

Light Ranger 2 Manual

Ver. 1.7

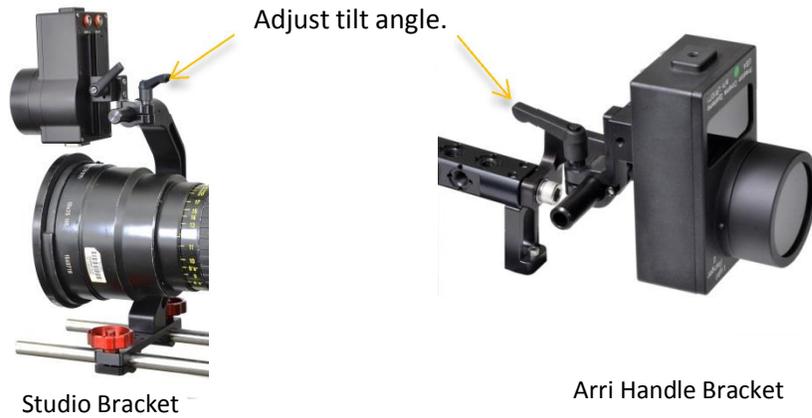


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Quick Start

1). Mount the LR2 on camera brackets.

a) Adjust the tilt angle so that the LR2 points at the subject at the closest subject to LR2 distance.



2) LR2 cable connections

a) Connect the serial cable from the LR2 to the MDR3.

b) Connect the LR2 power cable to 12-28 VDC



3) Video Interface cables.

a) VI power to 11 – 28 VDC

b) Camera HD-SDI to VI input BNC

c) VI output BNC to a HD monitor



- 4) Set Up the FI+Z system
 - a) Software versions required: <http://198.170.86.103/downloads.html>
 - i) HU3 v2.188 or later
 - ii) MDR3 v1.089 or later
 - b) Install motors on the camera lens
 - c) Calibrate the lens with the HU3. Note: New HU3 software adds calibrations for zoom and iris. See the Appendix1, page 12 for details.
- 5) Set up Video Interface Unit (VIU) from menu.
 - a) Select the Camera manufacturer and Camera Model from the menu listing.
 - b) Set the Distance Offset using either the subject standing at or near the close distance mark or a focus chart. See page 6 for details.
 - c) Choose the Bar Direction. See page 8.

MENU	Ver. 1.08	MENU	Ver. 1.08
Camera Manuf.	Red	Camera Manuf.	Red
Camera Model	Dragon 6K Full	Camera Model	Dragon 6K Full
Distance Offset	13.2" (Press OK for Auto)	Distance Offset	13.2" (Press OK for Auto)
Bar Color	Green/White	Bar Color	Green/White
Bar Direction	Subject Infinity: Up	Bar Direction	Knob Infinity: Up
Foreground level	80%	Foreground level	80%
Background level	20%	Background level	20%
Metadata Mode	Off when Recording	Metadata Mode	Off when Recording
LR Dist Display	Left	LR Dist Display	Left
Metadata Units	Imperial	Metadata Units	Imperial

1. Light Ranger 2 - Basic Description.

The Light Ranger 2 (LR2) provides groundbreaking enhancements to the art of focus pulling. Focus information is overlaid the camera image displayed on the video monitor. The graphics show the direction and amount the focus knob must be turned to bring subjects within the lens depth of field.

- In the manual mode, the Light Ranger 2 overlays onto the camera image sixteen rectangles. Each of the rectangles shows the direction and amount the focus knob must be turned to bring a subject within the rectangle into the depth of field of the camera lens.
- In the autofocus mode, the Light Ranger 2 automatically focuses on the subject enclosed by a red rectangle overlaying the monitor image. The size and position of the rectangle is controlled by the Navigation key of the HU3.
- In the Basic Range Mode, sixteen rectangles each show the range of the subjects to the camera focal plane.

Operating Principle

The LR2 emits short pulses of infra-red light in a fan shaped beam from the opening below the lens. The beam covers 18° horizontally and 3° vertically. The reflections from subjects illuminated by the beam are focused by the receiving lens onto an array of sixteen detectors and timed to determine their distance from the LR2.

The maximum range depends on the size and reflectivity of the subject. The typical range to a person is 40' (13m) or greater. The range is unaffected by ambient illumination and the LR2 will work both in bright sunlight or complete darkness.

2. LR2 Set-Up: Mounting the LR2 on the camera.

- a. To minimize horizontal parallax, mount the LR2 so that its lens is approximately centered horizontally over the camera lens. Figure 1 shows the LR2 above the lens and centered horizontally. Figure 2 shows the LR2 mounted below the lens between 15mm matte box rods. The small horizontal offset will not cause significant parallax.

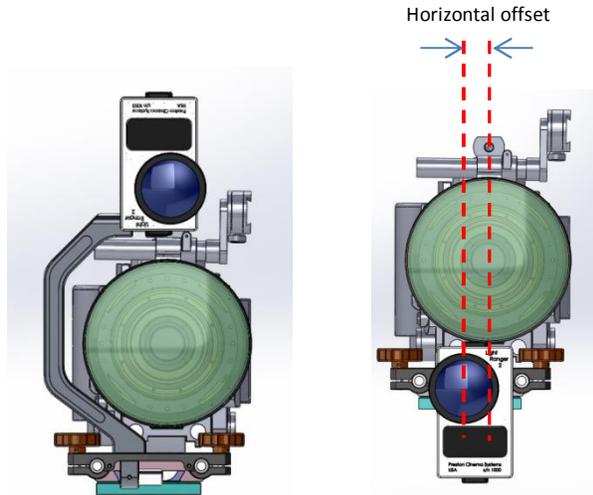


Figure 1
LR2 Above Lens

Figure 2
LR2 below lens

- b. To minimize vertical parallax, use the dovetail at the rear of the LR2 to slide the LR2 vertically as close to the lens as possible.

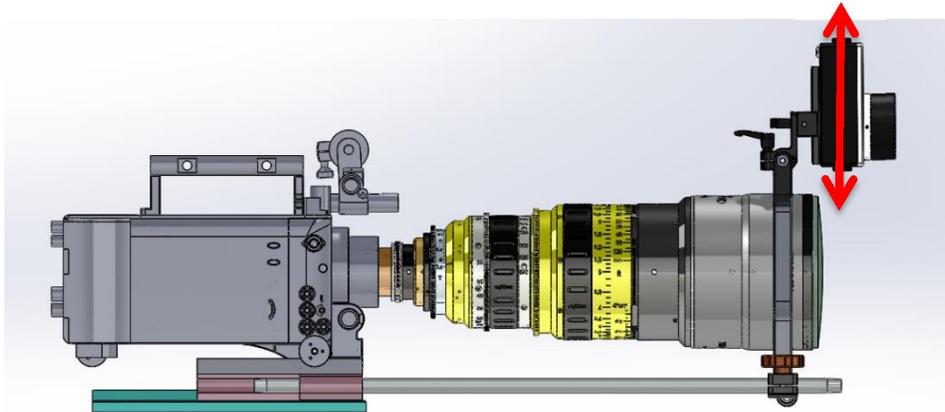


Figure 3. Adjust the vertical position of LR2 to be as close to the lens as possible.

- c. The LR2 must point in the same direction horizontally as the camera lens so that the graphics generated by the LR2 are aligned with the camera image. The LR2 brackets insure accurate alignment. The LR2 has 18° horizontal coverage. (see fig.4 on following page).

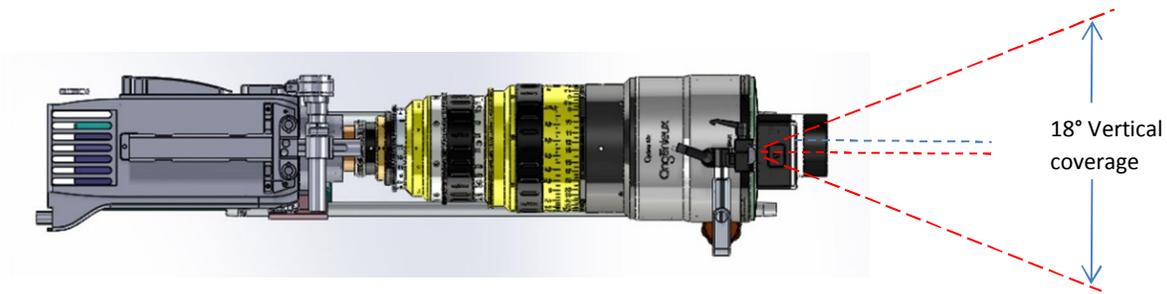


Figure 4. top view. The LR2 points in the same direction as the camera lens in the horizontal plane.

- d. Adjust the tilt of the LR2. The tilt angle can be adjusted to compensate for parallax at close distances. For example, if the LR2 is mounted above the lens (Figure 3), it may be necessary to tilt down so that it can measure the distance to a subject close to the camera. The LR2 has 3° vertical coverage.

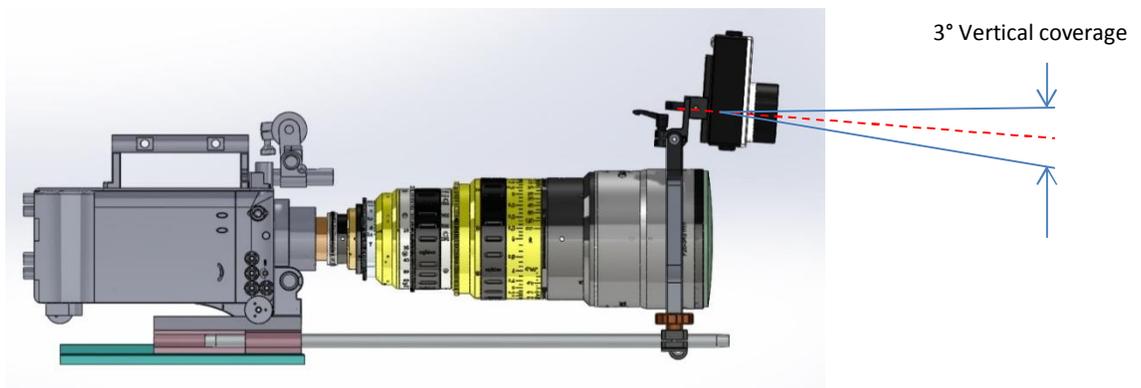


Figure 5. Side view. LR2 tilted down.

3. Connections

a. LR2 connections

1. Connect the power cable to 11 – 28 VDC.
2. Connect the Serial cable to the serial port of the MDR3

b. Video Interface Unit (VIU). This unit will only sync to 1080i or 1080p HD from the camera. Note that some wireless video units output 720p when re-booting. The VIU will not output a video signal until the wireless video unit outputs 1080 HD to the VIU.

c. VIU connections.

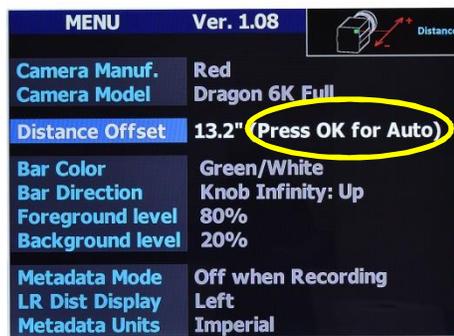
1. Connect the power cable to 11 – 28 VDC
2. Connect the camera HD-SDI BNC cable to the Input.

3. Connect the Output HD-SDI to the monitor.
4. After powering the unit, set the radio channel to the same one as the MDR3 and HU3.



4. Video Interface Menu: Press the Menu key on the VIU.

- a. Camera Manufacturer.
- b. Camera Model. This scales the graphics to the correct field of view of the camera lens.
- c. Distance Offset Calibration.
 - i. Manual input: distance is measured from the rear surface of the LR2 to the camera focal plane. Use the east/west navigation keys on the VIU to decrement/increment the distance offset.
 - ii. Auto Offset. This method uses the monitor image to set the offset by critically focusing on the subject **and gives the highest accuracy.**



There are two methods for using Auto Offset.

- **First Method:** Use the subject to set the offset. This is a simple and most effective way to deal with the offset between the area where the LR2 is measuring distance (an actor's torso. for example) and the desired area of focus (an actor's left eye).
 - Set the HU3 to Manual Mode.
 - Select the Distance Offset line in the VIU menu and press OK.
 - Have the actor (or stand-in) stand at the position of closest focus.
 - Find critical focus on the desired area using the monitor and press OK on the VIU.
- **Second method:** using a focus chart. **IMPORTANT: Use only a focus chart printed on grey matte surface. Using shiny white charts at short distance from the LR2 (less than 4') can**

cause the LR2 detector to overload and will give erroneous results. A flat chart will not take into account the three-dimensionality of a subject like the “first method” described above but can be used for less critical shots.

- Check the HU3 to make sure the LR2 is in manual mode, otherwise the focus cannot be changed with the focus knob.
- Place the focus chart either at the close focus of the lens or the closest distance the subject will be from the camera. Make sure that the LR2 is pointing towards the chart; tilt the LR2 if necessary.
- If using a zoom, set to the longest focal length. Open the lens T-stop to make the depth of field as shallow as possible. Adjust the focus with the HU3 focus knob and press the OK button on the VIU. Re-check the setting by pressing the AF button on the HU3, the chart should be in perfect focus.

The red rectangle as seen in the figure below defines the area where focus distance is measured.



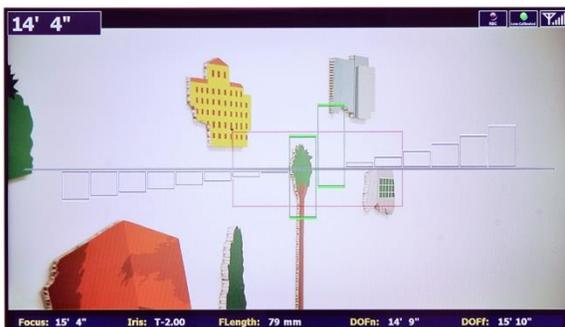
d. Bar Color. Green is the default for indicating that the subject is in the lens DOF, white is the default for showing the detection zones. Yellow/white and red/white are also available.

e. Foreground/background levels: Increase the transparency to make the graphics less prominent.

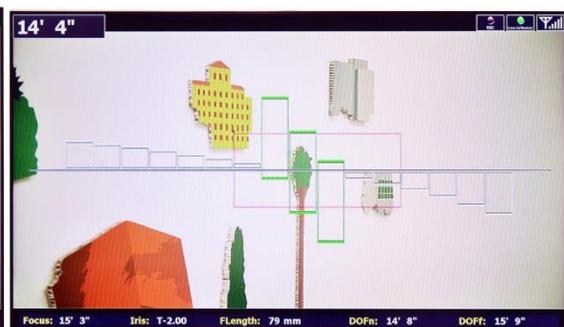
f. Bar Direction.

a. **Knob Infinity: Up.** The bars move up as the focus knob turns towards infinity (subject moves closer to lens than knob setting)

b. **Subject Infinity: UP.** The bars move up as the focus knob turns towards near focus (subject moves further from the lens than the focus knob setting)



Knob Infinity: Up

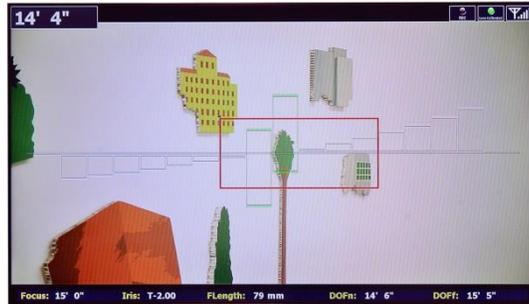


Subject Infinity: Up

g. Background/Foreground levels. Two modes of focusing, manual and autofocus are chosen from the HU3. The non-selected mode appears in the background of the chosen mode. The brightness levels of the foreground and background can be set from 0 – 100%. The red rectangle used in autofocus mode determines where the digital display window (seen in the upper left corner of pictures above) reads distance. The visibility of the red rectangle is set in Background Level.



Foreground/Background level

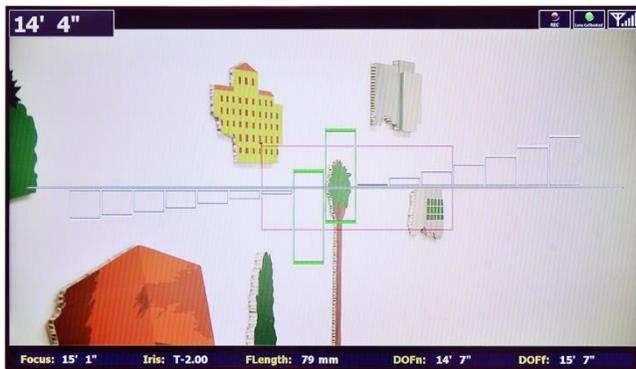


16 bars in background of AF mode

In autofocus mode, the 16 rectangles from manual focus mode can be used to pre-set the focus knob to the subject within the autofocus red rectangle so the transition to manual focus will be smooth. Alternatively, the manual focus rectangles in the background can be used to set focus knob to for a fast focus rack when changing from autofocus to manual mode.

h. Metadata Mode. Metadata On, Off, or Off when Recording. Note that the graphics updates faster with metadata off.

i. LR Distance Display. In Manual Mode, this setting places a distance display window on the top of the display, on the left, center, or right side (below, left). The distance displayed is the closest distance within the LR2 detection zone; the area enclosed by the red rectangle as set in the autofocus mode. (below, right)



Manual mode with red AF rectangle in background



AF mode with manual bars in background

j. Metadata Units. Choose Imperial or Metric

5. Choosing Manual/Autofocus/Basic Mode

The Manual and Autofocus modes are selected from the HU3. The center soft key toggles the AF mode on/off. Basic Ranging mode is selected from the VIU by pressing OK.



a. Manual mode. The video overlay graphics consists of sixteen rectangles arranged horizontally across the midline of the monitor. Each rectangle represents a detection zone, where a distance measurement is made. See picture above, left.

The Bar Direction menu setting (page 7) determines the direction the bars moves in response to the focus knob. The height of a rectangle indicates the relative amount the focus knob must be moved to bring the subject within the depth of field of the lens.

When the subject in a detection zone is within the depth of field of the lens, the corresponding rectangle turns green. The position of the green rectangle above or below the center line indicates where within the depth of field the subject is. The DOF is calculated using a .025mm circle of confusion.

The number and sizes of the rectangles shown on the monitor depends of the horizontal angle of view of the camera and lens. When the horizontal angle of the camera is 18° or greater, all sixteen rectangles are shown, as in the photograph above.

The overlay graphics are automatically scaled with changing lens focal length so that the horizontal position of each rectangle overlays the corresponding area of the camera image.

For reference, the following table shows the angle of view vs. focal length for a 35mm sensor, 22mm horizontal dimension. The second row shows the number of LR2 zones that are visible on the monitor and the third row shows the % of the monitor length covered by the LR2 graphics.

(mm)	25	27	32	35	40	50	65	75	100	135	150	180	290
Horiz. Field (degrees)	47	44	38	35	31	25	19	17	13	9.3	8.4	7.0	4.3
#LR zones	16	16	16	16	16	16	16	15	11	8	7	6	4
% of horizontal length	38	41	47	51	58	72	95	106	138	194	216	257	419

As the table above indicates, a 50mm fl lens covers 25° horizontally and the 18° LR2 horizontal angle covers 72% of the monitor picture horizontally. The LR2 optimizes coverage for focal lengths greater than 50mm where depth of field issues are the most critical.

b. Autofocus mode.

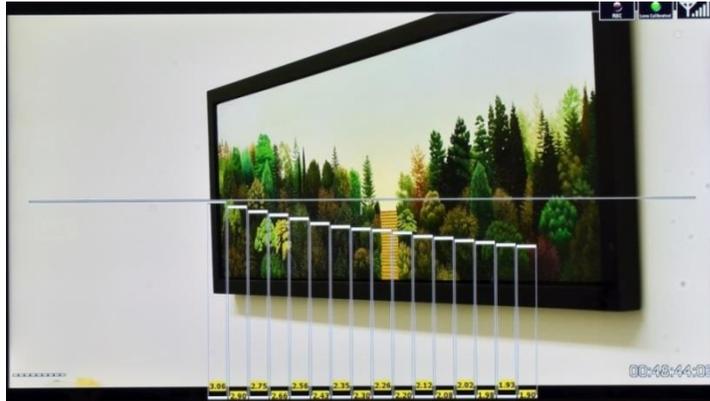


In autofocus mode, the focus motor moves the lens to the closest measured distance within the red rectangle on the monitor. The horizontal position of the rectangle can be shifted using the east/west sides of the HU3 navigation key and the size of the rectangle can be changed by using the north/south sides of the navigation key. **Pressing the center button of the navigation key holds the current focus position.** It is useful to prevent the focus from changing when a subject crosses in front of the intended subject.

The autofocus function is particularly valuable where the motion of the subject is moving quickly, unpredictably, or when the subject approaches the close focus of the lens. To insure accurate focus it is strongly recommended that the Offset is set using the subject (or a stand-in) positioned at the close focus point used in the shot. See page 6.

If the shot requires making a smooth transition from autofocus to manual mode, the HU3 focus knob must be set to the same distance as the autofocus distance to avoid the focus motor jumping at the transition. Adjust the focus knob until the background rectangles turn green.

c. Basic Ranging Mode.



Enter the Basic Ranging Mode by pressing the OK button on the Video Interface Unit. The distances from the camera focal plane to the subject within each of the zones is displayed at the bottom of each rectangle, forming a “depth map” of the scene.

The HU3 display shows the closest measured distance in the autofocus detection zone (red rectangle) set in autofocus mode.



6. Setting Focus Limits with the LR2.

Focus limits are set by pressing and holding the Set button while turning the focus knob from a near to a far distance (or vice-versa) setting. The LED adjacent to the switch will remain lit until the Reset button (r) is pressed.

When the LR2 is detected by the FI+Z, focus limits behave differently than when the LR2 isn't present.

- In **Manual Mode**, when focus limits are set, only those rectangles corresponding to subjects within the range of the focus limits are displayed. Focus limits minimize graphics clutter, so that the user can concentrate on the subjects of interest.
 - When focus limits are set and the LR2 is present, the focus knob operates over its full range rather than being limited to the span of the focus limits (as in operation without the LR2 present).



No focus limits are set. All rectangles are visible.



Focus limits eliminate the background wall rectangles.

- In **Autofocus Mode**, focus limits restrict focus to subjects within the set limits. For subjects outside of the limits, the focus motor will remain at its previous focus setting. This provides an effective way to prevent the focus from jumping to an undesired subject crossing in the foreground.
- When power is removed from the LR2, focus limits revert to normal.

Appendix 1: Lens Calibration with the LR2

In order to correctly scale the monitor overlay graphics and represent the depth of field, zoom lenses used with the Light Ranger 2 must have focus, iris, and zoom calibrated. For prime lenses, only focus and iris calibrations are required.

Lenses used with the Light Ranger 2 must be named and calibrated. Prime lenses are identified by their focal length (Fig A4) while zoom lenses are identified by their minimum and maximum focal lengths (Fig A13).

1. Naming a prime Lens:

To name the lens, go to the Lens selection screen (Fig A1) , press **Choose** , select **All lenses**, select a manufacturer's folder (Fig A3), and Lens Type Fig A4).



Fig A1



Fig A2



Fig A3

For most lenses, like the Cooke S4, the user can enter any focal length (Fig. A4). Figures A4 – A7 show how an 18mm lens is named.



Fig A4



Fig A5



A6



Fig A7

Lenses with non-linear focus characteristics like the Leica Summilux or Panavision 70 have their focal lengths chosen from a list (Fig A9).



Fig A8



Fig A9



Fig A10

2. Naming a zoom lens.

To **NAME** a Zoom Lens you must enter the minimum and maximum focal lengths. Return to the lens list: Menu→Lens→All Lenses→Mfg→Lens type. Figure A11 shows the Alura zoom is chosen. Press Enter (or Next) to specify the minimum and maximum focal lengths. Use the Navigation key to change to focal length numbers to match the lens, with the lowest focal length number on the left as shown in Figure A12. The focal length is specified in 1mm increments, so the 15.5 – 45 Alura is entered as 0015-0045. Figure A13 shows the 15-45mm lens in the Fujinon/ Alura Zoom list.



Fig A11



Fig A12



Fig A13

3. Calibrate focus. Calibrating focus is the same for prime and zoom lenses. An 18mm Cooke lens will be used as an example. Select the lens to be edited with the HU3 navigation key and press the Edit key (A14).



Fig A14



A15



A16

Choose Calibr. Focus, then using the HU3 focus knob, set the lens to infinity (A16). Set the lens focus to the next distance (A17), press Next (or Enter) and continue until all ten points are entered (A19). The focus is now calibrated. The letter F appears to the right of a lens (21mm) that has its focus calibrated (A14).



Fig A17

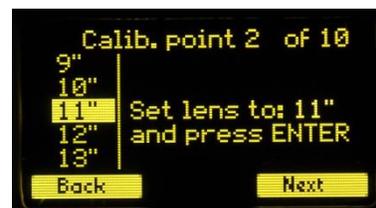


Fig A18

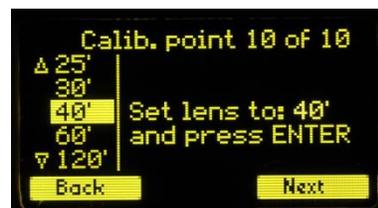


Fig A19

5. Calibrate the iris.

Check that the lens is wide open when the iris slider on the HU3 is at the top position. If not, reverse the direction of the iris motor using the MDR3 direction button.

Choose Edit Lens and then Calib. Iris (A20-21)



Fig A20



A21



A22



Fig A23

Using the HU3 navigation key, select the widest T-stop opening of the lens from the list of T-stops (A22). **If the lens T-stop is not on the list, choose the next higher value that appears. For example if the lens has a T-stop of 2.9, choose the next higher stop on the list, T4.**

Use the iris slider to set the lens to the stop selected from the list and press Next or ENTER.

Next choose the minimum opening T-stop from the list, set the iris to the same stop and press Next or ENTER (A23). The iris is now calibrated.

6. Calibrate zoom.

Before **calibrating** the zoom of a new lens, check that pressing the Microforce zoom button UP towards the Lemo connector causes the HU3 bargraph indication to also move in the up direction. If the bargraph indicator does not move up, change the position of the Microforce direction switch. Now, check that when the Microforce zoom button is pressed UP, the motor turns the lens to the maximum focal length. If this is not the case, reverse the direction of the zoom motor using the MDR3 motor direction button.

Return to the lens list (Fig A24). Press **Edit Lens** (A25). Select **Calibrate Zoom** with the Nav key (Fig A26), press **OK** or **ENTER**.



Fig A24



Fig A25



Fig A26

The suggested focal length setting (30mm) can be changed to match an engraved focal length on the zoom, close to the middle of the mechanical travel of the lens using the HU3 Navigation key (Fig A27).



Fig A27

Use the Microforce zoom to set the lens to the chosen focal length on the HU3 display and press Next. The zoom is now calibrated and ready to use.

7. The metadata shown on the monitor: Focus, Iris, FLength should match the lens settings. This confirms that the calibration has been completed correctly.



Appendix 2. Specifications

1. LR2 ranging module

Operating Range 1' to > 40'

Horizontal angle of view: 18°

Vertical angle of view: 3°

Number of detection zones: 16

Emission type/ wavelength: LED/ 970nm (typ.)

Eye Safety: IEC 62471-2006 exempt lamp classification

Size: 5 ½ x 3 ¼ x 1 inches

Weight: 600g

Power: 10-32VDC 5W

Mounting: 2 x ¼-20, Dovetail 15mm rod clamp

2. LR2 Video Overlay Unit with G4 wireless link

Size: 3.4 x 5.2 x 1.4 inches

Power: 10 – 32 VDC 5.5W

Weight: 390g

Video Input: 1 – HD-SDI, Mode: 1080i or 1080p only.

Video Outputs: 1 – HD-DSI loop thru

1 – HD-SDI with graphics overlay

Wireless Transceiver: G4

Calibration: Menu driven, using focus target or manual offset entry.

Depth of Field calculated using .025mm (.001") circle of confusion.

Loading New Firmware

- Video Interface Firmware Update. The Updater Program is available at:
<http://prestoncinema.com/downloads.html>.
 - Connect a serial cable (or USB to Serial adapter cable) between the VIU serial port and a PC or MAC running Windows and run the updater program. See Firmware updating instructions here:
<http://prestoncinema.com/Upgrades/FirmwareUpdatingInstructions.pdf>
 - Keep the Menu button pressed and then apply power. When the program recognizes the VIU, select **Yes** to update the program.
- Light Ranger Firmware Update
 - Before applying power to the Light Ranger, open the Updater Program on the computer.
 - Apply power to the Light Ranger.
 - When the Updater Program recognizes the Light Ranger, select **Yes** to update the program.

FCC Statement

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- * Reorient or relocate the receiving antenna.
- * Increase the separation between the equipment and receiver.
- * Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- * Consult the dealer or an experienced radio/TV technician for help.

This equipment has been verified to comply with the limits for a class B computing device, pursuant to FCC Rules. Operation with non-approved equipment is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference and
- (2) This device must accept any interference received including interference that may cause undesired operation.

FCC RF EXPOSURE STATEMENT

To satisfy RF exposure requirements, this device and its antenna must operate with a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Light Ranger Mounting Bracket Options

1. Arri Handle Bracket



The Arri Handle Bracket is a lightweight solution for Light Ranger mounting using the 3/8-16 threaded hole at the front of the handle.

LR2 Handle Bracket

p/n 6008



The Bridge Brackets provide mounting points both above and below the lens front.

15mm Bracket kit

p/n: 6003

19mm Bracket kit

p/n: 6004

19mm and 15mm bridges,

Complete bracket kit:

p/n: 6005