

# ELECTROTEK R/C

## GEM 2000 AIRCRAFT NAVIGATIONAL LIGHTING SYSTEM

*Important-Read thoroughly before use*

GEM 2000 Navigational lighting systems incorporate the latest in IC integrated circuit technology. Rugged surface mount solid state design assures long term reliable performance. Lighting effects are provided by State of the Art LED technology. LEDs burn cool at only 1/10th the power of comparable incandescent lights and have a life expectancy of 100,000 plus hours. These systems are unique in their features, versatility & expandability. Their scale like function and performance will give your R/C model that little extra touch that will provide more exciting and fun filled flying hours, day or night.

### System Models Description

All models are available in either monitoring or non-monitoring versions (refer to GEM 2000 'Electronic Guardian' User's Guide). All three models are available in either Airplane or Helicopter versions. The only difference in the Airplane version is the addition of inline plugs for all wing lights for easy wing removal. All Models are expandable to 24 lights.

### Model STANDARD Input Ports

- A) 4 steady glowing ports support up to 16 marker and landing lights.
- B) \* 1 flashing port supports up to 4 red lights
- C) 3 Auxiliary power ports for accessory modules such as anti-collision strobes, interior lights panel lights, etc.
- D) 2 switch ports for independent remote on/off control. Nav and landing lights. The flashing beacon always remains lit when power is on.
- E) 1 port (#7) for monitoring indicator LED on monitoring versions.

ITEM	PART No.	DESCRIPTION
Infra Red Switch	DSW	Automatically controls NAV light on/off function via ambient lighting conditions
Cockpit Lights	CPL	5 mm red, blue or white LED's with remote leads) on mini module with variable brightness control and remote switching port.
Instrument Panel Lights	IPL	5mm red, amber or blue LED's with remote leads on mini module with variable brightness control and remote switching port.
AC Strobe Lights	ACS	5mm white LED's with remote leads on mini module dual adjustments for rate and duty-cycle. Remote switching port and lens caps.
Multi Sequencing Lights	MSL	5mm white LED's with programmable flash pattern sequencing. Set for 1, 2, 3 or more flashes per sequence. Dual flash and pulse adjustments for programming a wide flash variety remote switching port.
Landing Lights	LL	5mm LED's with chromed metal reflector holder and remote leads on mini module. Remote switching port.
Marz-Lites Flashing Beacon	MZL	5mm red LED's with remote leads on mini module. Dual adjustments for rate and duty-cycle. Remote switching port and lens caps. Choice of strobing or ramping effect.
Low Fuel Indicator	LFI	Adjustable low fuel level is indicated via LED. This feature can be designed into any monitoring version MCU or a separate module that plugs in the MCU.

**Model 2 Deluxe**—11 Input Ports Same as model #1 except port #1 is a built-in anti-collision strobe circuit instead of auxiliary power port and will support up to 4 white LED single sequencing strobes.

**Model 3 Ultimate**—9 output ports same as model #2 except the anti collision strobe circuitry is multi sequencing. You can adjust for 1-10 flashes per sequence in between short or long pauses. The one auxiliary power port will support up to 4 accessory modules.

\*All models feature manual dual adjustments to control flash rate (speed) and duty cycle (LED on/off timing). The red flashing light is available in either normal LED flashing style or ramping flashing style i.e., the LED actually ramps up (slowly or quickly) to full intensity, then fades out and resequences. This provides more realistic rotating beacon simulation.

### Hardware Kit

All systems on request can be custom designed. For dimensions and configuration so modifications are unnecessary. However, just in case you decide to change something, a complete hardware kit is included—extra wire, shrink tubing, mounting tape and hook & loop—three types of LED holders are also included. Black plastic clips for nearly flush mounting and removable colored lens caps for landing light or spot and reflector type holders are included. Optional Low Fuel Indicator (LFI) can even be built-in on request.

**Note:** The 'Ultimate' model MCU's numbered ports are different than the 'Standard' and 'Deluxe' models. However, each numbered port on the MCU's label has a description either abbreviated or written out.

### Technical Data:

Master control Unit (MCU)	L2-1/4 x W 1-3/8 x D 9/16"
Dimensions	26 grams (1 ounce)
Weight	ABS plastic (high impact)
Case Material	11 (numbered 1-11)
Total Inputs	Beacon - 1 flashing
Input Types	AC Strobes—1 Flashing
	Nav—3 Solid (Red, Grn, Wht)
	Landing—1 Solid
	Switch—2 (ports 1,9)
	Aux. Power—3 on Models Standard & Deluxe
	2 on Ultimate
	Monitoring—1 Blue
Power Range:	4-8vdc 16ma avg. per LED
Current Drain:	6.0vdc 2.6ma avg. per LED
LED's:	5mm Ultra-Brite
Total LED's:	Up to 24 (4 per port)

### Input Functions

- Channel #1 = On/Off switch for landing lights
- 2 = Landing Light(s)
- 3 = Solid glow red position light (left side)
- 4 = Solid glow Green position light (right side)
- 5 = Solid glow White position light (aft tail or fuse)
- 6 = Flashing Red beacon light(s)
- 7 = Blue monitoring indicator light
- 8 = Flashing White AC Strobes Models 2 & 3
- 9 = On/Off switch of all NAV lights except Red flashing beacon light(s).
- 10 = Aux. power for accessory module
- 11 = Aux. power for accessory module

### Remote Switch Relay Inputs

**Channel Port #1—Landing Lights(s)**  
Any mechanical on/off micro switch can be used that has a 'lever arm' or snap design. Actuate the switch via either the throttle or retract servo control horn arm or use a separate mini or micro servo mounted to a small board with the micro switch and control the on/off function by plugging into a spare channel. An electronic switch designed to open or close a circuit via a mechanical or solid state relay may be used also. Electronic switches that are designed to actuate via an electronic signal only cannot be used.

### Channel Port #9—NAV Lights

This switch input controls the on/off function of the solid glowing NAV lights and on Models 2 & 3 the flashing AC strobes. The flashing red beacon light(s) always remain on when the MCU is powered-up and cannot be controlled by the NAV lights switch.

**Note:** In channel ports 1 (landing lights switch) and 9 (NAV switching system) your system includes either an external 'wire jumper' or a switch harness plugged into these ports externally. Removing either interrupts their respective circuitry and turns off their lights. Ergo, the NAV lights and Landing lights can be on/off controlled independently by an external jumper or relay type on/off switch.

### Optional 'D-Switch' (NAV Lights)

This is a separate module designed to plug into channel 9 to

automatically control the NAV lights via an infra-red light sensing circuit that reacts to ambient light conditions. It's sensitivity is fully adjustable for any ambient lighting condition.

### Color Coded Inputs

**MCU**—If the single screw on the bottom case half is removed, the case halves will separate. Do this carefully because the top half is wired to the bottom half. Looking inside you'll notice the input connections are all color coded as are the connectors on the LED light and switch harnesses. When plugging into the MCU all color dots on the plugs must be facing upward toward the top half case label. In some instances an inline 2 pin plug may be used for convenience or necessity. **Always** make certain the dots match up to one another for proper polarity. The MCU's 3 built in input connectors (two 8 pin and one 4 pin) are polarity protected when 8 pin and 4 pin plugs are used. However, 2 pin plugs can and are often used for inputs 8, 9 & 10. Once again, **ALWAYS MAKE CERTAIN** the male 2 pin plugs color coded dots face upwards on Model numbers 1 & 2 that have Aux power inputs (8,10 & 11). Never plug an LED light or light harness into 8, 10 or 11. These ports are for accessory modules only. Ports 1 & 9 are for Switches Only. On Models Standard or Deluxe port #9 is a flashing input for strobing LED's only.

### Color Coded Inputs

#### Single Dot Input ID

- Ports #1 Yellow—for Landing Light
- 2 White—for white Landing Light(s)
- 3 Red—Left red solid glow NAV Light(s) only
- 4 Green—Right green solid glow NAV Light(s) only
- 5 White—Tail and solid glow white light only
- 9 Yellow—for solid NAV lights switch only
- 10 Pink—Aux. power for accessories only
- 11 Pink—aux. power for accessories only
- 8 Pink—aux. power only Models 1

#### Double Dot Input ID

- Port #6 - Red—Flashing red Beacon light(s) only
- 8 White—Flashing white Anti-collision Strobe light(s) on Models 2 & 3
- Port #7 Permanently wired in lead on Models Standard/Deluxe for Monitoring LED if applicable

#### Model 2 - Flashing Circuit

**Model 3 Ultimate** (2 Flashing circuits) In these model a second flash circuit has been incorporated for the Anti-collision Strobe light(s).

- Optional multi flash sequencing AC strobe lights are available in mini modules that plug into MCU channel ports 10 or 11. Contact Technical Support for information.

**Note:** The Ultimate model has built in multi sequence flashing.

**Models 1, 2 & 3** — Flashing adjustments. Red Beacon light(s)

**Duty Cycle:** The beacon flash circuit is located in the MCU's bottom case half on the right side. Micro pot R6 controls the 'duty-cycle' and varies the timing of on vs. off. Using a small jeweler's slotted screwdriver and a very light touch turn the pot clockwise to increase the LED 'on' light timing or turn the pot counterclockwise to increase the 'off' light timing.

**Rate:** C1 is a combination capacitor and micro-pot that together control the flash intervals. Turn the pot clockwise for a faster flash speed and counterclockwise for a slower flash speed

**Model 2 Deluxe**—The AC strobe circuit is located in the top case half. After removing the case screw on the bottom, lay MCU on table with label facing upwards so the channel port numbers read 1—7 left to right. Two wires hold the top to the bottom. Carefully remove the top and flip upside down and away from the bottom. The AC strobe circuit PCB is located on the left side and also has 2 micro pots. Follow the same adjustment procedure to Rate & Duty-Cycle.

**Model 3 Ultimate**—The 'Ultimate' Model has 2 PCB's located in the top case half. The left controls rate and duty-cycle pulses to the right halves LED flash circuitry. There's a very large range of pulse and flash sequences that can be achieved. If you desire to change the Mfg preset, just experiment with the 4 micro pots until you're satisfied with the resulting flash sequence.

#### Monitoring Adjustment

Monitoring Models. Please refer to GEM 2000 User's Guide for voltage setting adjustments. The monitoring circuit PCB is located on the top case half opposite the AC strobe PCB. On Model 1 the PCB is opposite the blank side of the top case half. Model Ultimate—Monitoring PCB located on lower left case half. Model 2 upper right half

#### Lighting Configuration (typical)

**Beacon:** A flashing red light is normally located on top of the vertical fin (tail). Commercial airlines usually have 2 located top and bottom fuse.

**NAV:**  
One solid red on left wingtip  
One solid green on right wingtip  
Commercial airliner's usually have 3 solid white. One on tracking edge of both wingtips and one on tail and on fuse.

**Anti-Collision Strobe(s):** Various locations—Nose, struts, wing leading edge or tip.

#### Helicopter (rotary craft)

**Beacon:** Flashing red (varies) - Vertical fin, mid boom, behind rotor mast and sometimes a second red is located on the canopy underside.

**NAV:** Red—left canopy, skids and/or horizontal fin.

**Landing Light(s):** (varies) - Stub wingtips, vertical fin underside canopy and mid boom.

#### Installation

**MCU** — Mount anywhere practical. Use affixed double sided tape on smooth surface. Hook & loop tape is included for easier removal, if necessary. MCU is shock and vibration proof so soft mounting in foam, etc is unnecessary.

**LED's Holders**— Caps: Plastic lens caps (for Beacon, NAV & Monitoring lights). This system comes with Fresnel type plastic LED holders called lens caps which aid in light dispersal and appearance. Holding the LED by the shrink tube protected base, pull the cap off and remove the white compression collar. The collar sits in a 1/8" groove so compress the caps 4 prongs with your fingers and slip/work it off. Drill 1/4" hole in flat 1/4" or less surface. Snap cap into place and snap in LED. Collar is not used to this type installation. The white collar can be painted to resemble a light base for the red beacon light(s). Drill a 1/4" hole. Use adhesive to secure cap and collar to surface. [Use silicone to help secure lens cap if surface is less than 1/8"].

**Chrome:** Landing light LED's have a rubber base designed to friction mount into a chromed metal reflector holder. The LED is recessed in the holder with no cap to disperse the light. This results in a narrowly focus beam of pure white light that projects in excess of 50 feet. Drill 5/16" hole in 3/16" surface or less and secure with split ring washer and nut. LED pushes in and is help securely by a rubber grommet.

**Clip:** Black Plastic LED clip type holder supplied if lens cap or chrome holder is not desired. Drill 1/4" hole in 3/16" surface or less. Push in clip and snap in LED. Adhesive is unnecessary. Clips give a nice finished appearance but do not disperse through narrow viewing angle like the lens caps do.

#### Wire Routing

Any and all LED wire leads can be modified, i.e., cut spliced etc., if necessary. Inline connectors can be used for convenience. For routing it's suggested to consider adhering flex tubing or pixie six straws through wing and tail panels and even through the fuse for tail end lighting. "NAV-Lites" kits come with extra color coded inline connectors for easy wing removal on airplanes.

### Power—Up

Plug directly or 'Y' into any Rx channel port if your MCU is monitoring versions 1-4. Battery pack is regulated. . . . Y in after switch and before regulator. . . . For Non-monitoring versions plug into Rx or any 4-8 to 6 vdc supply source.

### LIMITED LIFETIME WARRANTY

The 'Aircraft Navigational Lighting System' is warranted to be free from defects in material and workmanship for the lifetime of the original purchaser. If this product becomes defective, return it along with \$5.00 for shipping & handling to Electrotek R/C and it will be repaired or replaced at no additional charge for material or labor. Electrotek R/C is not responsible for damages or injuries that may result from exceeding its stated application ratings. In the event this product becomes defective from misuse or the abuse of its intended application for R/C models, this warranty shall become null and void.

For technical support contact:

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