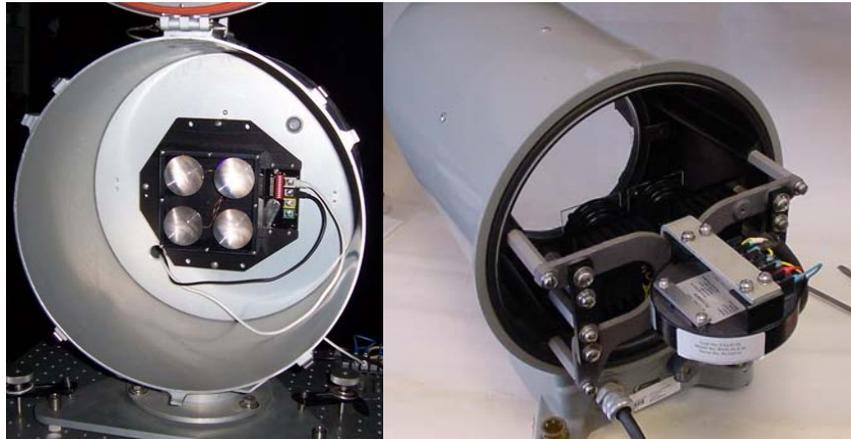


BWT LIGHTING AND CR CONTROL SYSTEMS FA-240 & RL14 LED RETROFIT KITS INSTALLATION & SERVICING INSTRUCTIONS

The Coast Guard embarked on a program to eliminate 12-volt, 0.25-ampere lamps from its inventory by converting all floating, fixed aids and ranges using this lamp to LEDs. Part of that program was to develop a LED retrofit kit for the FA-240 and RL14 range lanterns. BWT Lighting and CR Control Systems were awarded contracts for replacement kits for all range lanterns using 0.25a lamps.



CR LED in RL14

BWT 2LED in FA-240

Selection/Identification

BWT uses two different LED assemblies for the FA-240 and RL14 lantern. The two-head LED assembly fits the FA-240 and the four-head assembly fits the RL14. CR Control Systems uses one four-head LED assembly for both the FA-240 and RL14 lanterns. Each assembly consists of a LED head and programmable flasher/LED driver. For aids with synced passing lights, use the CR LED Range conversion and a CR 8920P flasher (available from the manufacturer).

Simulating an incandescent lamp with an LED in range lanterns proved to be too difficult as focus was very critical. Instead, we replaced the entire optical assembly (lampchanger, lamps and mirror) with a forward projecting array of LEDs. The existing colored spread lens is utilized when converting these lanterns to LED sources. Use of a *clear* spread lens with a red, green or yellow LED assembly only increases the intensity by a small amount.

IMPORTANT - In all cases, the correct LED color must be used regardless of the lens color. Example: An RL14 with a red 3-degree spread lens must use a red LED assembly. Do not use a white LED assembly in a lantern with a red, green or yellow lens since it will not produce adequate intensity. However, a red, green or yellow LED can be used in a lantern with a clear lens. The LED determines the signal color, not the lens.

The programmable Flasher/Driver is matched to each LED assembly. **Do not** mix and match components during installation and troubleshooting as inaccurate intensities and damage to the LEDs may result.

Do not loosen the plastic lens mounted on the front of the LED assembly. Each lens is carefully aligned to provide the optimum beam pattern when installed in the lantern. Disturbing this alignment can result in reduced intensities along the range line.

Programming

The LED assemblies must be programmed to the proper flash rhythm and intensity before deployment. The default program is Fixed-On. All other flash rhythms must be programmed into the flasher prior to installation. Likewise, the intensity setting for the proper color and spread lens must be set prior to installation. The LED assembly must be programmed and bench tested in the shop prior to transit to the aid.

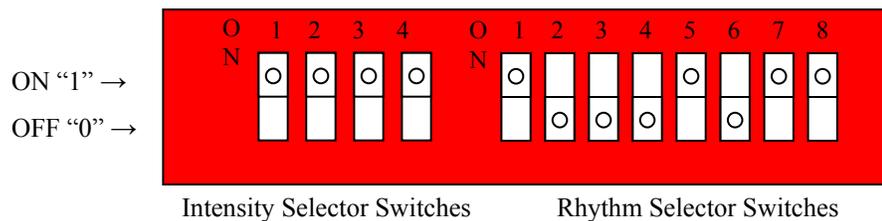
Flash Rhythm - BWT



BWT

On the LED driver/flasher, loosen the screw opposite the terminal strip corresponding to the slotted strap covering the dip switches, as shown above. On the BWT flasher, the four dip switches on the left are for intensity control and the eight dip switches on the right control the flash rhythm. Using the chart on the side of the flasher, or below, determine the switch position for the desired flash rhythm. Using a ball-point pen, slide the dip switches into the proper position corresponding to the code listed below. “1” is ON and “0” is OFF.

BWT DIP Switch Settings



	<u>BWT Flash Rhythms</u>							
ISO 2	10110001	Q	10001011					
ISO 6	10001001	FL2.5 (1)	11100000					
OC 4	11000011	Fixed	11111111					

For example, a Q rhythm has the following switch positions: 10001011. So the 1st, 5th, 7th, and 8th switches on the right group will be in the “up” (ON) position and the rest in the “down” position, as shown above.

Intensity - BWT

Intensities for the each specific lantern/color combination must be set prior to installation. The four dip switches next to the rhythm selector switches set the intensity.

	<u>BWT Intensity Settings</u>			
1	1000	8	0001	
2	0100	9	1001	
3	1100	10	0101	
4	0010	11	1101	
5	1010	12	0011	
6	0110	13	1011	
7	1110	14	0111	
		15	1111	

Intensity – BWT (cont'd)

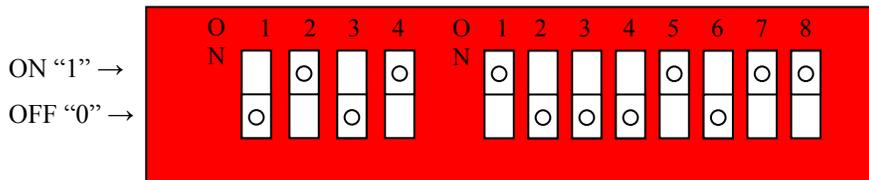
The four dip switches on the left determine the intensity. Program the following intensity setting into the BWT LED Flasher.

<u>Combination</u>	<u>Setting</u>	<u>Current*</u>
White RL14	0011	0.26
Yellow RL14	1001	0.18
Red RL14	0110	0.06
Green RL14	1110	0.08
White FA-240	0101	0.09
Red FA-240, 3.5 Degree Lens	1110	0.04

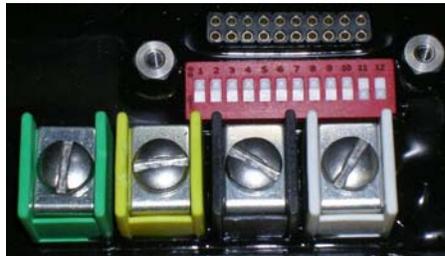
*Value entered in the Solar Design Program with the appropriate duty cycle.

So, for a White FA-240, 8 degree lens (0101) with a Q rhythm (10001011), the switch positions will be as shown below:

BWT Example-Intensity Setting



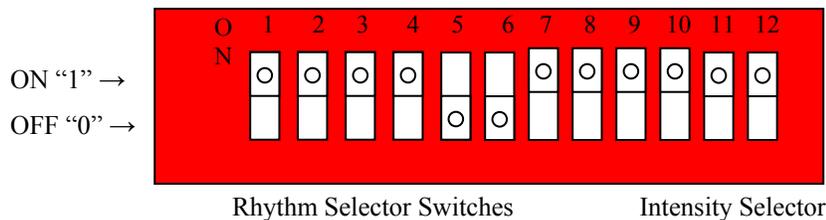
Flash Rhythm – CR



CR

On the LED driver/flasher, loosen the screw opposite the terminal strip corresponding to the slotted strap covering the dip switches, as shown above. On the CR flasher, the four right dip switches (9-12) are for intensity control and the left dip switches (1-8) control the flash rhythm. Using the chart on the side of the flasher or on the next page, determine the switch position for the desired flash rhythm. Using a ball-point pen, slide the dip switches into the proper position corresponding to the code. "1" is ON and "0" is OFF

CR DIP Switch Settings



Flash Rhythm – CR (cont’d)

<u>CR Flash Rhythms</u>			
ISO 2	11010001	Q	11110011
ISO 6	11110001	FL2.5 (1)	01101111
OC 4	10000011	Fixed	11111111

For example, a Q rhythm has the following switch positions: 11110011. So the 1st, 2nd, 3rd, 4th, 7th, 8th, 9th and 10th switches will be in the “up” (ON) position and the 5th and 6th in the “down” position, as shown on the previous page. Switches 9 and 10 should always be in the “ON” position.

CR Intensity Settings

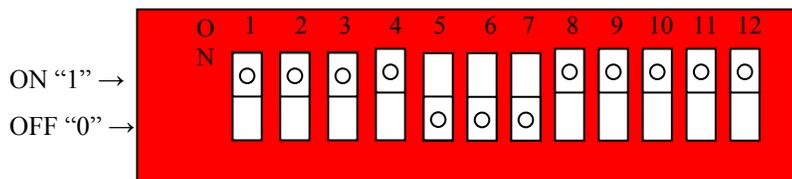
Program the following intensity setting into the CR LED Flasher.

<u>0.25a Lamp Combinations</u>	<u>Setting</u>	<u>Current*</u>
White RL14, All Lenses	1111	0.35
White FA-240, All Lenses	1101	0.15
Red RL14, All Lenses	1100	0.12
Red FA-240, All Lenses	1101	0.07
Green RL14, All Lenses	1100	0.26
Green FA-240, All Lenses	1101	0.22

*Value entered in the Solar Design Program with the appropriate duty cycle.

So, for a Clear (white) RL14, 8 degree lens (1111) with an Iso 6 rhythm (11110001) replacing a 0.25a lamp, the switch positions will be as shown below (111100011111):

CR Example-Intensity Setting

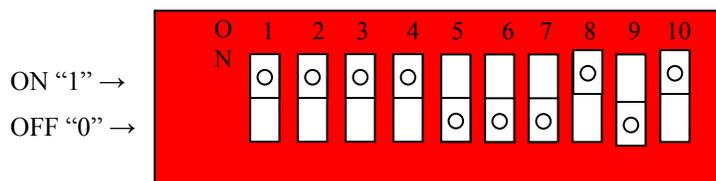


Reinstall the cover. Be sure that the gasket is seated and do not over tighten the screws as it will deform the cover.

Synced Range/Passing Light

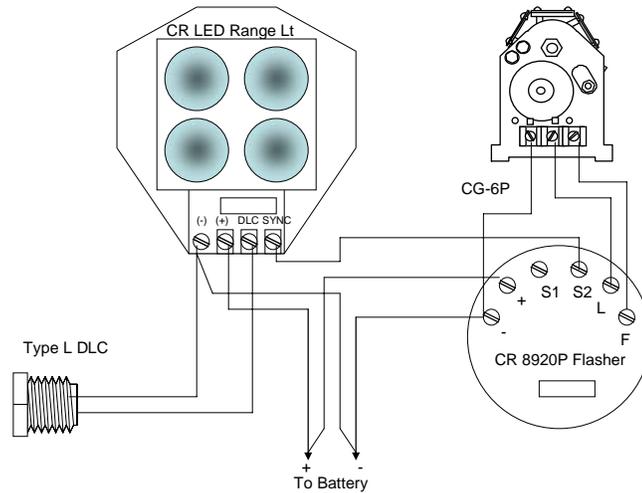
Ranges with passing lights (generally 155mm lanterns installed above the range lantern) synced to the range light must use a CR LED conversion kit and a CR 8920P flasher in place of the CG 181/493 flasher. The dip switch settings for the **flasher** are as follows (note that the flasher only has 10 dip switches; rhythm is the same as above example):

CR 8920P Flasher DIP Switch Settings



Rhythm Selector Switches

Use a type “L” daylight control connected to the LED range conversion to ensure that switching times with the other tower are consistent; do not install a daylight control in the 155mm lantern. The “rhythm” selector switches in the flasher must be set to the same rhythm as the LED conversion kit. Switch 9 must be in the OFF (0) position and switch 10 in the ON (1) position in the 8920P flasher.



Solar Sizing

The operating current of the LED assembly depends on the power setting. See the chart above to determine the current at the desired setting (note: current will differ depending on color and lantern type). An existing power system for 12v, 0.25a lamps will easily power this system. You may want to make a Solar Design run to verify your solar panel and battery sizing. No (0) flasher load is used. An example of the inputs is shown below:

Typical Duty Cycles

ISO 2	50%	Q	30%	OC 4	75%
ISO 6	50%	FL2.5 (1)	40%	Fixed	100%

Load	Amps?	Duty Cycle (10=10%)	D, N, or DN	Operate (if < 24)	Interval Number:	Interval Number:
BWT RL14 Yellow, Q	0.18	30	N			

Number of Flashers: 0

Bench Test

BWT

If not already connected, attach the wiring harness from the LED assembly to the BWT flasher. **Note:** Some black and white wires on the BWT Flasher may be reversed. The red lead goes to the “L” terminal on the flasher and the blue lead to the “F” terminal on the flasher. Do not attach a daylight control to the flasher at this time. Connect 12 VDC to the “+” and “-“ terminals of the flasher, check the flash rhythm and allow the assembly to operate for 24 hours.

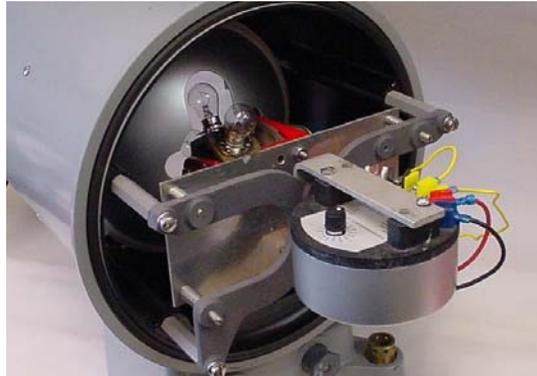
CR Control Systems

Connect 12 VDC to the “+” and “-“ terminals of the flasher, check the flash rhythm and allow the assembly to operate for 24 hours. **Note:** It can take up to 15 seconds for the CR LED assembly to turn on after power is applied.

Installation – FA-240 (Initial instructions for both BWT and CR)

The LED assembly replaces the existing flasher, lampchanger, 0.25a lamps and mirror in the FA-240 lantern. The existing color spread lens will remain in the lantern.

Disconnect the power leads and isolate them to prevent inadvertent shorting while this conversion is performed. Remove the four screws on the outer edge of the spider bracket that secure it to the lantern. Remove the wires on the terminal strip (if equipped) powering the flasher and lampchanger.



Remove the flasher and lampchanger, but leave the “L” flasher bracket in place (BWT only).

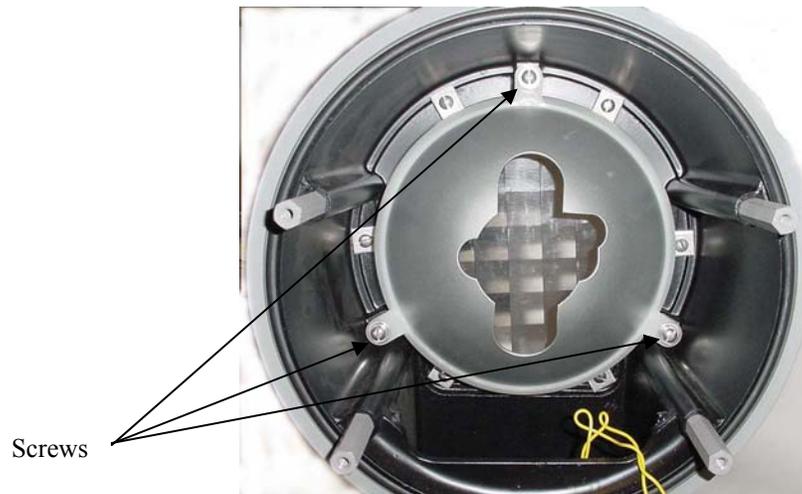


Remove if installing a CR LED kit

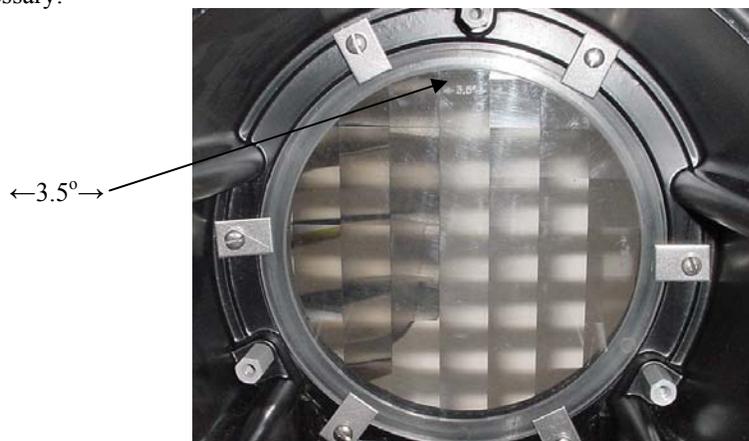
Remove the locknuts (if equipped) securing the focus adjusting screws, then remove the 4 screws and 4 springs securing the lampchanger mounting plate to the spider bracket and set aside.



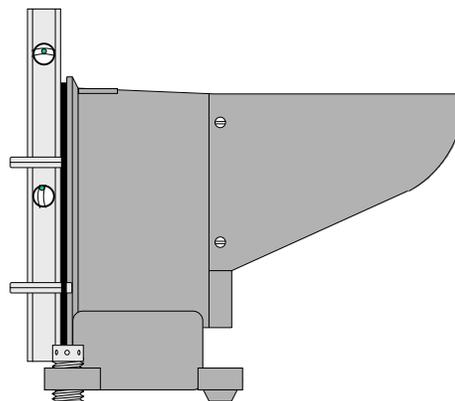
Remove the three screws securing the plastic ring inside the lantern and carefully remove the mirror.



At this point, inspect the spread lens for proper orientation. The 3.5 , 8 or 30 designation should be readable from inside the lantern, centered at the top mirror mount with the arrows pointing to the left and right. Clean the lens, if necessary.



Now that the components are removed from the lantern, check alignment by placing a level vertically on the rear housing lip and adjust the rear feet as necessary to ensure that it is level. This will ensure that the beam is projected horizontally and not up into the sky, or down into the water.



Specific Instructions – BWT in FA-240 (if using a CR kit, go to the next section)

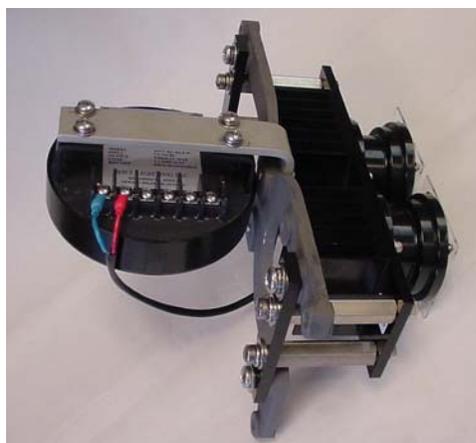
Attach the two black aluminum strips to the back of the lantern spider using the hardware provided in the kit (the side the flasher mounts to). Note: Additional hardware was shipped separately for these lanterns.



Attach the LED assembly from the front of the spider bracket so that the spider bracket straddles the standoffs and attach to the aluminum strips.



Attach the BWT flasher to the existing bracket on the back of the spider bracket.



Install the assembly back into the FA-240 housing and secure with the four screws removed from the outer edge of the spider bracket. Wire the LED signal head to the flasher, (red to the “L” terminal, blue to the “F” terminal), the type-L daylight control (to the “S2” and “-” terminals) and the power leads (black to the “+” terminal and white to the “-“ terminal) of the BWT flasher.



Cover the daylight control and check for proper operation. You should see two small beams of light projected on the spread lens

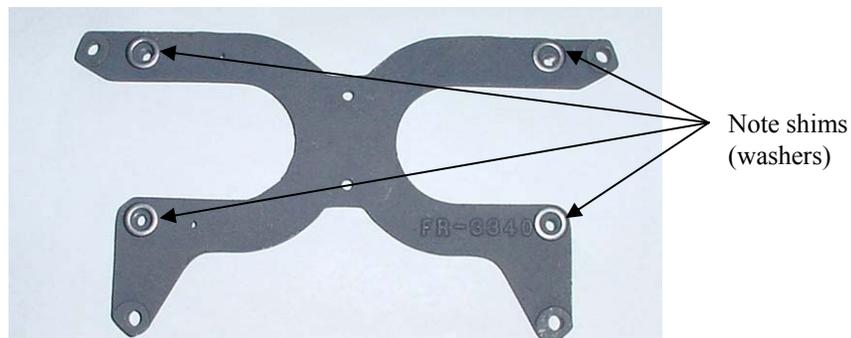


Aim the lantern with the aid of a boat crew observing the range at distance.

Reinstall the rear cover. Remove tape from the daylight control.

Specific Instructions – CR Control Systems in FA-240

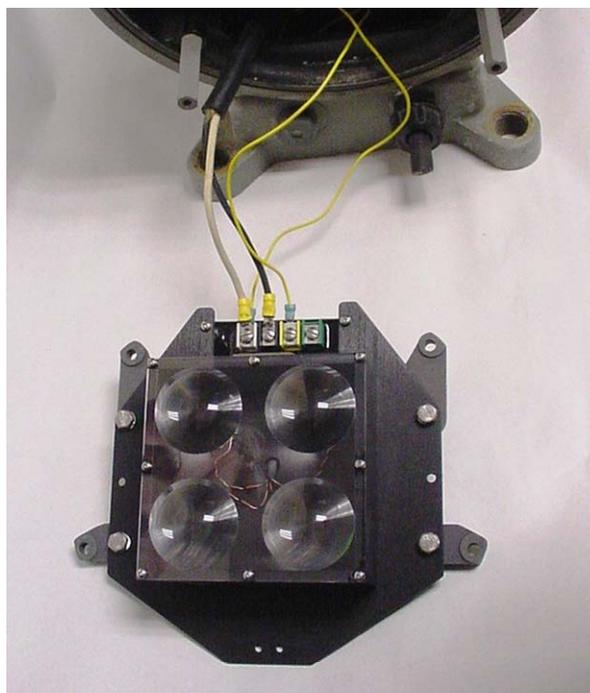
Remove the flasher bracket and terminal strip from the FA-240 spider. Locate the “FA-240 Range Light Conversion Hardware” bag packaged with the kit. Remove the 4 shims and place them on the bracket as shown below. The shims are necessary to clear the power cord between the flasher and LED head, and the raised lettering on the spider bracket to properly align the LEDs along the optical axis.



Install the CR LED assembly using the four 1/4" bolts and lock washers, as shown below. Be sure that the shims are between the spider bracket and LED assembly. The bolts are inserted through the front of the LED assembly and are threaded into the spider bracket.



Connect the power cable and Type-L daylight control to the CR LED assembly before installing in the lantern. The "+" power lead is connected to the black terminal and the "-" power lead is connected to the white terminal. The daylight control leads are connected to the yellow and white terminals, as shown on the next page. NOTE: Some CR LED assemblies will have a jumper between the "SY" and "-/DL" terminals. Do not remove this jumper. Only units labeled "NO SYNC" require this jumper. These units do not have sync capabilities (they can not flash in sync with another light.)



Install the LED assembly into the lantern (mirror has already been removed) using the slotted ¼” screws and lock washers.



Cover the daylight control and check for proper operation (**Note:** Turn-on may be delayed up to 15 seconds). You should see four small beams of light projected on the spread lens.

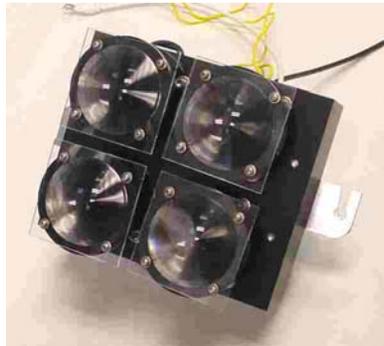


Aim the lantern with the aid of a boat crew observing the range at distance.

Reinstall the rear cover. Remove tape from the daylight control.

Installation – RL14

The LED assembly replaces the existing flasher, lampchanger, lamps and mirror in the RL14 lantern. The existing spread lens will remain in the lantern.

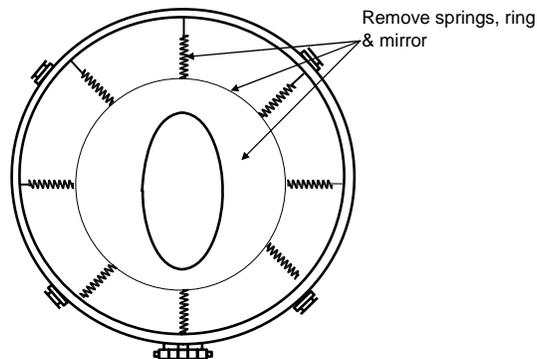


BWT



CR

Carefully remove the springs securing the mirror inside the cover door. Package the mirror for transport back to the ANT for use as a spare in other ranges. Leave the spread lens installed in the front cover.



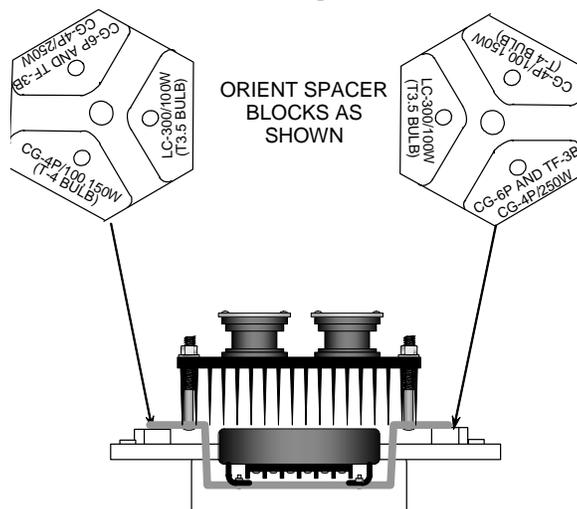
Remove the lampchanger and flasher assembly from the RL14. Disconnect the power leads and daylight control wires from the flasher. Isolate the power leads so that they do not inadvertently short together.

Specific Instructions – BWT in RL14 (if using a CR kit, go to the next section)

Attach the power leads and daylight control leads to the BWT flasher. You can use the two packaged black and white wires to allow extension of the power leads to the terminal strip in the lantern. Install the black lead to the “+” terminal, the white to the “-” terminal and the two yellow Type-L daylight control leads to the “S2” and “-” terminals.



Install the BWT LED assembly on the “stands” in the RL14 as configured for the LC-300/100W lampchanger. The highest step is needed to clear the round head screw securing the stand as the BWT bracket is slightly oversized. The distance between the BWT LED and the spread lens is not critical.



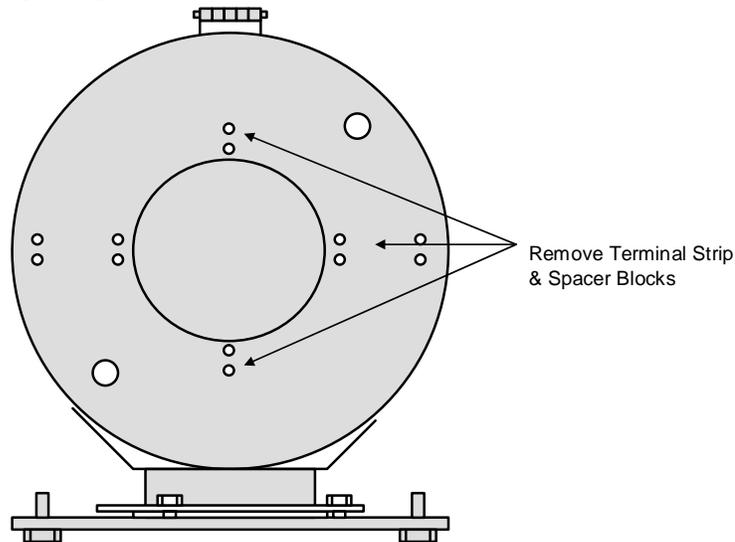
Cover the daylight control and ensure that the LEDs turn on.

Close the cover and latch it into place. The LEDs should project four small beams of light on the spread lens of the lantern. Check the two spirit levels on top of the beacon to ensure that the lantern is level. Adjust, if necessary, by loosening the mounting bolts and turning the threaded sleeves in the base, then retightening the mounting bolts.

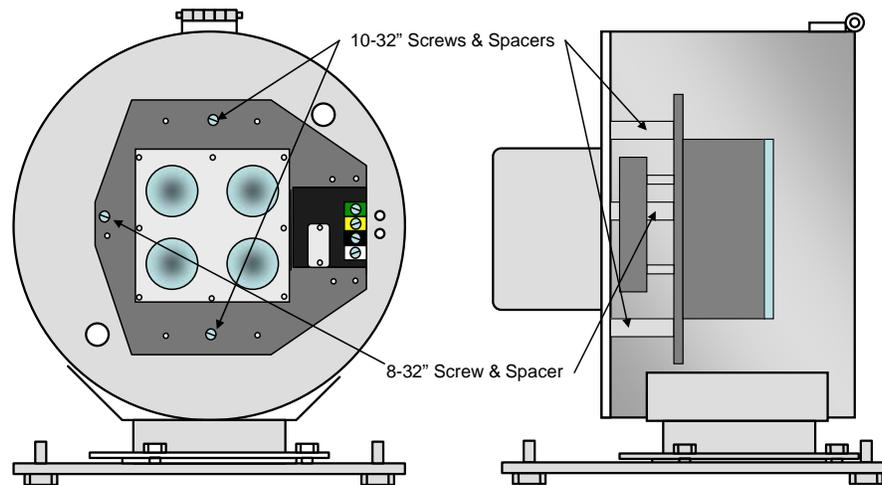
Verify beam realignment with a boat crew observing the range at distance. Remove tape from daylight control.

Specific Instructions – CR in RL14

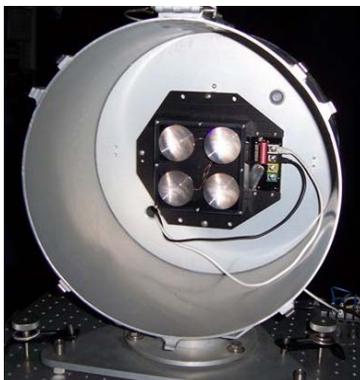
Remove the terminal strip and spacer blocks from the RL14, as shown below.



Locate the “RL14 Range Light Conversion Hardware” bag packaged with the kit. Install the CR LED assembly as shown (the terminal strip can be installed to the right or left, whichever is easier to route wires). Note that two screws and spacer are sized for 10-32 and one 8-32. The 10-32 screws and spacer attach to the inner mounting block mounting holes and the 8-32 screw and spacer attach to one of the terminal strip mounting holes, as shown below:



Attach the power leads and daylight control leads to the CR LED flasher. Install the black “+” lead to the black terminal, the white “-“ lead to the white terminal and the two yellow Type-L daylight control leads to the “**Yellow**” and “-” terminals. NOTE: Some CR LED assemblies will have a jumper between the “SY” and “-/DL” terminals. Do not remove this jumper. Only units labeled “NO SYNC” require this jumper. These units do not have sync capabilities (they can not flash in sync with another light).



Cover the daylight control and ensure that the LEDs turn on (**Note:** turn-on may be delayed up to 15 seconds).

Close the cover and latch it into place. The LEDs should project four small beams of light on the spread lens of the lantern. Check the two spirit levels on top of the beacon to ensure that the lantern is level. Adjust, if necessary, by loosening the mounting bolts and turning the threaded sleeves in the base, then retightening the mounting bolts. Verify beam realignment with a boat crew observing the range at distance. Remove tape from daylight control.

Intensity - 0.25 amp Lamp Replacement

RL-14 Lantern with BWT/CR LED, 3 degree lens – Intensity (candelas)

Rhythm	White	Yellow	Red	Green
Fixed	12,000	8000	2200	3000
Oc 4, Iso 6	11,300	7500	2100	2800
Iso 2, FL2.5(1)	10,000	6700	1800	2500
Q	7200	4800	1300	1800

RL-14 Lantern with BWT/CR LED, 8 degree lens – Intensity (candelas)

Rhythm	White	Yellow	Red	Green
Fixed	5500	3500	1000	1100
Oc 4, Iso 6	5200	3300	900	1000
Iso 2, FL2.5(1)	4600	2900	800	900
Q	3300	2100	600	700

RL-14 Lantern with BWT/CR LED, 11 degree lens – Intensity (candelas)

Rhythm	White	Red	Green
Fixed	4000	800	1000
Oc 4, Iso 6	3700	750	900
Iso 2, FL2.5(1)	3300	650	800
Q	2400	500	600

RL-14 Lantern with BWT/CR LED, 20 degree lens – Intensity (candelas)

Rhythm	White	Red	Green
Fixed	2100	400	500
Oc 4, Iso 6	2000	350	450
Iso 2, FL2.5(1)	1700	300	400
Q	1300	240	300

RL-14 Lantern with BWT/CR LED, 28 degree lens – Intensity (candelas)

<u>Rhythm</u>	<u>White</u>	<u>Red</u>	<u>Green</u>
Fixed	1700	300	400
Oc 4, Iso 6	1600	280	350
Iso 2, FL2.5(1)	1400	250	300
Q	1000	200	240

FA-240 Lantern with BWT/CR LED, 3.5 degree lens – Intensity (candelas)

<u>Rhythm</u>	<u>White</u>	<u>Red</u>
Fixed	2600	800
Oc 4, Iso 6	2400	750
Iso 2, FL2.5(1)	2200	650
Q	1600	500

FA-240 Lantern with BWT/CR LED, 8 degree lens – Intensity (candelas)

<u>Rhythm</u>	<u>White</u>	<u>Red</u>
Fixed	1300	500
Oc 4, Iso 6	1200	450
Iso 2, FL2.5(1)	1100	400
Q	800	300

FA-240 Lantern with BWT/CR LED, 30 degree lens – Intensity (candelas)

<u>Rhythm</u>	<u>White</u>
Fixed	350
Oc 4, Iso 6	325
Iso 2, FL2.5(1)	300
Q	200

Intensities for some other combinations (larger lamps) are possible. Contact COMDT (CG-432A) for details.

Service Life

The maximum service life is determined by the operational hours of the LEDs and the ability to maintain the advertised intensity over that term, limited by the durability of the lens and base.

LED in FA-240 and RL14 – Fixed/Oc4 **10** years
 LED in FA-240 and RL14 – FL/Q/Iso rhythms **20** years

Servicing

- The lantern shall not be opened unnecessarily on-station as doing so introduces salt air inside it (visual inspection can be accomplished by looking through the spread lens to check for proper rhythm and that all LEDs are lit and covering the daylight control to check for proper day/night operation).
- The service interval for these LED based aids is three years.
- The service life of the lantern depends on the operational duty cycle and durability of the lantern, discussed above. The LEDs will not burn out, but intensity degrades over time.
- Ensure that the lens is clean, not discolored or crazing. Wipe with a cloth dampened with mild soap and water, if necessary. Replace if not clear otherwise cracks could compromise its strength or light transmission (note: only a small portion of the actual lens is used with the new LED system).
- Inspect the wiring and power system in accordance with the Short Range Aids to Navigation Servicing Guide. Load test the battery.

- Cover the daylight control to ensure that the lantern flashes on rhythm. Observe the LEDs through the lens. If one or more LEDs are out the LED assembly should be replaced at the earliest convenience after posting a local notice to mariners.
- If the lantern fails for any reason, replace it with another LED assembly or reinstall the mirror, a conventional programmable flasher, lampchanger, DLC and lamps. Do not mix and match parts if replacing the LED assembly. The flasher/LED driver is matched to each LED head assembly. Contact COMDT (CG-432A) for hardware disposal disposition.

Troubleshooting

No light.

- Check voltage at the battery terminals. Minimum voltage is 10-volts to operate (10.5 or less indicates a dead battery). No reduction in LED intensity will occur at this voltage. Replace battery, if necessary.
- Check voltage at LED flasher input terminals (“+” and “-“). If low voltage at the flasher but battery voltage is good, replace/meg power cable.
- Disconnect external daylight control. If light operates, replace the Type-L daylight.
- If light fails to operate with daylight control removed, replace the LED assembly. **Note:** the CR LED takes about 15 seconds to turn on after power is applied or transitioned from light to dark.

Improper rhythm

- Check the position of the code selection switch.
- Disconnect one lead from the battery, wait 10 seconds, then reconnect (rhythm cannot be changed with power applied).
- If the LED still has an improper rhythm, replace the LED assembly.

Various LEDs out

- If one or more LEDs do not light, replace the LED assembly. If a replacement is not immediately available, continue using the LED assembly until a replacement can be secured. If two or more LEDs fail, replace the assembly.

Light will not turn off

Be sure that the daylight control is connected to the “S2” and “-“ terminals on the BWT LED and “Yellow” and “White” terminals on the CR LED

Apply a jumper between the “S2” and “-“ terminals (BWT) or “Yellow” and “White” terminals (CR). If the light turns off, replace the daylight control.

If the light does not turn off with the jumper in place, replace the entire LED assembly.

Replacement

The LED flasher and LED head are matched sets. Do not mix and match components when troubleshooting. Replace the entire assembly.

Ship failed LED assemblies to BWT/CR for analysis/repair:

BWT Lighting, Inc.
19 Shea Way, Suite 301
Newark, DE 19713
302-368-7824

CR Control Systems
20 Airpark Road
West Lebanon, NH 03784
888-897-9391

Please report all problems to COMDT (CG-432A)

Reporting Requirements

Units and Cutters shall enter the following information into IATONIS so that your district and CG Headquarters can monitor these lanterns. In the LAMP TYPE field, select the appropriate designation listed below:

LED BWT RL14
LED BWT FA240
LED CR RL14
LED CR FA240

For the lanterns, enter the appropriate nomenclature, i.e., RL14-3 deg, FA-240-8 deg.

In addition, specific problems, concerns, observations and questions may be directed to anyone on the COMDT (CG-432A) staff via the website www.uscg.mil/systems/gse/gse2.