



Carmanah®

OWNER'S MANUAL

Solar-Powered LED Pedestrian Crosswalk Flashing Beacon - Model R820



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R820 - 36983

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1.0 Introduction

The Model R820 solar-powered flashing beacon increases the visibility of pedestrians using uncontrolled crosswalks. A typical installation consists of two pairs of flashing beacons, each mounted on poles at opposite ends of the crosswalk. Pedestrians activate the R820 solar roadway lights by pressing a button installed on either pole. The two units communicate with each other using radio signals. On each pair of lights, one light is flashing towards traffic approaching the crosswalk from each direction. Coming from either direction, drivers will see two flashing lights, one on each end of the crosswalk. When activated, drivers will see a “bouncing-ball effect”, with lights flashing on alternate ends of the crosswalk. The R820 system can accommodate additional beacons, either in the median, overhead, or in advance of the crosswalk.

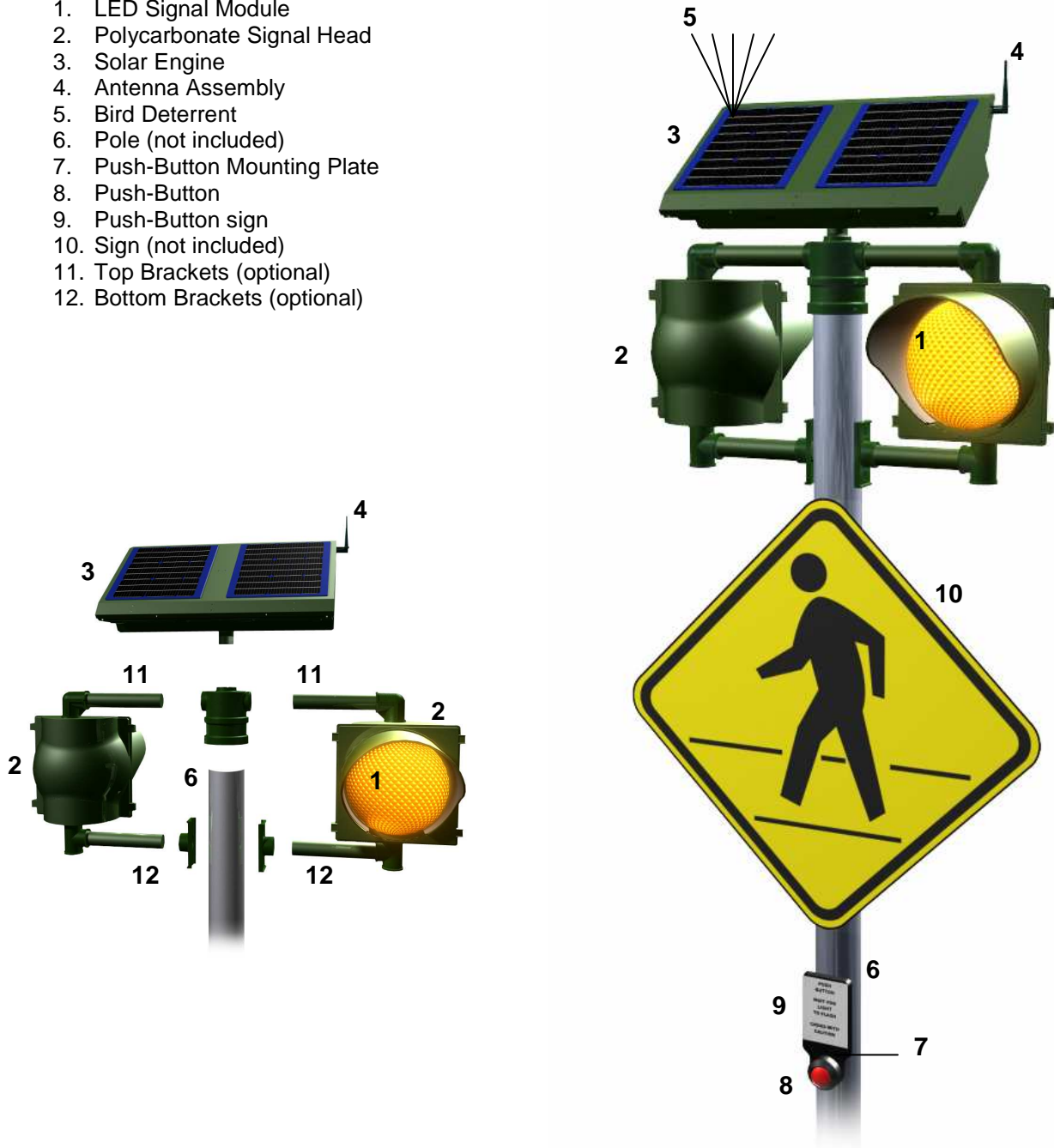
Since the R820 operates entirely by solar power, connecting to grid power is unnecessary. In addition, wireless communication between units means that the R820 requires no trenching of cables across the roadway. The R820 solar-powered roadway light is designed to operate reliably under all environmental conditions with no scheduled maintenance for up to 5 years.

WARNING: The R820 is a warning beacon and is intended to be used as a supplemental emphasis to warning signs located at uncontrolled marked crosswalks, as specified in the 2003 Manual of Uniform Traffic Control Devices, Chapter 4K . It is not a traffic control device. It is the responsibility of the pedestrian to ensure traffic has stopped before entering the crosswalk; this is clearly noted on the information plate mounted with the activation pushbutton. The R820 is only a supplement for an uncontrolled marked crossing.

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.

2.0 Component Identification

1. LED Signal Module
2. Polycarbonate Signal Head
3. Solar Engine
4. Antenna Assembly
5. Bird Deterrent
6. Pole (not included)
7. Push-Button Mounting Plate
8. Push-Button
9. Push-Button sign
10. Sign (not included)
11. Top Brackets (optional)
12. Bottom Brackets (optional)



3.0 Configuration & Installation Instructions

Installing the R820 is a quick and relatively smooth procedure that can normally be carried out by existing road maintenance crews. The installation instructions in this manual are divided into three parts: choosing a location, unit configuration and pre-wiring in the shop, and field installation. Please read this manual to determine what tasks should be completed in the shop prior to the field installation portion of the job.

Required Tools:

- Socket Set
- Crescent Wrench
- Tap and Die Set
- #2 Phillips Screwdriver
- 5/32" Allen Key
- Fish Tape
- 12-15 ft Ladder
- Level
- Compass

3.1 Choosing and Preparing a Suitable Location for Installation

Likely a suitable location will already have been selected at the time of order. However, please ensure that each of the criteria outlined in this section have been met before proceeding with the installation.

3.1.1 Optimal Solar Location

As the Carmanah Model R820 is a solar-powered device, it is critical to position the unit in relation to the optimum angle of the sun in order to achieve maximum solar power generation.

To do this, the Solar Engine must ideally be installed in a non-shady location where it can be angled towards the equator for maximum solar exposure during daylight hours. See section 3.5.3 for more details.

3.1.2 Minimum Distance between Systems

Figure 1 shows the minimum distance that must be maintained between independent systems using the same radio channel. If independent systems are required to be located less than 300 meters from each other the radios in each independent system **MUST** be set to different channels.

Please refer to section 3.2.3 for information on setting the radio channel.

3.1.3 Preparing the Pole Mount

The R820 lights are mounted on a pole that will most likely be affixed to a base with the necessary mounting hardware. If concrete foundations will be used, concrete bases will need to be poured before the installation of the system. See Figure 2.

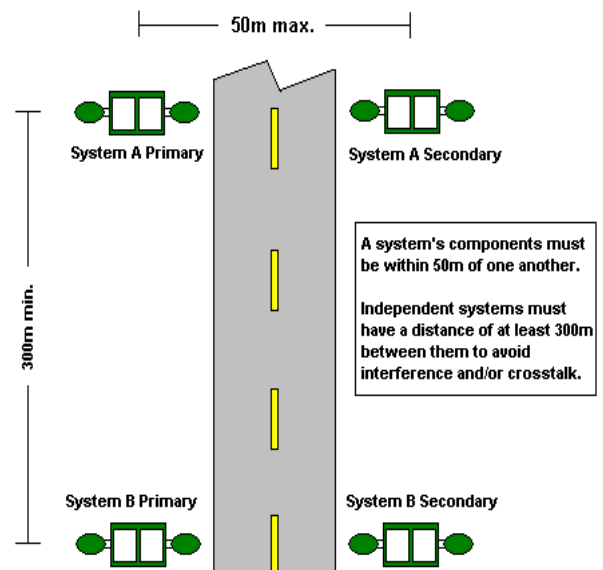


Figure 1: Minimum Spacing Between Two Systems Using the Same Radio Channel



Figure 2: Concrete Base

3.2 Configuring the Solar Engine Prior to Installation

R820 solar roadway beacons should be configured before being installed at the selected location. This is especially important when installing multiple R820 units as the job can be divided between shop and field time.

3.2.1 Preparing the Bird Deterrents and Antenna for Installation

There are two items attached to the Solar Engine: bird deterrents and an antenna. Both items are shipped with the R820 solar roadway light. The small deterrents discourage birds from using the R820 as a perch.

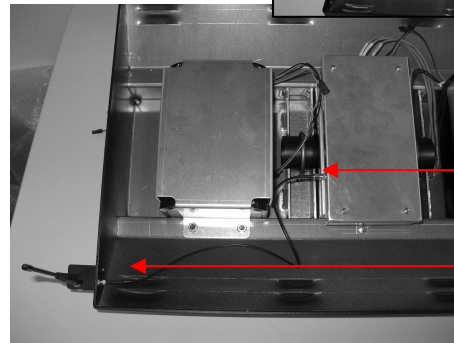
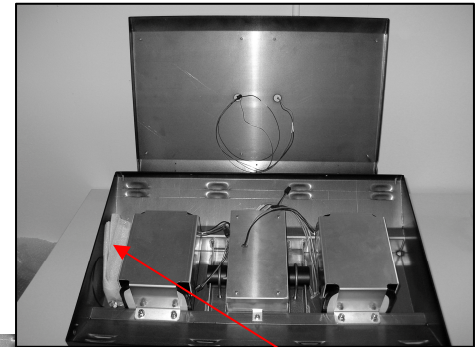
The antenna broadcasts or receives the radio signal to ensure each of the R820 beacons act as a system. The antenna is shipped inside the Solar Engine component when it comes from the factory. As shown in Figure 3, the antenna is wrapped in foam and placed on the left side of the enclosure.



Figure 2: Bird Deterrents

To set up the external pieces attached to the Solar Engine, complete the following steps:

1. Identify the three bird deterrents and set aside.
2. Remove the cover with the solar panels from the top of the Solar Engine.
3. Attach each of the three bird deterrents, included with the R820, to the top of the solar panel via the pre-drilled holes. Ensure the solar panels remain as clean as possible.
4. Detach the co-axial cable from where it is connected inside the Solar Engine, and remove and unwrap the attached antenna.
5. Remove the mounting screw for the antenna bracket, located on the side of the Solar Engine.
6. Insert the co-axial cable through the hole in the side of the Solar Engine, and carefully thread the co-axial cable onto the gold colored fitting on the electronics enclosure from where it was just removed it.
7. Pull the cable through the hole and position the antenna bracket over the mounting screw hole on the side of the Solar Engine.
8. Use the mounting screw to attach the antenna bracket to the Solar Engine.



Antenna wrapped in foam

Co-axial cable

Antenna

Figure 3 (top): R820 as shipped from the factory.
Figure 4 (bottom): Antenna Assembly

3.2.2 Temporarily Connecting System Pieces to Configure System

To configure the flash duration and timer delay, the R820's button, signal heads and batteries must be temporarily connected.

1. Carefully unwrap the three wires running from the mounting tee located on the bottom of the Solar Engine.
2. Remove the button assembly from the button mounting plate.
3. Attach the button wire from the Solar Engine to the button contacts.
4. The button wire has two ring terminal connectors.
5. Connect the remaining two wires to the two signal heads.

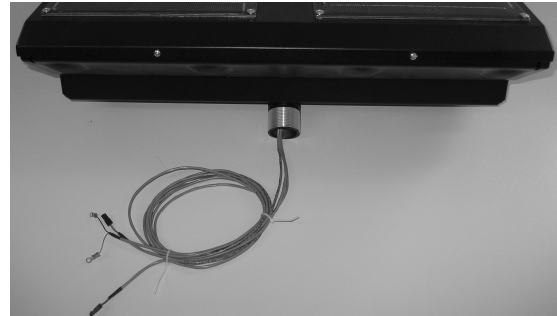


Figure 5: Button Connector Wires

Note: The signal head connections use Molex quick connectors.

Figure 6: Button Mounting Plate

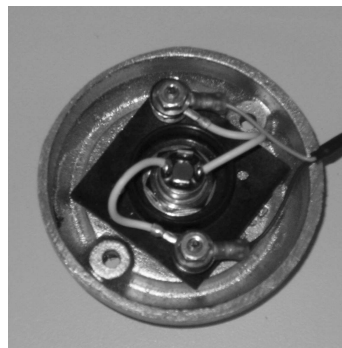
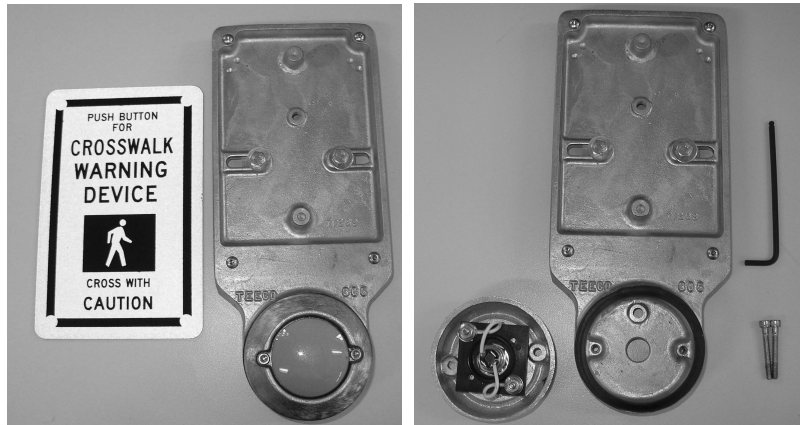


Figure 7: Button Contacts

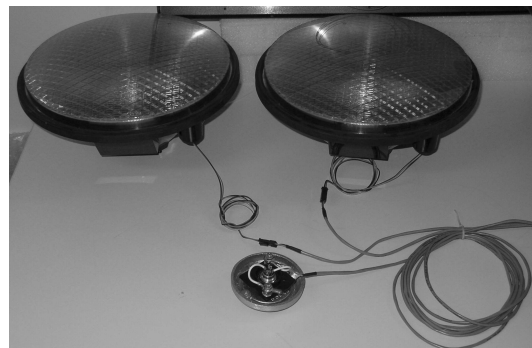


Figure 8: Signal Heads

3.2.3 Primary/Secondary Channel Selection

The channel chosen for each system must be the same in each unit of that system. Five channel switches give the possibility of 32 unique channels as shown in Figure 9, below. Each R820 system is shipped set to a factory default of one Primary and one or more Secondary, all at Channel 0.

Note: If the settings require changing at a later date, the batteries must be unplugged and then reconnected after the system is reconfigured for the new settings to take effect, as the system

reads the settings only upon power-up. It is recommended that configuration occur when the batteries are unplugged to minimize any potential safety hazard.

Note: For a system (two or more units) there must be only one primary – the remaining units in the system must be configured as secondary.

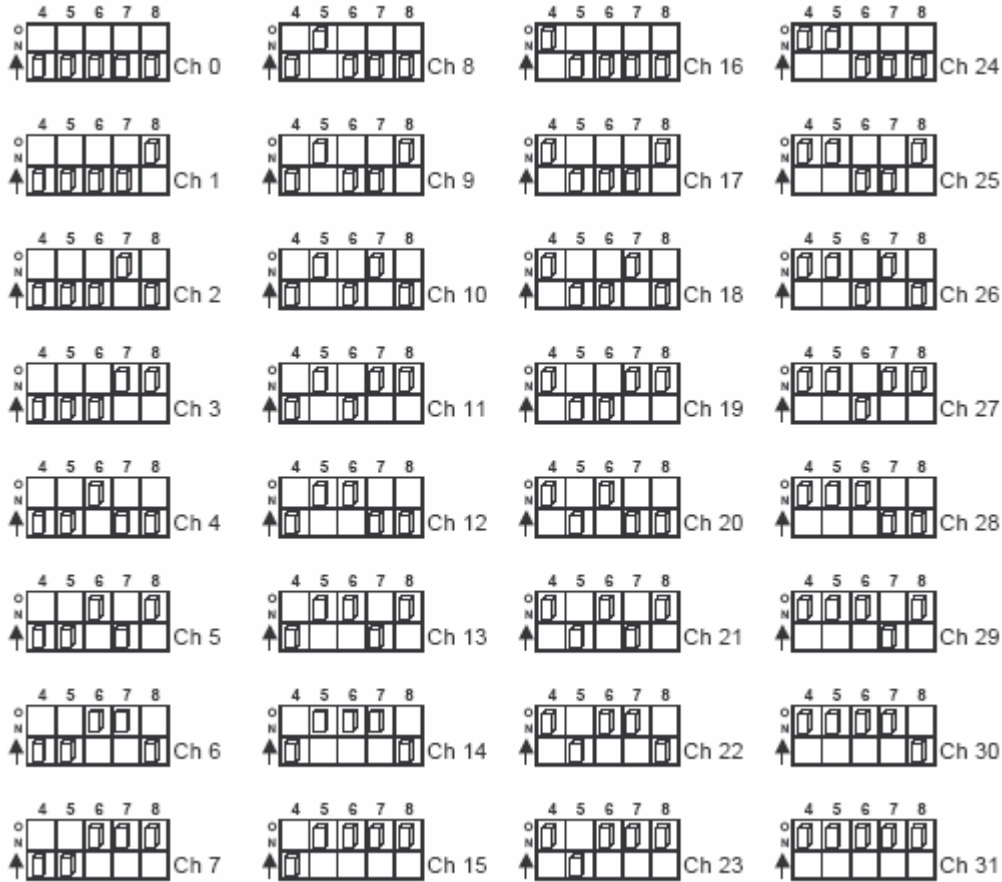


Figure 9: Channel Selection

To set the channels for each system:

1. Remove the logic card housing cover located between the two batteries (See Figure 10).
2. The DIP switches are located on the logic card and has eight individual switches (See Figure 11).
 - Switch 1 is used to configure the unit as a Primary or a Secondary. "ON" position is PRIMARY. "OFF" position is SECONDARY.
 - Switches 2 and 3 are not used.
 - Switches 4 through 8 are used to set the channel.

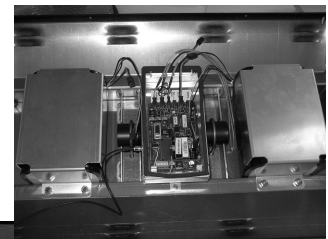


Figure 10: Logic Card Housing



Figure 11: DIP switch settings indicating a Primary unit on channel 0

3.3 Configuring the Flash Duration and Timer Delay

The customer can select the length of time the lights should flash after each button press and an optional delay time between uses. This is done in the first five (5) minutes following power-up of

the system. If the customer does not attempt to enter the configuration mode upon power-up, but simply presses the button, the previously stored settings will be utilized.

Each of the R820 units in a crosswalk installation must be configured individually, with the same settings. After product configuration is completed, the settings are stored in non-volatile memory. If the batteries are re-connected, and no change in configuration is desired, the product will continue to operate with its previous settings. The R820 system has two user-configurable parameters:

Flash Duration - The amount of time the light will flash after each button press by a pedestrian. The flash duration is set in 5-second increments, up to one minute. This command sequence sets the length of time the system will flash after one button press, and should consider the length of time it will take a pedestrian to cross the street.

Timer Delay - The amount of time the light will delay between uses before accepting a new button press. The delay is set in 5-second increments, up to one minute. If the delay is set to 0, a button press while the light is flashing causes the light to restart its timer at the time of the button press (the light will flash for "*flash duration*" seconds after the new button press).

3.3.1 Factory Flash and Timer Delay Settings

The default factory configuration is a 20 second flash duration with a zero second delay between activations. What this means is, if a second pedestrian should press the button while the light is flashing, the light will flash for 20 seconds starting from the moment the button is pressed.

To customize the flash duration and timer delay, follow the instructions provided in the next section.

3.3.2 Battery Connection, Customized Flash Duration and Timer Delay

The R820 ships with two battery packs that are disconnected for shipping. Configuration of flash duration and timer delay is performed during the five minutes immediately following battery connection. Battery connection is as outlined below:

1. Find the two connection wires from each battery pack: the longer terminating with a male connector, and the shorter terminating with a female connector.
2. With the bases of the batteries facing the person doing the installing, attach the long harness (male) of the left side battery to the short harness (female) of the right side battery.
3. Attach the long harness (male) from the right hand battery to the "Battery" connection on the PCB harness end of the battery nearest to the end of the PCB connectors. The short harness (female) from the left hand battery will remain unused.
4. The flash duration and timer delay for the system are now ready to configure as per the table below:

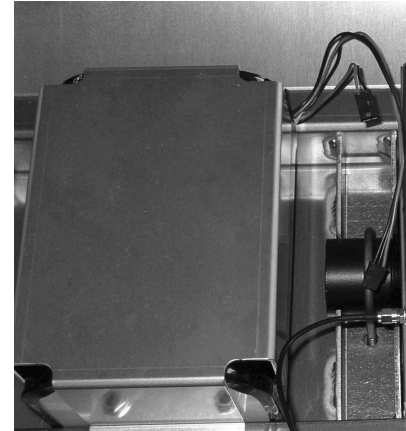


Figure 12: Left side battery pack showing short (female) and long (male) leads

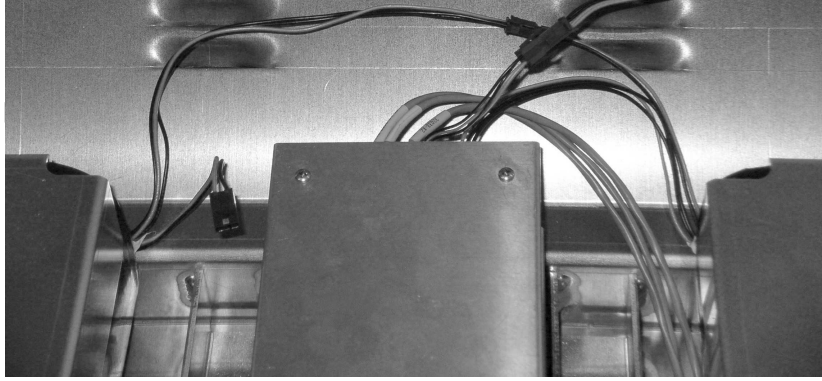


Figure 13: Battery Connectors

<p>Setting the Flash Duration</p>	<p>a) Press and hold the button for ~3 seconds. (until you see the unit quickly flash twice).</p> <p>b) Each subsequent button press adds 5 seconds to the flash duration starting at zero, i.e. 1 press = 5 seconds, 2 = 10 seconds, etc., to a maximum of 12 presses for 60 seconds. Further presses will not increase the time beyond 60 seconds.</p>
<p>Setting the Timer Delay</p> <p>Note: Steps a) and b) above must be completed before setting the timer delay. The process cannot be initiated at c).</p>	<p>c) Press and hold the button for ~3 seconds (until the light flashes quickly 4 times) to access the next command sequence.</p> <ul style="list-style-type: none"> • For zero seconds delay, go to Step d). • Each subsequent button press adds 5 seconds to the flash duration starting at zero i.e. 1 press = 5 seconds, 2 = 10 seconds, etc., to a maximum of 12 presses for 60 seconds. Further presses will not increase the time beyond 60 seconds. <p>d) Press and hold the button for ~3 seconds (until the light flashes quickly 6 times).</p> <p>e) The light is now set to the new values and will demonstrate its settings. If the new values are incorrect, you can repeat starting from Step a) within 30 seconds.</p>
<p>Resetting Factory Default Settings</p>	<p>Once the batteries are connected in Step 4 above:</p> <p>a) Hold the button for ~10 seconds (the light will flash once after 3 seconds, then several times after 10 seconds).</p> <p>b) The light is now reset to the factory default and will demonstrate its settings.</p> <p>Note: If the newly set values are not what are desired, the system will allow 30 seconds to either reset the unit to factory defaults or enter user configurable parameters.</p>

Note: If the user is in the Flash Duration Setting mode and holds the button for 3 seconds (i.e. tries to bypass the flash duration setting mode), the lights will flash 6 times and exit from the programming mode. The pattern displayed will be the previously programmed configuration.

Note: If two units with different user parameter settings are utilized in the same system, the unit that has its button pressed will determine the duration and delay for both units.

3.4 Preparing R820 Components for Field Installation

Now that the Solar Engine is configured, it must be prepared for installation:

1. Carefully re-install the logic card housing cover located between the two batteries. Ensure that the foam rubber gasket on the underside of the cover is positioned over the wires exiting the logic card.
2. Connect the solar panel wires located on the underside of the solar panel cover to the female connector with one red and two black wires going into the logic card housing.
3. Re-install the cover with the solar panels on the top of the Solar Engine. Ensure the notch in the top cover mates with the antenna mount.
4. Disconnect the button and the signal heads and carefully recoil the wires exiting the mounting tee located on the bottom of the Solar Engine.
5. The R820 Solar Engine is now ready for installation on the pole.

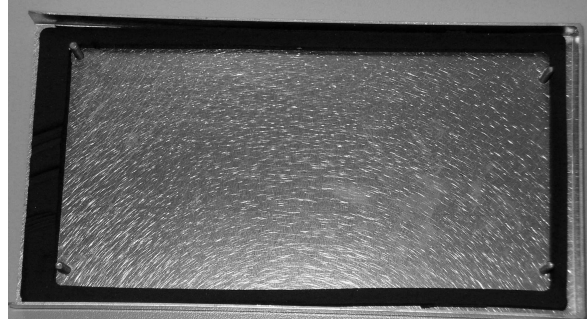


Figure 14: Logic Card Housing Cover

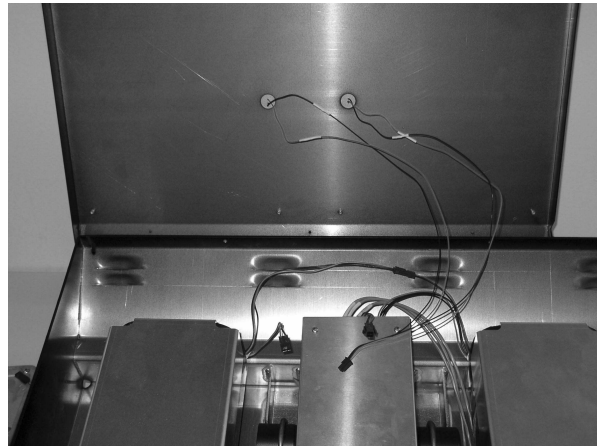


Figure 15: Solar Engine Assembly



Figure 16: Solar Engine top cover showing notch for antenna assembly

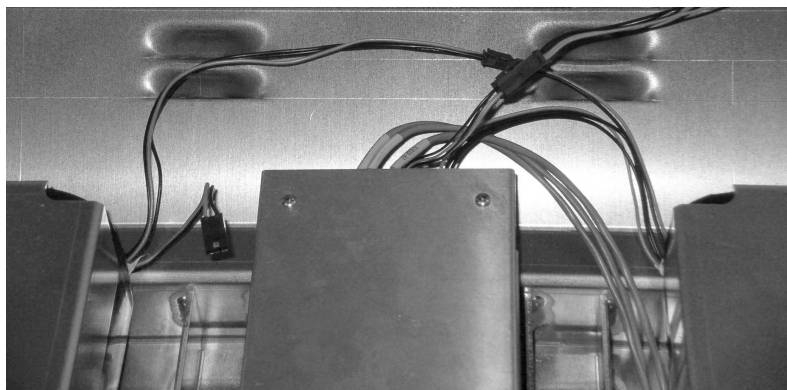


Figure 17: Solar Engine Assembly with wires connected

3.4.1 Using a New Pole, Wiring the R820 Button

If a new pole will be used in the installation, the holes for the R820 button hardware can be drilled while the poles are in the shop prior to field installation. Follow the instructions provided in section 3.5.2 to mount the button plate.

3.5 Installing the R820 on a Pole or Mast Arm

Note: As outlined in Section 3.1.3, ensure the concrete foundation with the necessary mounting hardware has been poured prior to pole installation.

3.5.1 Selecting the Poles

Typically, a 10-foot "Type 1" pedestrian pole is used for the installation. A "Type 9" with the mast arm for over the road configuration, or any other pole that has a 4" to 4.5" OD top cap, can also be used.



Figure 18: OD Pole

Note: If you use a 4" OD Pole, you will need longer bolts than those provided.

3.5.2 Using an Existing Pole, Wiring the R820 Buttons

Note: ADA regulations specify that the button should be 42" from the ground.

1. Tap the screw holes, and then file the edges to avoid damaging the wires during installation.



Figure 19: Button Plate



Figure 20: Screw Holes

2. Next, attach the button plate and the button sign to the pole using a socket set to tighten the bolts.
3. Use a fish tape to run the wires from the solar head to the button.



Figure 21: Push-button plate and sign (right)

4. Carefully thread the button wire through the mounting pole. (Figure 22).

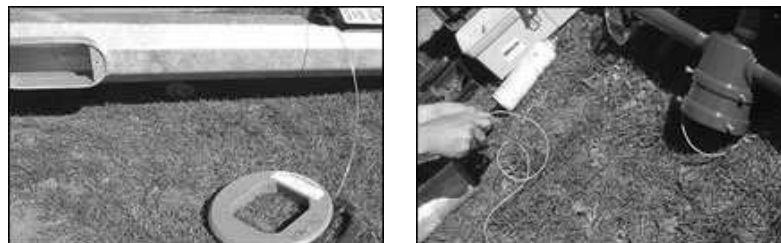


Figure 22: Mounting Pole & Wire



Figure 24: Button



Figure 25: Button Plate

5. Attach the button wires from the solar engine to the button contacts. This is the long harness with the two ring terminals.

3.5.3 Mount the Solar Engine

Two installers without the use of a bucket truck can complete the final step in the installation of the R820.

Note: If you are using a 4" OD pole, you will need longer bolts than those provided.

1. Simply attach the Solar Engine to the pole and finger-tighten the bolts.
2. Next, using two installers, stand the pole up and set onto the mounts.
3. Bolt the pole to the mounting hardware already poured in the concrete base.
4. Position the Solar Engine so that the unit achieves maximum solar power generation by angling the solar panel towards the equator and tipping it upwards at an angle equal to the latitude of the geographical location of the installation plus 5 degrees. (For example, Seattle, WA would require that the solar panel point south at an angle of 54 degrees up from the horizon (49 degrees Latitude plus 5 degrees)).



Figure 26: Solar Panel Assembly



Figure 27: Pole Installation

Rotate the Solar Engine on the Pole

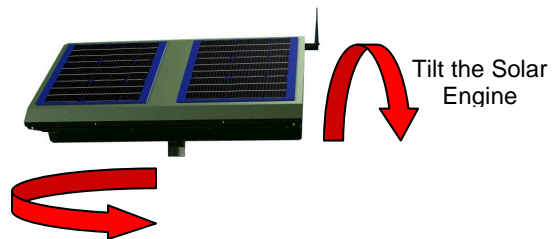


Figure 28: Adjusting the Solar Engine so that the Solar Panels Face the Equator

3.5.4 Install the Signal Heads

1. Install the signal head housing onto the upper support arm.
2. Connect the signal wire from the Solar Engine to the LED module.
3. Attach the bottom brackets then level the solar head and tighten the top cap bolts. The bottom brackets can be affixed with bolts or stainless steel straps.
4. Next, tighten the setscrew on the cap and position the lenses towards oncoming traffic.
5. Tighten the bolts inside the signal heads.
6. Attach the crosswalk signs to the poles.



Figure 29: Signal Head



Figure 30: Bottom Brackets

4.0 System Maintenance

Although the system is designed to be maintenance free, large performance gains can be made with clean solar panels and lenses.

Maintenance Type	Instructions
Cleaning: Yearly	<p>Use water and a soft sponge or cloth for cleaning and a mild, non-abrasive cleaning agent for more stubborn residue. Rinse well.</p> <p>Pressure washers should not be used (water forced up into the louvers may soak internal components).</p> <p>Note: Clean solar panels more frequently during drier months, as they may become soiled more quickly.</p>
Inspection: Yearly	<ol style="list-style-type: none"> 1. Check all electrical and mechanical connectors yearly to ensure they are clean, secure and undamaged. 2. The main battery housing has several vents and drain holes. Ensure that they are free of debris. 3. Visual inspection – check over exterior assembly for cracks, missing or broken hardware or other potential problems.

4.1. Troubleshooting

There are two faults that may occur with the R820 that will prevent the light from flashing:

1. Check the battery connection and the LED array connection to ensure that the connectors are fully inserted. As the light is designed to function as soon as the battery is plugged in, this should be fairly simple to diagnose.



2. IF SO EQUIPPED: Certain units have batteries that utilize inline fuses. In the case of system malfunction, open the inline fuse holder (pictured left), and check the state of the fuse. If the interior filament is intact, the fuse itself is functional, otherwise replace fuse with **Cooper-Bussman** model ABC-4 (4-amp fuse).

If your R820 flasher still refuses to operate correctly, contact Carmanah Technologies Corp. at 877-722-8877 or contact your distributor.

5.0 Service and Product Information

5.1 Service

Before contacting Carmanah's customer service department, please have the serial number of the Model R820 available, a brief description of the problem, as well as all details of the installation.

Carmanah products are covered by a standard 3-year pro-rated warranty. A warranty card is supplied with each unit. The warranty can also be viewed online at:

<http://www.carmanah.com/content/products/warranty/>

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Website: www.carmanah.com

5.2 Additional Products

Carmanah offers a variety of solar-powered and energy efficient LED lighting products. For roadway applications, Carmanah also manufactures solar 24 hour flashing beacons and school zone flashers, as well as LED internally illuminated street-name signs and traffic signs. For more information, please visit our website at: www.roadlights.com.

6.0 Appendix A: Product Specifications

Light Output

Daytime Effective Intensity, Flashing	570 Cd
Daytime Peak Intensity	800 Cd
Nighttime Effective Intensity, Flashing	285 Cd
Nighttime Peak Intensity	400 Cd
Average Day Range	0.5 mi/0.75km

Operation

Daily Operational Profile	2 hrs. Continuous or intermittent
<i>Example: 300 activations daily at 20 sec. per activation</i>	

Required Solar Isolation for Daily Operational Profile	2 hrs.
Continuous Operation Without Sun	30 Days minimum
Lifespan of LEDs	Up to 100,000 hrs.
Color Output	Yellow
Dominant Wave Length	590 nm
Flash Pattern/On Time/Off Time	0.55s/0.55s(MUTCD Compliant "Bouncing Ball")
Battery Capacity	400 Whr.

Lens

Colors	Yellow (ITE compliant)
Material	8" or 12" polycarbonate is hard coated for abrasion

Communication

RF Transmission	900 MHz (Frequency hopping spread spectrum)
Transmit Output Power	Less than 100 mW
Effective Range	165 ft./50 m/line of site operation
Antenna Type	Omni-directional dipole
Maximum Number of Independent Systems	64

Operating Temperatures

Optimal Ambient Range	-4° to 77°F (-20° to +25° C)
Maximum Ambient Temperature Range	-40° to 176°F (-40 to +80°C)
Storage Temperature	68° +/- to 5°F (20° +/- 5 °C)

Housing

Head and Support Structure	Powder coated aluminum
Signal Housing	Injection Molded UV stabilized polycarbonate
Switch	Die-cast aluminum with a 2" ADA compliant polycarbonate button

Trademark and Patents Pending

US Patent No. 6,573,659