALL BE AS SET FORTH IN THE SUBSECTION A HEREOF AS LIMITED BY SUBSECTION B HEREOF. THIS EXCLUSIVE REMEDY SHALL NOT HAVE FAILED OF ITS ESSENTIAL PURPOSE (AS THAT TERM IS USED IN THE UNIFORM COMMERCIAL CODE) PROVIDED THAT THE SELLER REMAINS WILLING TO REPAIR OR REPLACE DEFECTIVE EQUIPMENT (AS DEFINED IN SUBSECTION A) WITH A COMMERCIALLY REASONABLE TIME AFTER RECEIVING SUCH EQUIPMENT. BUYER SPECIFICALLY ACKNOWLEDGES THAT SELLER'S PRICE FOR THE EQUIPMENT IS BASED UPON THE LIMITATIONS OF LWS'S LIABILITY AS SET FORTH IN THIS CONTRACT.

Warranty Of Repairs After Initial Two (2) Year Warranty:

- A. Upon expiration of the initial two-year warranty, all parts and repairs completed by an authorized Lighthouse repair technician are subject to a six (6) month warranty.
- B. Other than the above, LWS makes no warranty of any kind, expressed or implied, except that the products manufactured and sold by LWS shall be free from defects in materials and workmanship and shall conform to LWS's specifications; Buyer assumes all risk and liability resulting from use of the products whether used singly or in combination with other products. If instrument is modified or in any way altered without the explicit written consent of LWS, then the warranty is null and void.
- C. WARRANTY REPAIRS SHALL BE COMPLETED AT THE FACTORY, BY AN AUTHORIZED SERVICE LOCATION, BY AN AUTHORIZED SERVICE TECHNICIAN, OR ON SITE AT BUYER'S FACILITY BY A LIGHTHOUSE AUTHORIZED EMPLOYEE. BUYER PAYS FREIGHT TO FACTORY; SELLER WILL PAY STANDARD RETURN FREIGHT DURING THE WARRANTY PERIOD. BUYER MAY SELECT A FASTER METHOD OF SHIPMENT AT ITS OWN EXPENSE.

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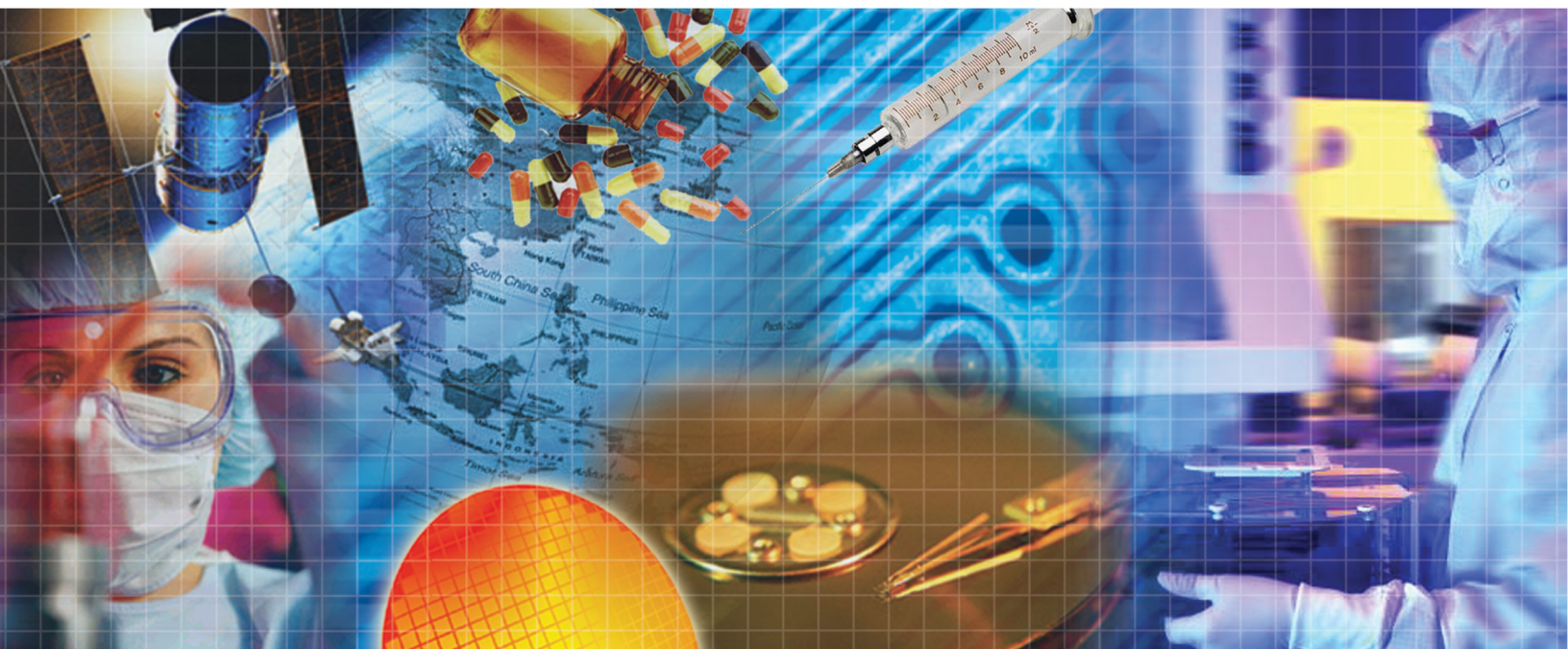
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