PAPI – Infrared Operation Overview

USER MANUAL SUPPLEMENT

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1.0 Safety & Usage

The following symbols indicate important safety warnings and precautions throughout this manual:

WARNING indicates that serious bodily harm or death may result from failure to adhere to the precautions.

CAUTION indicates that damage to equipment may result if the instructions are not followed.

NOTE suggests optimal conditions and provides additional information.

1.1 Viewing Precautions

Do not view an actively emitting infrared or visible light from the side or top of the light (close to or on beam) from a range of less than 4 ft. (1.2 m). The PAPI is capable of emitting visible and infrared light energy that is harmful to the eye if viewed directly.

1.2 Wireless Precautions

Keep the Handheld Controller at a distance of at least 3 ft. (1 m) from the antennas of lights or other Handheld Controllers. It transmits a powerful radio signal that could damage sensitive receiver circuitry if operated at close range.

1.3 Warranty Disclaimer

This manual will familiarize you with the features and operating standards of the product. Failure to comply with the use, storage, maintenance, or installation instructions detailed in this manual could void the user warranty.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. Installation work must be done by a qualified person(s) in accordance with all application local codes and standards.

1.4 Recycling

This product may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. In order to avoid release of such substances into the environment, we encourage you to recycle the product in an appropriate way that will ensure most of the materials are reused or recycled. Check your local municipality for electronics recyclers.

1.5 Abbreviations

The following is a list of abbreviations used in the description of Airfield Lighting Systems. Some terms listed below may not be used in this document.

A	Ampere
AC	Alternating current
AGM	Absorbed glass mat
AH	Ampere-hour
APAPI	Abbreviated Precision Approach Path Indicator
BBA	Battery Box Assembly
cm	Centimeter
DC	Direct Current
FAA	United States Federal Aviation Administration
ft.	Foot
Hz	Hertz
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
in	Inch
IR	Infrared
kg	Kilogram
lb.	Pound (US)
LED	Light Emitting Diode
LHA	Light Housing Assembly
m	Meter
mm	Millimeter
MTBF	Mean Time Between Failure
NATO	North Atlantic Treaty Organization
NSN	National Stock Number
NVE	Night Vision Equipment
NVG	Night Vision Goggle
PAPI	Precision Approach Path Indicator
PCB	Printed Circuit Board
PCL	Pilot Controlled Lighting
PCU	Power Control Unit
RCT	Remote Control Transmitter
s	Second
SE	Solar Engine
STANAG	(NATO) Standardization Agreement
TDZ	Touchdown Zone
UFC	Unified Facilities Criteria
V	Volt
VAC	Volts, alternating current
VDC	Volts, direct current

1.6 Limitations of scope

- This manual supplement provides an overview of Carmanah Precision Approach Path Indicator infrared operation, for systems that are **equipped with infrared LEDs.**
- This manual is supplemental to the general user manual and is not intended as a replacement. Consult the general user manual for all other aspects of setup, commissioning and troubleshooting of PAPI systems.
- This manual supplement pertains to both portable and permanently-mounted systems.
- This manual is not specific to either solar or AC-powered systems, nor is it specific to system configurations within those categorizations. Supplemental information specific to each Precision Approach Path Indicator configuration is supplied with the purchased equipment under separate cover.

2.0 Theory of operation

Infrared light emitting diodes provide corridors of steady and modulated infrared (IR) light that is night vision goggle (NVG) compatible. The corridor of steady IR light corresponds and overlaps the white light corridor, and the corridor of modulated IR light corresponds to and overlaps the red light corridor. The flash rate is 2 times per second, and the modulation pattern is 50% on, 50% off.

The following is a description IR visual character as compared to glideslope for a 4-LHA PAPI system:

The indication for proper glideslope as seen with NVG is **two LHA** showing flashing light and the other **two** showing **steady** light to the pilot on approach to landing.

When the aircraft is well above the proper glideslope, then the pilot with NVG sees steady lights from all four LHA. When the aircraft is above the proper glideslope, then the pilot with NVG sees steady lights from three LHA and a flashing light from one LHA. When the below the proper glideslope, the pilot with NVG sees flashing lights emanating from three LHA and a steady light from one LHA. When well below the proper glideslope, then the pilot with NVG sees flashing lights emanating from all four LHA.

Note: For 2-LHA systems, visual indication of correct glideslope is determined by the same flashing or steady-state character as 4-LHA systems. The indication for proper glideslope as seen with NVG is **one LHA** showing flashing light and the other **one** showing **steady** light to the pilot on approach to landing.

Efficacy of PAPI systems and the safety of aircraft and personnel is contingent on the correct alignment of light emitting fixtures and maintenance of the overall system.

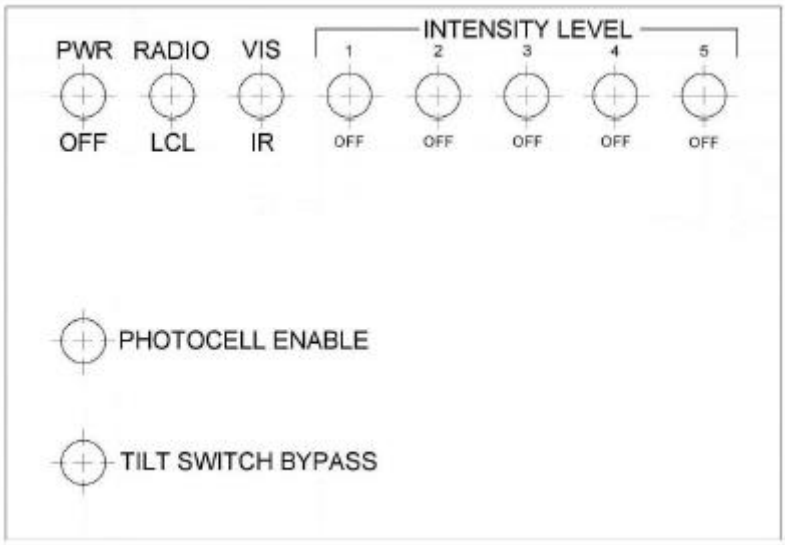
Installation, setup and maintenance of PAPI systems should only be performed by qualified personnel.

Do not view an actively emitting infrared or visible light from the side or top of the light (close to or on beam) from a range of less than 4 ft. (1.2 m). The PAPI is capable of emitting visible and infrared light energy that is harmful to the eye if viewed directly.

3.0 Power Control Unit Operating Procedures

3.1 Power Control Unit Switches

The Power Control Unit (PCU) has ten toggle switches on its control panel. The two switches on the left of the top row are for control. The third switch, from left-to-right, is for selection of the operating mode of the LHA, either visible signals or IR signals. The next five toggle switches are used to select the intensity step. The toggle switch on the left side, below the top row enables or disables autonomous photocell operation. The toggle switch on the bottom is to enable or disable tilt switch functionality.



Power Control Unit (PCU) control panel layout.

Note: Above configuration depicts IR and Tilt Switch control panel layout.

The toggle switches – top row:

- The switch on the left-hand side marked with "PWR" turns the system on and off. When this switch is in the off position, no power is supplied to the LHAs and radio remote controller signals will not be received by the PCU
- The local-radio switch determines if the PCU options are chosen by the remaining switches on the PCU control panel or by the radio remote controller. If this switch is in the "RADIO" (radio) position, then the PCU operation options are activated by the radio remote controller (optional). If this switch is in the "LCL" (local)

position, then the PCU options are selected by the positions of the switches to the right and below of this switch

- The switch marked with “VIS/IR” determines if the visible (white/red) or infrared sources of the LHA’s are turned on when the local-radio switch is in the local control position ("LCL"). ****If the local-radio switch is in the radio ("RADIO") position, then the position of this switch is ignored.**
- The intensity switch marked with “5” determines if the corridors of the LHAs are turned on the high setting (100% intensity) when in local control mode. If the local-radio switch is in the "RADIO" position, then the position of this switch is ignored
- The intensity switch marked with “4” determines if the corridors of the LHAs are turned on the 20% intensity level when in local control mode. If the local-radio switch is in the "RADIO" position, then the position of this switch is ignored
- The intensity switch marked with “3” determines if the corridors of the LHAs are turned on the 4% intensity level when in local control mode. If the local-radio switch is in the "RADIO" position, then the position of this switch is ignored
- The intensity switch marked with “2” determines if the corridors of the LHAs are turned on the 0.8% intensity level when in local control mode. If the local-radio switch is in the "RADIO" position, then the position of this switch is ignored
- The intensity switch marked with “1” determines if the corridors of the LHAs are turned on the lowest setting (0.16% intensity) when in local control mode. If the local-radio switch is in the "RADIO" position, then the position of this switch is ignored.

3.2 General notes on IR operation:

The following applies to IR equipped systems:

-Systems without photocell control-

1. When the system is operating in IR mode, system control is maintained via the local control (panel switches) **or**, via the hand held controller – depending on the position of the “RADIO/LCL” control switch.

-Systems with photocell control-

2. When the system is operating in IR mode, system control is maintained via the local control (panel switches) **or**, via the hand held controller, **or** via the photocell – depending on the position of the “RADIO/LCL” or “PHOTOCELL ENABLE” control switches.

3. With the system operating via photocell, “PHOTOCELL ENABLE” – UP, the system will NOT respond to either local intensity control or, intensity and on-off control via the hand-held controller.

4. When operating in IR and photocell mode concurrently, the system will automatically maintain 100% intensity during the daylight hours then revert to 5% intensity at night. (See table at the end of this section).

5. For nighttime IR operation, multiple-step intensity control can only be achieved via local control or via the handheld controller – with the photocell mode “inactive”.

3.2.1 Infrared Operation, Modes and Intensities:

Mode	Intensity Setting	Fixture Intensity - Infrared (mW/sr)	
High	100%	225	
Med.	20%	45	
Low	5%	11	

3.2.2 Infrared Mode Function Table

Photocell Control	Local "LCL" Control	Wireless "RADIO" Control	Output LEDs	Intensity	Activation
-	-	Auto Low IR	Infrared	Low	24 hr. continuous
-	-	Auto Med IR	Infrared	Med	24 hr. continuous
-	-	Auto High IR	Infrared	High	24 hr. continuous
-	-	Temp Low IR	Infrared	Low	15 min. -> OFF
-	-	Temp Med IR	Infrared	Med	15 min. -> OFF
-	-	Temp High IR	Infrared	High	15 min. -> OFF
-	INTENSITY LEVEL "3"	-	Infrared	Low	24 hr. continuous
-	INTENSITY LEVEL "4"	-	Infrared	Med	24 hr. continuous
-	INTENSITY LEVEL "5"	-	Infrared	High	24 hr. continuous
**Automatic (100%)	-	-	Infrared	High	Daytime Only
**Automatic (5%)	-	-	Infrared	Low	Nighttime Only

Note: **Applies only to systems equipped with photocell control and in photocell "enabled" mode.

4.0 Product Support

This product is covered by the Carmanah warranty. Visit carmanah.com for additional information.

Before contacting Carmanah's customer service department, please have the serial number of your product available, a brief description of the problem, as well as all details of the installation and recharging efforts (if applicable).

For additional information regarding PAPI systems or any other specialized Carmanah products, please contact Customer Service or, Sales Engineering – Signals Division.

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