OWNER'S MANUAL

Carmanah Solar-Powered LED Aviation Lights

Self-contained and maintenance-free with no battery or bulb replacement required for five years!

Easy installation for most qualified maintenance departments.

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1.0 Introduction

Congratulations on your purchase of Carmanah Aviation Lights! They are the most technologically advanced solar-powered, LED (light emitting diode) aviation lights available in the world today.

Carmanah Lights are currently the choice of hundreds of air-defense, commercial and general aviation airfields around the world. These organizations have chosen Carmanah Aviation Lights for their record of superior performance under extreme environmental conditions, their rugged and durable design, and their extremely low cost of installation and operation versus hardwired lighting systems.

The winning combination of the sun's energy and LEDs (with a 100,000 hour lifespan) offers further benefits by providing an extremely reliable light source – no scheduled maintenance, or associated costs, over the initial five-year period of ownership.

Incorporating patented electronics, Carmanah Aviation Lights provide a range of advanced features that include: intelligent control of the light output from the LEDs via automatic light control (ALC) and precise power management capabilities. These and a long list of additional features allow you to customize the operation of each light to suit your specific needs. This customization can easily be done using an easy to use infrared remote controller.

There are a broad range of airfield applications for Carmanah Aviation Lights including nighttime marking of: ***taxiway edge, runway edge, obstructions, barricades, threshold, helipad perimeter, apron edge and windsocks, in addition to other general airfield lighting applications where power is inaccessible or not economically feasible.***

Should you have any questions about Carmanah Aviation Lights that are beyond the scope of this manual, please do not hesitate to contact us using the information below:

Mail: Carmanah Technologies Corp.
Building 4, 203 Harbour Rd.
Victoria, BC Canada V9A 3S2

Phone: 1 250 380-0052 (ask for our Aviation Lighting Technical Support)
1 877 722-8877 (toll free in North America)

Fax: 1 250 389-0040

Email: customerservice@carmanah.com

Web Sites: www.solarairportlights.com
www.carmanah.com

- Thank you for choosing Carmanah Aviation Lights! –

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2.0 Installing Carmanah Aviation Lights

2.1 Choosing a Location

There are three factors that must be considered when choosing a location for a Carmanah Aviation Light: adequate sunlight, suitable ambient temperature, and proximity to radio transmitters.

2.1.1 Adequate Sunlight

A Carmanah Aviation Light is solar-powered; therefore to operate each night throughout the year it requires an adequate amount of sunlight during the daytime to recharge its batteries. The average daily exposure of the light to sunlight must correspond to the intensity settings on the light.

NOTE: To operate continuously at 100% intensity, the light will require an average of three hours of sunlight (or equivalent) per day. To operate continuously at 25% intensity setting it will require 0.75 hrs of sunlight (or equivalent) per day.

It is important to ensure the light is not installed in a location where it will be in the shade all day. During the winter season, the sun is lower on the horizon, so be aware that obstructions such as trees, buildings and mountains, that do not shade the Carmanah Aviation light during the summer, may be a source of shade during the winter.

2.1.2 Suitable Ambient Temperature

Exposure to extreme temperatures can significantly reduce a rechargeable battery's useful lifespan. Consequently, in Carmanah Aviation Lights that do not have replaceable batteries, the overall lifespan of the unit can be shortened by exposure to extreme temperatures. In a unit that has a replaceable battery pack, more frequent battery replacements may be necessary when repeatedly exposed to extreme temperatures.

A Carmanah Aviation Light is expected to last five years when its batteries recharge/discharge at temperatures between -30°C and +50°C (-22° and 122°F). Ambient temperatures higher than 50°C (122°F) during recharging/discharging will reduce the lifespan of the batteries.

To ensure the Carmanah Aviation light remains within its optimal temperature range, it is recommended that the unit be mounted a way that it avoids contact with hot surfaces. Mounting the lights directly on surfaces such as black rooftops and tarmac, that can regularly have ambient temperatures over 50°C (122°F), should be avoided.

2.1.3 Proximity to Radio Transmitters

While Carmanah lights are not susceptible to radio signals encountered in typical applications, installation of the lights in close proximity to, and in the direct path of, a radio or microwave transmitter can result in damage to the lights. This damage would

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not be covered by the warranty. Carmanah strongly recommends that the lights be mounted well away from the primary transmission beam.

2.2 Mounting Carmanah Aviation Lights

Use the mounting holes provided around the edge of the base of the unit to mount it to the chosen surface. It is strongly recommended that you install one (1) or two (2) washers between the light and the mounting surface to ensure that the one-way pressure relief valve on the bottom of the light is unobstructed.

2.2.1 Optional Airport Mounting Stake

An optional, all weather airport mounting stake can be used to mount your Model A601 & A700 Aviation light(s). Manufactured out of galvanized steel, the all weather airport mounting stake allows for permanent installation in earth and gravel environments at general aviation airports and remote defense airfields. The 30" steel airport mounting stake is available in 2" and 1.5" coupling configurations. Frangible coupling size must be determined before ordering.

Stake (Angle Iron) Mounting Instructions:

Using an auger, drill a 3" to 4" diameter hole to a depth of 30" (76 cm). Do not install the stake by driving it into the ground. Install the top of the stake even with, or not more than 1/2" (1.3 cm), above the finished grade and maintain within 1 degree of the vertical. Backfill around the stake with thoroughly compacted earth (or suitable backfill material such as sand or concrete). For hard bedrock or sediment areas, 15" stakes can be used. In areas where frost may cause heaving, anchor the stake with concrete and use a permeable backfill material such as sand and then cover the top surface with an impervious material to reduce moisture penetration.

NOTE: Do not attach the light to the mounting surface using any type of adhesive, and ensure that the pressure relief valve located on the bottom of the light is unobstructed.

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3.0 Basic Programming

3.1 Programming Basics

All Carmanah Aviation Lights come from the factory with the following default settings:

- Aviation code 001 (steady on light output)
- 100% level of intensity
- Sensitivity set for unit to turn "on" at 70 lux and "off" at 100 lux of ambient light
- Turned off (shipping code 820 or automatic shut down code 000 has been entered)

NOTE: With the infrared remote control programmer, you can change these attributes quickly and easily. Before you perform any changes on the default settings or any other settings during the light's life, you must first initialize the infrared programmer and transition the light, i.e. take it from night to day or vice versa.

3.1.1 Programmer Initialization/Set up

Carmanah Technologies will provide an infrared remote control programmer upon request for Carmanah Aviation Lights. Before using the programmer, install two new AAA batteries and follow the ***three*** steps, listed below and on the back of the remote control, to set up the programmer for communication with the light:

Step One: Press and hold the ***Code Search*** button until the red Indicator Light lights up, then release the ***Code Search*** button.

Step Two: Press and release the ***TV*** button. The Indicator Light will blink and then remain lit.

Step Three: Enter ***0-0-6*** using the number buttons. The light will blink once after each entry and then the Indicator Light will turn off.

The programmer is now ready to use for programming the light.

NOTE: Whenever you replace batteries in the programmer, you will be required to set up the programmer again using the same three steps above.

If the light will not respond to the programmer, remove the batteries from the programmer. Reinstall the batteries and try the above three steps again.

3.1.2 Programming Sequence Overview

This is a quick-reference programming guide. Every function will be explained in more detail in another section of the manual.

The unit will flash after each button is pressed successfully. Do not press the next button unless you see a single flash (response) from the light. You MUST enter the security

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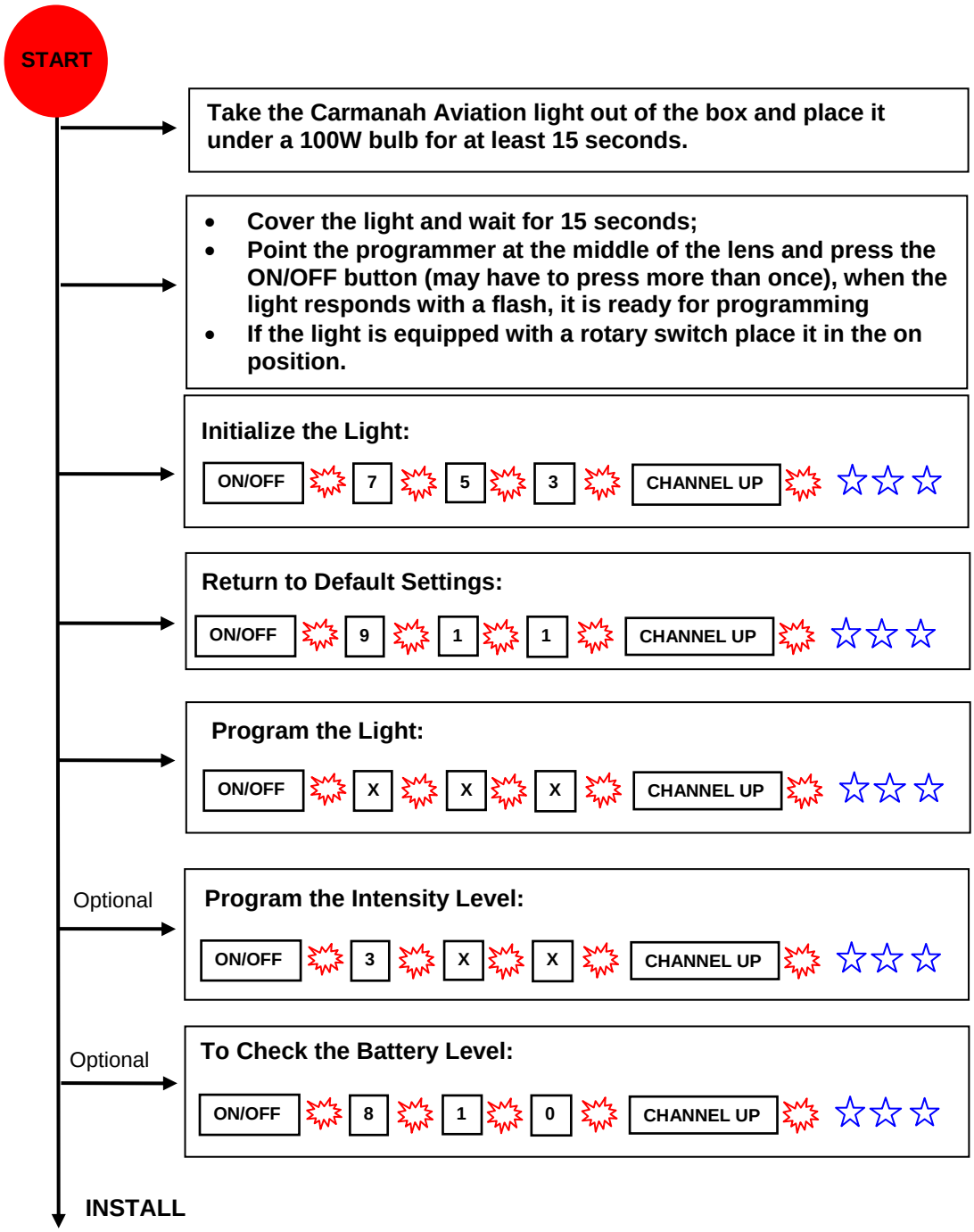
code (ON/OFF-7-5-3-Channel Up) BEFORE any other changes can be made such as setting the flash code or checking the battery levels.



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3.1.3 "Transitioning" the Light

Depending on your situation, follow one of the steps below to transition the light:

New light:
Take the light out of the box and place it under an incandescent light for at least 15 seconds. Move the light into virtual darkness and wait 15 seconds.

If the single flash does not appear, it may mean you have not left the light under the light source quite long enough. After 20-30 seconds, point the programmer at the middle of the lens while the light is still exposed to the light source and press the ON/OFF button repeatedly, as if you are changing channels on TV. When the light responds with the flash, it is ready for programming.

Installed light:
Cover the light with an opaque or dark material (assuming you are doing this during the day) for at least 15 seconds. Commence programming when the light begins flashing in response to presses of the controller on/off button.

Stored light:
If the light was stored outside and turned off using code 000 (see the section entitled "Storage Considerations"), bring it inside or cover the light (transition phase) for 15 seconds. Press the ON/OFF button on the programmer; if the light responds with the flash it is ready for programming. If not, wait a bit longer and try the ON/OFF button again. A light that was turned off using code 000 can only be 'revived' using the programmer.

If the light was stored inside and was not turned off using 000 but was left to automatically turn off after 24 hours (automatic shut down), place it under the incandescent light for at least 15 seconds. Point the programmer at the light (middle of the lens) and press the ON/OFF button. When the light responds with a single flash, you can proceed with programming.

3.1.4 Entering the Security Code and Programming

After the light is transitioned, and before any changes can be made to the light's settings, the security code must be entered. **NOTE: The security code has to be entered every time the light is transitioned:**

The security code is:

7 5 3

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Enter the sequence: ON/OFF button, 7,5,3, and then CHANNEL UP (as shown below). The light will flash after each correct entry. If it does not flash after you press the button, press the button again until it does flash.

NOTE: Do not proceed until the light has acknowledged the button press with a flash.

If the light responds to a button press with two flashes instead of one, you must return to the ON/OFF button and start the sequence again then. When your security code has been accepted, the unit will give three very quick flashes.

Once the security code has been entered, a change can be made to the:

- Flash code or flash pattern (see below),
- Intensity of the light (see the "Advanced Programming" section),
- Sensitivity of the automatic on/off settings to the ambient light level (see the "Advanced Programming" section).

After entering the Security Code (as described above), enter the code for the desired changes. The specific codes are listed in the relevant sections. There will be a quick triple flash at the end of the programming sequence every time the code is successfully entered.

NOTE: THIS IS VERY IMPORTANT WHEN CHANGING FLASH CODES IN LOW SOLAR REGIONS OF THE WORLD: The flash code will reset all the previously entered settings like the sensitivity level, intensity level, etc. to avoid any confusion that can arise with multiple users or programmers. You MUST enter the flash code BEFORE any other setting codes are entered.

If you get a double flash at the end of the sequence, it is because the:

- Computer does not recognize the sequence, or
- The computer has decided that you have not entered the security code.

First try the sequence again, to ensure that you pressed the right numerical buttons. If that doesn't work, re-enter the security code.

NOTE: Make sure you press the buttons firmly and slowly!

Multiple changes can be made in one session without transitioning the light again and re-entering the security code each time. The light gives you one additional minute to program a change every time the ON/OFF button is pressed. After you finish one change, press the ON/OFF button within one minute to continue programming more changes.

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NOTE: If more than one minute elapses from the time the ON/OFF button was last pressed, you must start again by transitioning the light and re-entering the security code.

3.1.5 Changing the Flash Code

The sequence codes to change flash patterns range from 001 to 209. Please refer to the table below for a complete list of flash codes.

The sequence to change the flash code is as follows:

Transition (if required)
Enter the Security Code (if required)
Enter code 911 (recommended)
Program the New Flash Pattern (see table below)

After you successfully entered a flash code, the light will flash or stay fixed for one minute. This will allow you to see what the programmed flash code will look like and you can decide whether it is the flash pattern you wanted or not.

NOTE: The infrared sensor is active during this minute; you can interrupt flashing at any time by pressing the ON/OFF button and enter the new code.

After a minute of flashing or fixed output, the light will then shut off if it is in the light or keep flashing or stay on if in the dark. The IR sensor shuts off and can only be reactivated by transitioning the light.

Table 1: Flash Codes

Sequence Code	Flash Character	FL1	EC1	FL2	EC2	FL3	EC3	FL4	EC4	FL5	EC5	FL6	EC6	FL7	EC7	FL8	EC8	FL9	EC9
001	**fixed**																		
043	**Fl 1.5s**	0.5	1																
053	**Fl 2s**	0.3	1.7																
055	**Fl 2s**	0.5	1.5																
129	**Q 1S**	0.3	0.7																
209	**Q 1S**	0.15	0.85																

Contact Carmanah if you require additional flash codes.

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3.1.6 24-Hour Shutoff

If a light is left in an active state for 24 hours, it will switch itself off to preserve the battery, as the light will assume this is an error. This could occur, for example, if the light has been placed in a container preventing it from sensing ambient light.

4.0 Advanced Programming

4.1 Resetting Factory Defaults

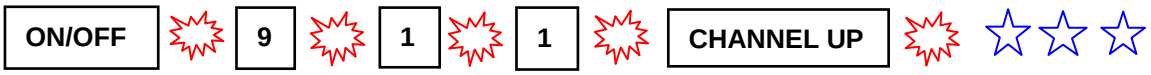
Totally confused? Not to worry, there's a simple way to get everything back to factory default settings. Just dial 9-1-1!

It is also recommended that you enter code 911 after the security code, but before the required code; this will ensure that the light is at a known state before you start programming or changing parameters. 911 will reset the following default factory settings:

- Sequence code 064 flash pattern (0.5 seconds on, 3.5 seconds off);
- 100% level of intensity;
- Sensitivity set for unit to turn "on" at 70 lux and "off" at 100 lux.

The sequence is as follows:

Transition (if required)
Enter the Security Code (if required)
Enter code 911

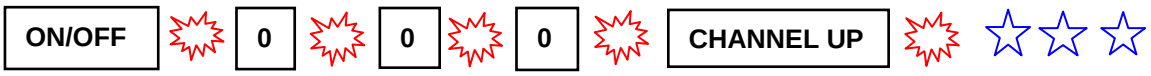


Program the Flash Code (if required)

4.2 Turning the Carmanah Aviation Light "On" or "Off"

If you want to turn the Carmanah Aviation light "off", enter the code 000.

Transition (if required)
Enter the Security Code (if required)
Turn the unit off



Immediately after the 000 code is entered, the light will turn "off" and will stay off until it is turned on again with the programmer.

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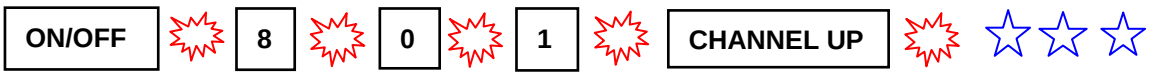
You only need to turn the Carmanah Aviation light "on" if the unit has been turned "off" with 000 (see above).

To turn the light on, enter the security code. Entering the security code cancels the "off" function. Program the light as usual.

4.3 Automatic Light Control (ALC) – default setting is "on"

4.3.1 Turning ALC "On"

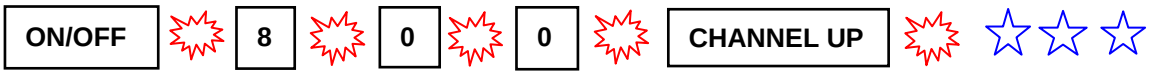
Transition (if required)
Enter the Security Code (if required)
Turn the ALC on



Program the Flash Code (if required)

4.3.2 Turning ALC "Off"

Transition (if required)
Enter the Security Code (if required)
Turn the ALC off



Program the Flash Code (if required)

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4.4 Changing On/Off Threshold Levels

The Carmanah Aviation light constantly measures the ambient light level. It activates at dusk and turns 'off' at dawn. The default settings for the ambient light levels required to activate the light are set at the factory as follows:

- Activate when light level drops below 70 lux.
- Turn 'off' when light level climbs above 100 lux.

If your requirement is for more or less sensitivity to the ambient light levels, these settings can be changed.

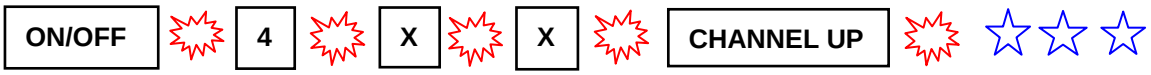
Table 2 lists codes to change the ambient light levels at which the Carmanah Aviation light turns "on" and "off". Note that turning the unit "on" earlier in the evening will decrease its autonomy, and turning it "on" later will increase its autonomy.

Table 2: Sensitivity Codes

Light Level in Lux for Carmanah Aviation light to Turn "on"	Light Level in Lux for Carmanah Aviation light to Turn "off"	Sensitivity Program Code
110	130	4 7 0
90	120	4 6 0
70	100	4 5 0
50	80	4 4 0
30	60	4 3 0
15	30	4 2 0
10	20	4 1 0

Using Table 2 above determine the desired sensitivity level and its corresponding program code.

Transition (if required)
Enter the Security Code (if required)
Enter code 911 (recommended)
Program the New Sensitivity Level



Program the Flash Code (if required)

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4.5 Adjusting the Intensity Level or Duty Cycle Limiter

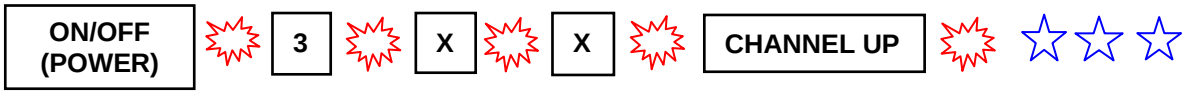
There are four possible levels for the intensity of the light. The intensity setting of the light can be reduced if local solar conditions don't allow the light to function sustainably at 100% intensity (default).

Table 3: Intensity Level Programming Codes

Program-ming Code	Intensity Setting
3 9 9	100% Intensity
3 7 5	75% Intensity
3 5 0	50% Intensity
3 2 5	25% Intensity

Using Table 3 above, determine the desired intensity level and its corresponding programming code (325, 350, 375, or 399). Then enter the code in the normal manner:

1. Transition (if required)
2. Enter the Security Code (if required)
3. Enter code 911 to return the lantern to factory default settings (recommended)
4. Program the Flash Code (if required)
5. Program the new Intensity level



Note: This code can be entered only after the flash code since the flash code will reset the intensity level to 100%.

After the intensity code is entered, the lantern will operate at the selected flash code for one minute, during which time you will be able to see whether the programmed intensity is adequate or not. If not, enter the new sequence any time within that minute.

Note: It is important to understand that reducing the intensity reduces the visible range of the light.

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5.0 Storage of / Caring For Carmanah Aviation Lights

5.1 Storage Considerations

If your Carmanah Aviation Light is to be stored inside for extended periods of time you have several options to turn your light off to prevent battery drain:

- Off Code (**000**) – In order to turn your light off, use programming code 0-0-0. This code will turn the light off and it will not awaken until it is transitioned and receives input from the programmer.
- Sleep/Storage Code (**820**) – Using programming code 8-2-0 will also turn your light off. However, this code allows the light to 'wake up' when it is exposed to bright light for a minute or so. Do not expose the unit to light until it is to be deployed again, since it will resume normal functioning once it senses light.
- 24hr Sleep Mode – To use 24 hour sleep mode, place the light in a box and ensure that it remains in the dark. After 24 hours of darkness, it will automatically go into sleep mode. No programmer is required. As with Sleep/Storage Code, do not expose the unit to light until it is to be deployed again. Every time it senses light it will turn on for another 24 hours.

NOTE: It is not recommended that you store the light in 24hr sleep mode for long periods of time due to the initial drain of the battery before the light turns off

Storage temperature can significantly affect the rate of battery self-discharge, especially at higher temperatures. In order to avoid fast discharge of the batteries in storage, the lights should be stored at 20°C or cooler.

To keep the lights fully charged, they should be put under a 500 Watt halogen lamp for a maximum of five days, for every two months stored. If the battery levels are tested and appear fully charged, this is not required. Verify the battery level using the programmer and code 810 (see below) before charging, deploying or installing the light.

NOTE: It is recommended that the battery level be checked with the programmer every 2-3 months for lights in storage. It is possible that the light may not need to be charged before installing.

5.2 Battery Testing

To determine the state of the batteries of the Carmanah Aviation Light, transition the light if needed and enter code 810. You will get a series of flashes. Every flash represents 10% charge, e.g., a single flash indicates 10% battery charge while 10 flashes represent a full 100% battery charge.

Transition (if required)
Enter the Security Code (if required)
Enter Battery Testing code 810

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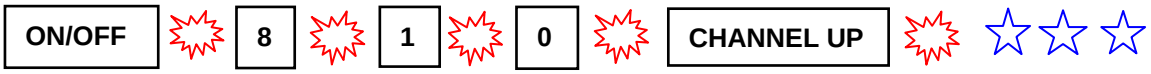
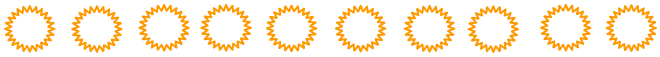


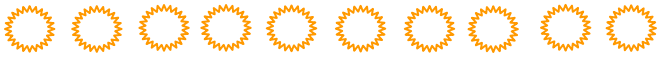
The set of flashes indicating the state of the batteries will be shown twice, after which the Carmanah Aviation light will return to the programmed flash code.

For example, for a full battery, after entering code 810 you will see the following:

2 seconds delay



3 seconds delay



2 seconds delay

Return to programmed flash code

5.3 Battery Charging

When the light is in a low battery condition, it will display a quick flash once every minute. This is called "Low Battery Cut-off," a sign that the light needs to be fully charged.

NOTE: While the light is in this state, you will <u>not</u> be able to transition it or program it.

To recharge a Carmanah Aviation light, program the light with code 226 and place it outside in the sun for three days (this is not possible if the light is in low battery cut-off). This should be sufficient to provide a reasonable charge to the battery. The light will display two short flashes once a minute (to distinguish it from the low battery mode) and will not flash during the night to preserve the power. Five days should produce a full charge from a flat battery.

Transition (if required)
Enter the Security Code (if required)
Enter Recharging code 226

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If using an artificial light to charge your Carmanah Aviation Light, place the light at least 60 cm (24 inches) away from a 500-watt halogen light bulb.

NOTE: Placing the light source too close to the unit will overheat the solar panel and invalidate the warranty!

Approximately 100 hours under a 500-watt halogen light bulb should be sufficient to recharge the battery. The battery will not recharge under fluorescent lighting and will be very slow to charge under incandescent. It is recommended to leave the light for 4-5 days for a full charge.

5.4 Battery Replacement

The batteries in your Model A701/702 will typically last about five (5) years under normal operation conditions. For replacement batteries contact your Authorized Carmanah Representative.

WARNING: Exercise caution when handling the battery packs. They are capable of generating enormous short-circuit currents. Remove all jewelry (bracelets, metal-strap watches, rings) before attempting to handle or remove the battery packs.

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6.0 Appendices

Appendix A: Answers to Frequently Asked Questions

Here are some questions frequently asked by purchasers of Carmanah Aviation lights. If you receive any questions that you cannot answer through this manual, contact Carmanah Technologies at info@carmanah.com. We will be happy to provide you with the answers.

Q: The Carmanah Aviation light is not responding to the programmer. What is wrong?

A: Be sure the batteries in the programmer are installed and are still charged, and that the programmer has been initialized correctly. Follow the instructions on the back of the remote.

Second, ensure the unit is transitioned from light to dark, or dark to light. The transition turns on the infrared sensor for one minute. You must wait 15 seconds between light changes (dark to light) before the light will respond to the remote.

Q: Your brightness measurements are in candelas. What's that in watts?

A: Most people think watts are a measurement of brightness. Watts are actually a measure of how much energy a light bulb consumes, not how much light it produces. Standard light bulbs are extremely inefficient—only a small percentage of the energy consumed comes back out as light, and the rest comes out as heat.

A light bulb running at 120 volts using 0.5 amp current is known as a 60-watt light bulb since it consumes 60 watts of electricity. Carmanah Aviation lights run at 4 volts using about 0.025 of an amp and consume only 0.1 watts. Carmanah Aviation lights are very efficient in that nearly all the energy consumed comes back out as light and very little comes out as heat.

Q: It's been raining a lot here. Will my Carmanah Aviation light stop working?

A: The Carmanah Aviation light does require solar energy to work. However, it can run for either 150 hours at full intensity or 600 hours at low intensity without recharging or receiving solar energy.

Q: Why is there a small hole at the base of the unit? Isn't it waterproof?

A: The Carmanah Aviation light is designed with a safety vent valve on the base of the unit. This vent is installed in the unlikely event that the battery inside the unit should overheat and vent gases. Every battery manufacturer recommends that batteries be vented. The vent is a one-way valve, so as not to compromise the integrity of the waterproof design of the unit.

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Q: My Carmanah Aviation light has stopped working. What do I do?

A: If the light emits very brief pulses once a minute when placed in the dark, the batteries are discharged and require recharging.

If the light is not pulsing in the dark, program it with the programmer. Does it respond to the programmer after a transition? If so, it is turned off. Turn it on by entering the security code.

If it does not respond to the programmer or produce pulses in the dark, then either the batteries are completely dead or the circuit board is damaged. Try re-charging the light under a 500-watt halogen light bulb for 4-5 days and see if it begins to pulse in the dark or respond to the programmer.

If it does not recharge, the light may require replacing. Contact Carmanah Technologies (see contact information at the end of the Introduction), and we will assign a Return Merchandise Authorization (RMA) number to you so that the light can be returned for inspection.

Q: What happens if birds perch on the Carmanah Aviation light?

A: Although the top of a Carmanah Aviation light does not have a bird spike to deter birds, we have not had problems with bird excrement accumulating on the domes. The solar panel is domed for ease of cleaning by rain. An optional bird spike is offered.

Q: Can I glue a bird-spike to the top of the Carmanah Aviation light?

A: This is **not** recommended.

Q: Are the lights bullet-proof?

A: Carmanah Aviation lights are made of extremely strong materials. Several lights have withstood bullets from small calibre rifles. However, we do not guarantee that the units are bullet-proof.

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Appendix B: Glossary of Terms

Autonomy:	How long a light can produce light without recharging.
Candela:	Standard measure of luminous intensity based on the response of the human eye.
Duty Cycle:	Amount of time the unit is flashing over entire cycle of flash pattern (e.g., 0.5 seconds "on", 3.5 seconds "off" has a 12.5% duty cycle or 0.5/4)
Effective Intensity:	Amount of brightness the human eye perceives.
Equivalent Intensity:	The average brightness a flashing light emits.
Fixed Light:	A light showing continuously and steadily.
Flash Character:	The properties of a light that distinguish its appearance (its flash character).
Flashing Light:	A light in which the total duration of light in a period is shorter than the total duration of darkness, and the appearance of light (flashes) are usually of equal duration.
Intensity:	The quantity (in candelas) of light reaching the eye of an observer after the light emitted by a source has gone through a lens, filter or protective covering.
Lux:	1 candela brightness at 1 meter's distance = 1 lux.
Nominal Range:	The luminous range of a light when the meteorological visibility is 13nm (T=0.8).
Peak Intensity:	The maximum brightness a light emits.
Signal Colour:	The colour of the light exiting the light (e.g., red, green, white). Defined by its charted chromaticity coordinates or the wavelength of the light (in nanometers).
Unitized:	Designed to be an all-in-one sealed unit (no assembly required). This helps make an item weatherproof and vandal-proof.
Vertical Divergence:	Angle over which the light exits the light in the vertical axis. A greater vertical divergence increases the allowable tilt of the light but reduces the intensity of the light.

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Appendix C: Catalogue of Carmanah Aviation Lights & Accessories

You can see our full catalogue of solar Aviation Lights at: www.solarairportlights.com

Model A501

Barricade or Hazard Marking Light

The A501 is a cost-effective solar-powered LED light ideal for any low-intensity nighttime marking applications. The A501 has been used for all types of general aviation and private airfield lighting and is especially well suited for barricade marking. At commercial airports, the A501 is allowed for barricade lighting as per FAA Advisory Circular AC150/5370-2E.

What sets the A501 apart from any other light is its unique encapsulated design. The unit is completely waterproof, vibration-proof and vandal-resistant. It is designed for autonomous operation without any maintenance (i.e. bulb or battery replacement) for up to 5 years.

The A501 is available in blue, red, amber, white and green LED output colors using a clear lens.

Model A601

Taxiway / Obstruction Light

The A601 is the world's most advanced solar-powered LED aviation light with 2 miles of visibility.

Used in obstruction and airport lighting applications at commercial, Air Force and general aviation airports, the A601 is extremely durable, reliable and requires no scheduled maintenance for up to 5 years.

Ideal for:

- Taxiway Edge Lighting (Meets the requirements of ICAO Annex 14, Volume I, Sections 5.3.16.6 and Appendix I, 2.1.1 for taxiway edge lighting)
- Obstruction Light
- Apron Edge Light
- Barricade Light
- Wind Sock Light
- Helipad Perimeter Light

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Model A702

Runway / Obstruction Light

Initially designed for expedited airfield lighting with the U.S. Air Force and the U.S. Army, the A702 Runway Light is the first solar powered LED aviation light to be used for fixed wing operations at remote airfield landing strips and expedited airfields.

Fully integrated, self-contained and watertight, the Model A702 is used for temporary and permanent runway edge lighting, obstruction lighting and heli-pad lighting applications.

The Model A702 is ideal for use in regions where daily solar illumination at least 1.5 hours of winter sunlight.

Ideal for:

- Runway edge lighting
- Military expedited airfields
- Obstruction lighting
- Helipad lighting
- Telecommunication towers
- Wind energy masts

Model A702T

Sectored Threshold Light

Initially implemented for expedited airfield lighting with the U.S. Air Force and the U.S. Army, the 700 Series are the first solar powered LED aviation lights to be used for fixed wing operations at remote landing strips and expedited airfields.

The Model A702T is fully-integrated, self-contained and completely watertight. It is designed for permanent, temporary and expedited runway threshold edge lighting applications.

The A702T features a unique split red/green LED array with a clear lens for precision illumination and optimal brightness.

With 4 solar panels and significant power storage capacity, the A702T is designed to operate reliably at any location featuring a minimum of 3 hours of winter sunlight.

Ideal for:

- Short Airfield Lighting Systems
- Military Expedited Airfields
- General Aviation Airports

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- Displaced Runway Thresholds
- Private Airstrips
- Remote Runways

Model A702C

Runway Caution Light

Initially implemented for expedited airfield lighting with the US Air Force and the US Army, the 700 Series are the first solar powered LED aviation lights to be used for fixed wing operations at remote landing strips and expedited airfields.

The Model A702C is fully integrated, self-contained and completely watertight. It is designed for permanent, temporary and expedited runway caution zone lighting applications.

The A702C features a unique split amber/white LED array for runway end caution zone lighting along the last 2000' of runway. The A702C offers a clear lens for precision illumination and optimal brightness.

Ideal for:

- Military Expedited Airfields
- Remote Runways
- Private Airstrips

601 Mounting Plate

The Carmanah airport A601 mounting plate is designed for elevated edge lighting for stake mounted or floor flange installations on concrete and dirt surfaces. Applications include: taxiway edge lighting, apron edge lighting, helipad edge lighting and obstruction lighting. Manufactured to provide FAA maximum height requirements of 14", the Carmanah A601 mounting plate will adapt to 1.5" and 2" to 1" frangible couplings with set screws for secure fit. The mounting plate is manufactured out of steel with powder-coated aviation yellow for daytime visual guidance. The Carmanah 1.5" or 2" Floor Flange is recommended for permanent or temporary installations using the A601 Mounting Plate.

702 Mounting Plate

The Carmanah airport A700 Series mounting plate is designed for elevated runway, threshold and runway caution edge lighting. The A700 Series mounting plate is designed for stake mounted or floor flange installations on concrete and/or dirt surfaces. Manufactured to fit 1.5" or 2" to 1" frangible couplings, the A700 Series mounting plate is designed to bolt into the bottom of the A700 series aviation light using stainless steel

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bolts. Powder coated aviation yellow, the A700 Series mounting plate adapts to the 1.5" Carmanah Floor Flange using a 1.5" frangible coupling or the 2" Carmanah Floor Flange using a 2 to 1" frangible coupling. Common size of the airports coupling will determine which floor flange is ordered.

1.5" Frangible Coupling

The 1.5" frangible coupling is compatible with the Carmanah A600 & A700 Aviation lights for stake mount and floor flange installations at civilian and military airfields. Easily adapted to concrete and dirt mounted surfaces, the set-screw will allow for quick adjustment in the event of jet blast or collision.

2" to 1" Frangible Coupling

The 2" to 1" frangible coupling includes a 1" column with additional set screw for secure installation using Carmanah aviation accessories. The 2" to 1" frangible coupling adapts to the 1.5" Carmanah Floor Flange, the 2" Carmanah Floor Flange, the 601 airport mounting plate and conventional 2" threaded NPT stakes. The 2" to 1" frangible coupling is manufactured out of aluminum, providing FAA compliance for high and medium intensity edge light requirements.

The 2 " NPT Frangible Coupling will provide a permanent, temporary or expedited mounting system for Carmanah aviation lights.

2" Floor Flange

The 2.0" floor flange is designed for concrete installations using the 2" to 1" frangible coupling for taxiway, runway, threshold, apron, or helipad edge installations. The 2.0" floor flange is excellent for permanent installations where current infrastructure is not in place and edge lights need to be secured and frangible.

1.5" Floor Flange

The Carmanah 1.5" floor flange is designed for concrete installations using the 1.5" frangible coupling for taxiway, runway, threshold, apron, or helipad edge installations. The 1.5" floor flange is excellent for permanent installations where current infrastructure is not in place and edge lights need to be secured and frangible.

Airport Mounting Stake

Made out of galvanized steel, the all weather airport mounting stake allows for permanent installation in earth and gravel environments at general aviation airports and

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remote defense airfields. The 30" steel airport mounting stake is available in 2" and 1.5" coupling configurations. Frangible coupling size must be determined before ordering.

Stake (Angle Iron) Mounting Instructions:

Using an auger, drill a 3" to 4" diameter hole to a depth of 30" (76 cm). Install the top of the stake even with, or not more than 1/2" (1.3 cm), above the finished grade and maintain within 1 degree of the vertical. Backfill around the stake with thoroughly compacted earth (or suitable backfill material such as sand or concrete). For hard bedrock or sediment areas, 15" stakes can be used.

Infrared Programmer

Models A601 and A702 are user-programmable using an optional infrared programmer. Functions available through the programmer include:

- Flash code settings
- Intensity and autonomy adjustments
- LUX Level adjustments for the photoelectric switch that automatically turns the
- Activation / deactivation ability for storage or transport
- A battery voltage check to determine the relative health of the battery system
- About the infrared programmer

The programmer employed by Carmanah to control its Model A601 and A702 aviation lights is a standard infrared unit, identical to those used to operate televisions, VCR's, stereos, etc. Why use a standard infrared programmer? There are many reasons behind this decision:

1. Infrared technology requires minimal additional power to work effectively -- an important feature for our solar-powered, self-contained products.

2. The programmer is simple to use and people are typically familiar with this type of user interface.

3. The programmer is easy to replace in the field. If a user breaks or loses a programmer, the user can purchased a new programmer at any electronics supplier and initialize it to program Carmanah's lighting products (obviously, a special security code is required).

4. The programmer is extremely cost-effective. These programmers are mass-produced and the cost is very low relative to the cost of supplying a programmer custom manufactured by Carmanah.

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Appendix D: Installation Instruction for Model A601

Introduction

This instruction is used to define the correct torque settings and fastener installation for the Model A601 light.

Note: Exceeding the recommended torque can result in the delamination and cracking of the light base.

Method

Getting Started:

- If mounting an A601 light with switch, avoid mounting the light to any surface that attracts a magnet, as it may interfere with the operation of the switch.
- When using a mounting surface of 3/16" thickness or less, the following fastener kits are recommended:
    a. P/N 38334 (non-security)
    b. P/N 38335 (security) mounting kit.
- Fastener threads should be clean, dry and burr free prior to beginning installation.
- The mounting points should be flat (coplanar) to within +/- 1/16".
- The mounting points should not cause the fastener to bind into the mounting flange of the light.
- Non-permanent thread locking compound should be used when the nut does not having a locking feature. Alternately, two nuts may be used and "double-nutted" if the fastener length is sufficient.
- The head of the fastener should be held static with the appropriate tool, and the torque instrument used to apply the correct torque to the nut.

If the CTC fastener kit bolts are of insufficient length to suit the installation location, the following parts may be used by determining the length of the fastener required.

Quantity	Description
3	Hex head screw, ¼-20, stainless steel, 1.5" minimum length
6	Washer, 5/8" OD x ¼" ID, flat, stainless steel
3	Washer, ½" OD x ¼" ID, flat, stainless steel
3	Nut, nylock, ¼-20, stainless steel

Follow the correct order of fastener installation outlined in Figure 1 and Steps 1 through 6 on the next page.

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Figure 1 shows the correct order of installation (non-security fastener kit shown for example).

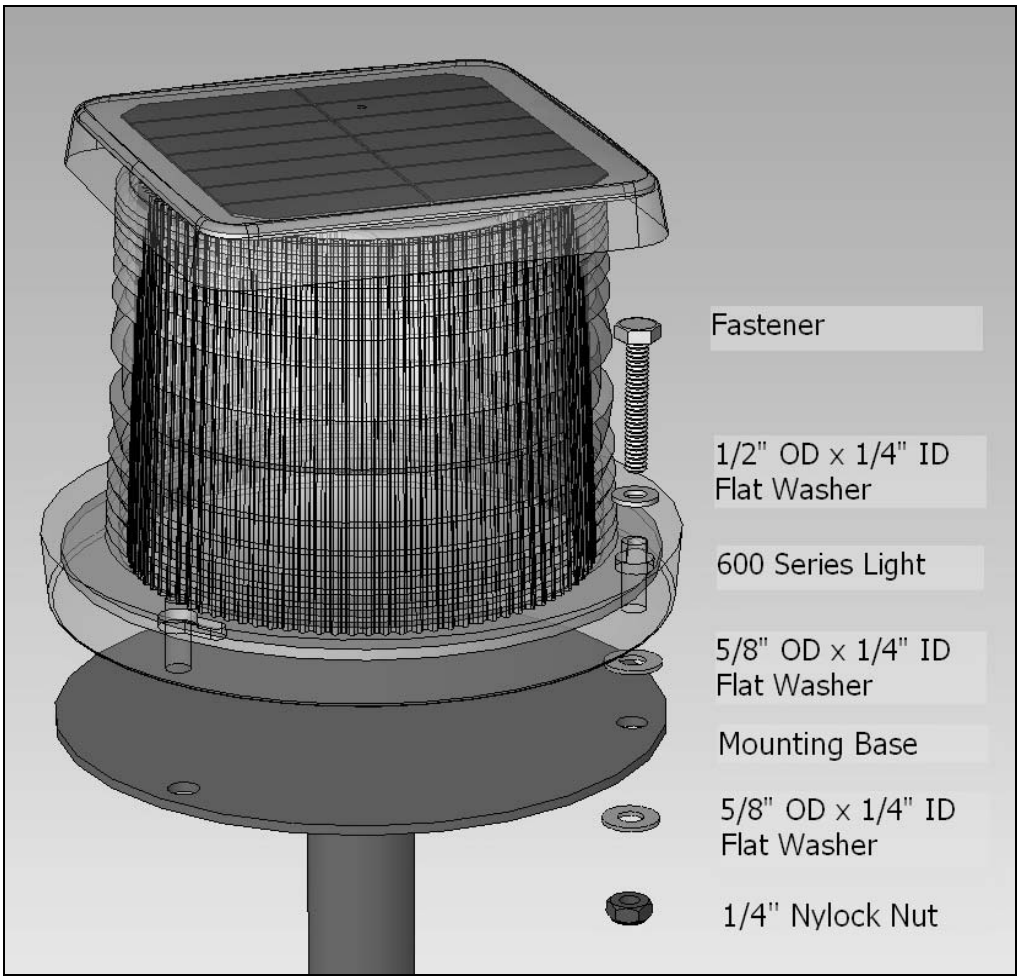

Figure 1: Exploded View of Installation

Installation Instructions:

1. Place a 5/8 " OD x ¼ " ID Flat Washer onto the mounting base over the mounting hole. Repeat for all three holes.
2. Place the light onto the mounting base ensuring the mounting holes in the base line up with the mounting holes in the mounting plate.
3. Place a ½ " OD x ¼ " ID Flat Washer over the mounting hole on the lights base. Repeat for all three holes.
4. Place a fastener from the top through the assembly. Repeat for all three holes.
5. Place a 5/8 " OD x ¼ " ID Flat Washer onto the end of the fastener then hand tighten the supplied ¼" nut onto the end. Repeat for all three fasteners.
6. **Torque each fastener to 40-45 inch pounds. Do not over-torque.**