ST-4000

AIRCRAFT STROBE LIGHT TESTER

INSTRUCTION MANUAL

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TABLE OF CONTENTS

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INTRODUCTION

The FLASH TEST ST-4000 System has been developed by American Aerospace Corporation for the primary purpose of measuring aircraft strobe light effectiveness. The system measures strobe light output in effective intensity (Candela) units as required by the Federal Aviation Regulations (FAR). For example reference FAR 25.1401 (f). The system is ACCEPTED by the Federal Aviation Administration (FAA) as meeting the criteria necessary to meet their requirements.

The FLASH TEST ST-4000 System is portable, hand-held, and easy to use. The system consists of the photometric test *instrument*, the *detector*, and the *wand*. The photometric test *instrument* is essentially a computer designed to receive signals from the *detector*, integrate and analyze the signals, and display a digital readout of the light intensity in Candela units. The *detector*, mounted on the *wand*, picks up the light source using a silicon photo diode cell. The *wand* is a telescoping rod extending from approximately 27 inches (0.7 meters) to 108 inches (2.75 meters).

The light intensity measurements must be taken with the *detector* located eight (8) feet (2.44 meters) from the light source. This distance is programmed into the *instrument* computer but may be increased based on customer requirements.

The measurements are accomplished by mounting the *detector* at one end of the *wand* and extending the *wand* to measure 8 feet from the *detector* to the tip of the *wand*. With the *detector* connected to the *instrument*, the tip of the *wand* is held against the light source. The *wand* must be held as horizontal as possible.

With the *instrument* turned "ON", it will automatically "ZERO" to account for ambient conditions. Then, with the strobe lights flashing, the operator presses the "START" button on the *instrument* and after ten (10) flashes can read the light output in effective Candelas. Ultraviolet ray protection eye-wear must be worn when strobes flash.

In actuality, the *instrument* automatically counts (9) flashes and then stops and displays the results in Candela units. We ask the operator to count ten (10) flashes to insure sufficient activity. To repeat the measurement, simply press START again and count ten flashes

NOTE: When measuring light, consideration must be given to the surrounding surfaces in order to minimize reflections. A strobe light close to the floors, two feet or less, may reflect off the painted floor and cause interference. Inconsistent readings are an indication that stray reflections occur. In these cases, moving the airplane to a less reflective surface may be the easiest solution. American Aerospace Corp. Should be consulted on any problems of this type to assist in developing solutions.

The measurement range of the ST-4000 is from fifty (50) effective candelas (eff cd) to four thousand (4,000) effective candelas (eff cd). If the strobe light intensity is below 50 eff cd, the display will read "**** TOO LOW ****" on the top line and "FAILED" on the lower line. It will also let you know that it is ready for another test by blinking "READY" on the lower right.

If the unit measures more than 4,000 eff cd, the top line will read "****TOO HIGH ****".

If the unit measures more than 999 eff cd, for example 1350 eff cd, the display will read "1.350 keff cd". This indicates "Kilo-Candelas" where "K" is the metric prefix "Kilo".

The display messages are as follows:

A. Any time the START button is pressed, the instrument begins to look for the first flash. It will display "PROCESSING" with a number to the right. If no flash, it will stay on number "0". As each flash is processed, it will increment up to a maximum of "9".

B. "COMPLETE" - If Nine (9) satisfactory flashes in a row have been detected, and the flashes were between 50 and 4,000 eff cd, then the instrument will display the final answer on the top line and the word "COMPLETE" on the bottom left.

C. "HIGH BACKGROUND" - If the ambient light is too bright, the instrument cannot distinguish a flash properly. This may occur in sunlight or very brightly lit surroundings. When this occurs, the display will read "HIGH BACKGROUND". In this case reposition the *detector* to point away from the bright light source.

D. "BAD EEPROM" - Means the *instrument* memory chip is defective. If this display appears, return the *instrument* and *detector* to American Aerospace Corporation for repair.

E. "NO CAL" - Means the unit has lost calibration and must be returned for repair.

F. "FACTORY TOO HIGH" - Means that a problem exists with the memory in the *detector* or computer. Return the entire system for repair.

The *instrument* also incorporates an automatic shut-off feature that turns the unit OFF after eight (8) minutes if left un-used. If the *instrument* inadvertently turns off, simply press ON button again. The unit will again automatically "ZERO" to account for ambient conditions.

Ultraviolet (UV) light ray protection eye-wear must be worn by the operator(s) during the strobe testing process.

The system is calibrated to National Institute of Standards and Technology (NIST) traceable optical standards. The system is calibrated for the specific distance of 8 feet (2.44 meters), and the Candela unit display peculiar to this specific task. The system can be customized to operate at an increased distance based on individual customer requirements, but cannot be decreased.

In order to insure accuracy, the system needs periodic re-calibration. Because of the specialized facilities, equipment, knowledge, and expertise required to calibrate this type of equipment, the ST-4000 system should be returned to American Aerospace Corporation every nine (9) to twelve (12) months for calibration.

Revision to this manual will be controlled by American Aerospace Corporation and any revisions will be introduced by the re-issuance of the entire manual and a new date on each page.

DESCRIPTION OF EQUIPMENT

The ST-4000 Flash Test System consists of:

- *Instrument*
- *Detector* ASSEMBLY
- *Wand*

Instrument

The *instrument* contains the electronic package necessary to integrate the *detector* signals, the control buttons, and the digital display. The *instrument* is 7.3 inches (185 mm) long, 3.9 inches (100 mm) wide, and 1.7 inches (43 mm) deep. Three control buttons are located on the front panel along with a two-lined digital display window. See Figure 1.

The unit operates on four (4) quality "AA" alkaline batteries located under the back cover. A "low battery" warning will appear in the display window when battery replacement is required. The unit weighs approximately 1.2 pounds (555 grams). The *instrument* automatically shuts-off after 8 minutes if un-used. The last ZERO setting is retained in memory.

Detector ASSEMBLY

The *detector* assembly consists of three parts; the *detector* with electrical wire and connector, hood, and filter. See Figure 2. The three pieces are attached by threading each piece to the other. The *detector* assembly is approximately 3 inches (76 mm) long and 1.6 inches (42 mm) in diameter.

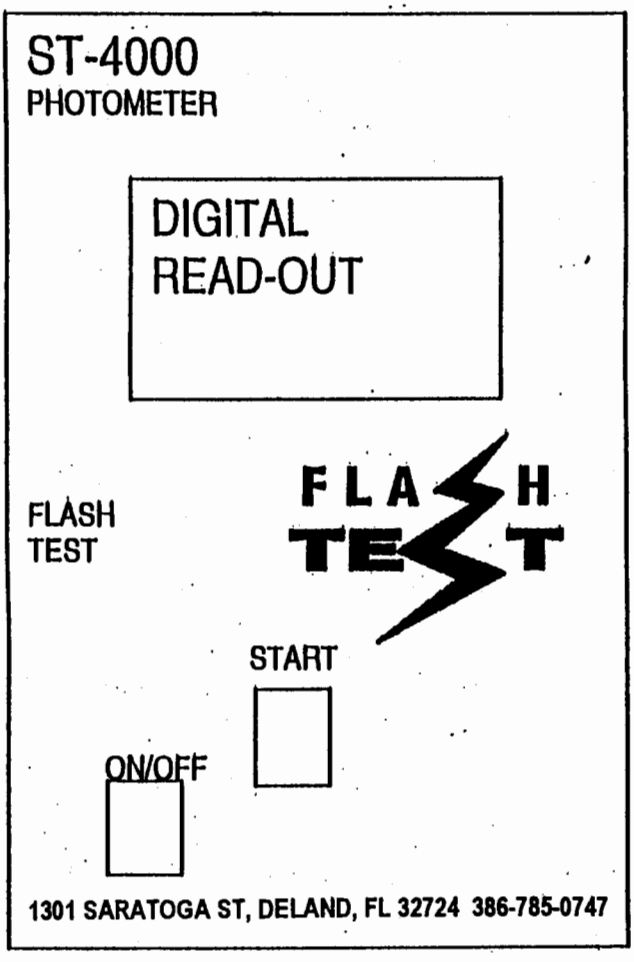
The *detector* contains the silicon photo diode and care must be taken not to expose the photo diode to damage, i.e. dirt & moisture. Do not touch the exposed photo diode. Try to keep the lens on and a cover over the *detector* at all times when not in use.

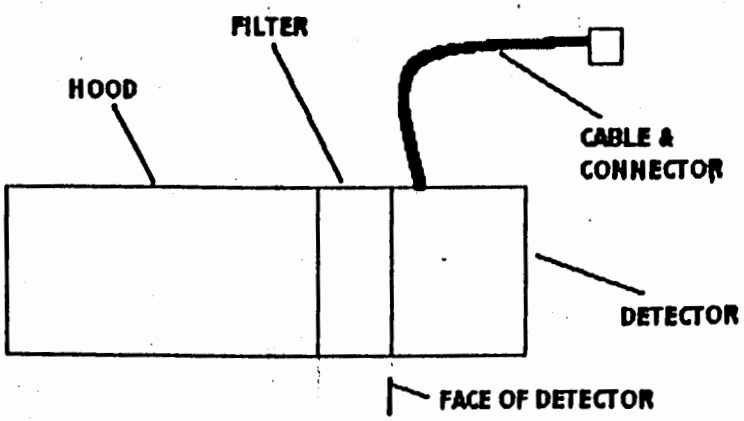
Wand

The *wand* is a telescoping rod that expands from approximately 27 inches (0.7 meters) to 108 inches (2.75 meters) long. It consists of five concentric tubes, from the largest 7/8 inch (22 mm) diameter to the smallest 3/8 inch (10 mm) diameter. See Figure 3. The *detector* mount is secured to the *wand* and facilitates easy installation of the *detector* assembly.

THE INSTRUMENT

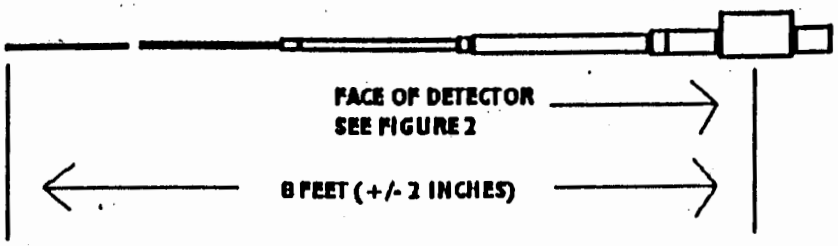
FIGURE 1





Detector ASSEMBLY

FIGURE 2



THE *Wand*

FIGURE 3

OPERATION

The following instructions apply when testing aircraft strobe lights. When the system is used in a shop facility, the same procedure applies except the *wand* is not necessary.

The ST-4000 Flash Test System is intended to measure the effective light intensity of aircraft strobe lights in effective Candela (Candle) units. The measurements are taken with the strobe lights installed on the aircraft and operating in the normal manner.

The system is calibrated to measure the strobe light intensity with the *detector* located eight (8) feet (2.44 meters), +/- 2 inches (+/- 5 cm) from the light source. This requirement is met by mounting the *detector* assembly on the *wand* and extending the *wand* to measure 8 feet (+/- 2 inches) from the tip to the *detector*.

NOTES:
1. The distance of 8 feet (+/- 2 inches) is measured from the face of the *detector* itself, not from the face of the *detector* assembly. See figure 2 & 3.
2. If the light source is located behind an outer lens, then the distance from the light source to the lens must be estimated and the *wand* shortened accordingly.
3. Light intensity measurements should not be taken outside during sunlight hours. Best results will be obtained in a hanger or, if outside, after sunset.
4. Minimize possible reflections. See Note on page 4.
5. Ultraviolet (U.V.) protective eye-wear must be worn by the operator(s) during the testing process.

With the *detector* assembly mounted on the *wand* and connected to the *instrument*, we are now ready to begin light intensity measurements.

1. Inspect the light lens for cleanliness and general condition.

2. Extend the *wand*. Secure *wand* segments by rotating the locking rings. Place the tip of the *wand* against the light source with the *detector* at the other end, 8 feet away. Hold the *wand* as horizontal as possible.

NOTE: Place the tip of the *wand* against the strobe in a manner that will minimize obstruction of the flashing light from reaching the *detector*. This may require placement of the tip directly under, above, or the side of the light. Rotate the *wand* as necessary to position the *detector* in direct line to the light source.

3. Turn on the strobe lights.
   WARNING: ULTRAVIOLET (U.V.) PROTECTIVE EYE-WEAR MUST BE WORN BY THE OPERATOR(S) WHEN STROBE LIGHTS ARE FLASHING....

4. Turn the *instrument* ON. The ZERO button can be pressed to insure the "AUTO ZERO" feature operates but this step is not mandatory. The *instrument* will automatically "ZERO" by measuring the ambient lighting conditions between each flash and adjust the *instrument* accordingly.

NOTES:
1. Numbers may appear in the digital readout after zeroing or before initiating the test. These numbers are of no consequence and will not affect the actual test readings.
2. The strobe lights may be operating throughout the testing period since the *instrument* has "AUTO ZERO".
3. The *instrument* will automatically shut OFF after eight (8) minutes if unused. If this happens, simply press ON button.

5. On the *instrument*, press the Start button and count ten (10) flashes.

NOTES:
1. Allow the strobe lights to flash for a short period of time before taking readings to assure proper operation.
2. Press the START button during the period between flashes in order to capture complete flashes only.
3. Insure tip of the *wand* does not obstruct the light. See NOTE in step 2 above.

6. After ten (10) flashes, the reading will be displayed on the *instrument* in Candela units.

NOTE: The *instrument* will automatically stop sensing flashes and display the results. No need to stop the strobes or turn *instrument* off.

7. If a second reading is desired, simply press the START button again and count ten flashes.

8. Record results.

CALIBRATION REQUIREMENTS

Specialized training, experience, equipment and facilities along with traceable standards are required to calibrate the ST-4000 photometric system. For these reasons, it is necessary to return the system to American Aerospace Corporation for re-calibration. We recommend a calibration interval of nine (9) to twelve (12) months.

BATTERY REPLACEMENT & MAINTENANCE

To replace the batteries, the back cover of the *instrument* must be removed as follows:

1. Remove the four (4) screws on the back of the *instrument*.
2. Carefully remove the back plate and back cover, making sure not to pull off the battery wires which are still connected. The battery compartment is affixed to the back cover. Follow the instructions for battery polarity as marked.
3. Carefully replace the back cover, taking care that all wires fit snugly inside. Squeeze the back cover in place tightly, and install the back plate and secure with the four (4) screws.

Due to the sophisticated nature of this computer control system, we do not recommend that the user attempt to make repairs. Return the unit to American Aerospace Corporation for corrective actions. The optical windows should be carefully cleaned from time to time using common window cleaning fluids. Be careful to avoid spraying or dripping fluid into the unit.

ENVIRONMENTAL SPECIFICATIONS AND CONSIDERATIONS

Operating temperature range:	40° to 100°F (5° to 40°C)
Storage temperature range:	-16° to 130°F (-30° to 60°C)
Operating and storage, relative humidity:	0 to 90 %

Keep units shielded and protected from moisture, dirt, and dust.

WARRANTY POLICY

The **ST-4000 Flash Test System** from American Aerospace Corporation has been expertly designed and was carefully tested and inspected before being shipped. If properly operated in accordance with the instructions furnished, it will provide excellent service. The equipment is warranted for a period of twelve (12) months from date of shipping to be free of defects in material or workmanship. This warranty does not apply to damage resulting from accident, alteration, abuse, misuse, loss of parts or repair by other than American Aerospace Corporation or its authorized agents. The equipment will be repaired or replaced, at our option, without charge to the owner for parts or labor incurred in such repair. This warranty shall not apply unless the equipment is returned for our examination with all transportation charges prepaid to American Aerospace Corporation, 1301 Saratoga Street, Deland, FL 32724, USA. American Aerospace Corporation has no other obligation or liability in connection with said equipment.

ILLUSTRATION

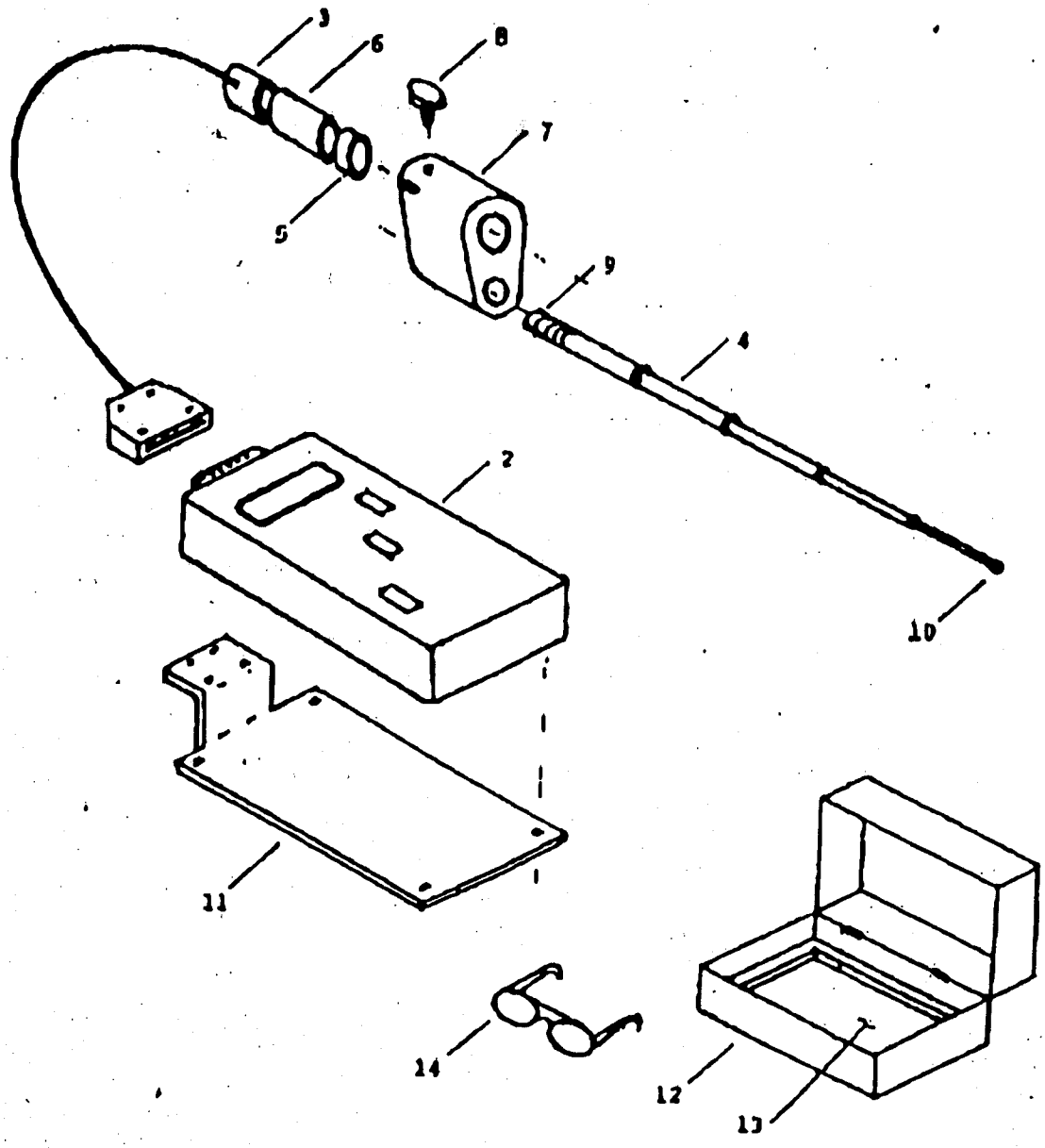


ILLUSTRATION PARTS LIST

Item No.	Part No.	Description	Quantity per Unit
1	ST-4000	Flash Test Unit Assembly	----------
2	ST-4000-1	Instrument	1
3	ST-4000-2	Detector, Cable & Connector	1
4	ST-4000-3	Wand Assembly	1
5	ST-4000-4	Filter	1
6	ST-4000-5	Hood	1
7	ST-4000-6	Mount, Detector	1
8	ST-4000-7	Screw	1
9	ST-4000-8	Handgrip, Rubber 7/8 dia.	1
10	ST-4000-9	Rubber Tip 3/8 dia.	1
11	ST-4000-10	Back Plate	1
12	ST-4000-11	Carrying Case, small	1
13	ST-4000-12	Small Case, cut out	1
14	OTG 3001	Glasses UV protective (S2534) Vendor : UVEX, Smithfield, RI Or equivalent	1