Dragonfish-II Series Torch Lights
6000m

USER MANUAL

Model AR105, Rev. C - FW v1.4 - 17 April, 2020

I. INTRODUCTION:

The Arctic Rays Dragonfish-II Light (DF2) is an ultra-high-output, dimmable continuous-mode, 2-channel LED light, rated for subsea use down to 6000m. It is housed in hard-anodized 6061-T6 aluminum, and available with addressable RS232 or RS485 serial communications, or analog 0-10Vdc dimming control (optional). The two LED banks may be optionally populated with different color LEDs and controlled independently, allowing 2-color monochrome or white color blending.

| PARAMETER	SPECIFICATION		
Model Number	AR105		
Depth Rating	6,000m (20,000ft)		
Input Voltage	200-420Vdc or 90-260Vac		
Max Input Power	300W		
Dimming Control	Multi-drop RS232 or Analog 0-10Vdc		
Max Intensity	30,000 lm (total combined from 2x independent channels)		
Color	2700K-6500K white, various static colors available		
Color Rendering Index (CRI)	70 min (optional 80 min)		
Beam Pattern (FWHM)	70° Flood (standard), 100° wide (optional)		
Window Material	Cast Acrylic		
Housing & Reflector Material	Aluminum, 6061-T6, AHC Black		
Weight (in air)	DC Version: 1.6kg (3.6 lbs) AC Version: 2.3kg (5.1lbs)		
Weight (in seawater)	DC Version: 0.7kg (1.5 lbs) AC Version: 1.0kg (2.2lbs)		
Operating Temperature	-10°C – 40°C		
Standard Connector Pinout* (Subconn MCBH8M)	1: Neutral (AC) or GND (DC) 2: Line (AC) or +Vdc (DC) 3: Chassis 4: N/C	5: RS232 RX / RS485(A)- 6: RS232 TX / RS485(B)+ 7: Analog GND 8: Analog Dim IN	

*WARNING: DF2 may be ordered with non-standard pinouts. Be sure to verify your unit's pinout before connecting power!

Dragonfish-II Dimensions (DC Version):
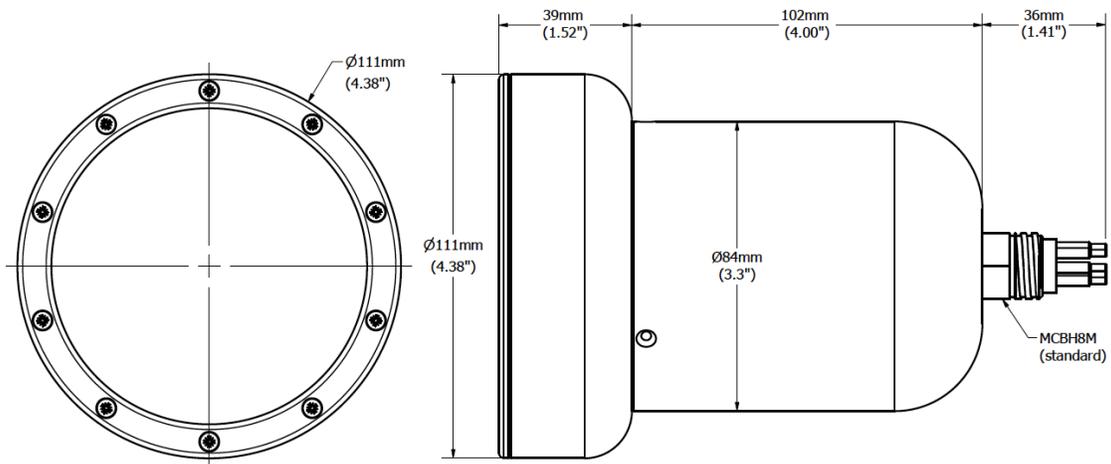
Dragonfish-II Dimensions (AC Version):

Ø111mm
(4.38")

Ø111mm
(4.38")

39mm
(1.52")

174mm
(6.86")

36mm
(1.41")

Ø84mm
(3.3")
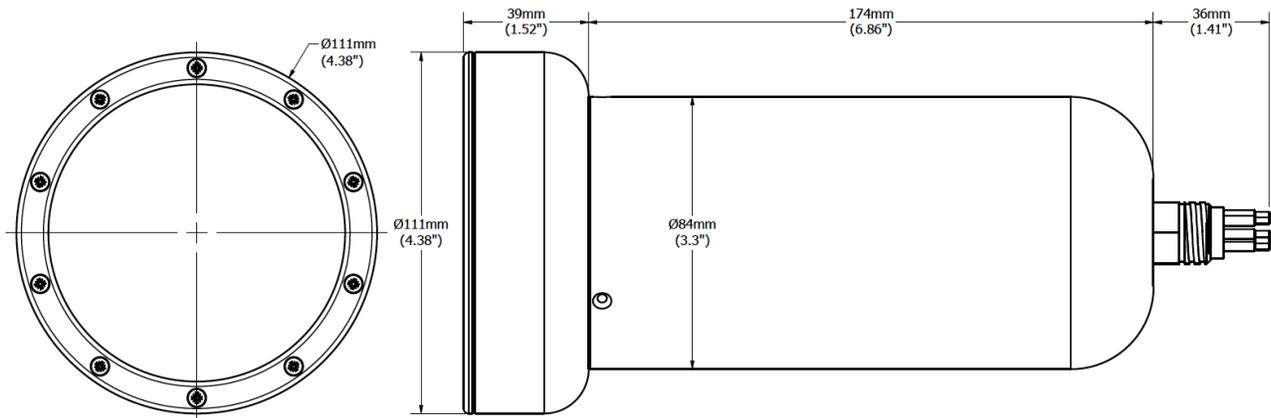
II.   SETUP

- **Mechanical:** The Dragonfish-II light should be clamped on its diameter. Do not suspend the DF2 from its connector.

- **Power:** The Dragonfish-II light is offered in two versions: high-voltage DC or high-voltage AC. The version should be shown on the product label. As shown in the figure above, the AC versions are longer than the DC. The DF2 does not require a regulated supply, as it has its own internal voltage regulators, but current draw and performance may vary when using supplies near the edges of its input range.

- **Thermal Considerations:** The Dragonfish-II light is meant for in-water operation, and should only be operated in air for short durations, for example during pre-dive testing (<1 min). The light may be powered in air indefinitely, but the LED array should be OFF.

   Heatsinking for the LED array is provided by the endcap bezel. Heatsinking for the driver electronics is provided by the cylindrical housing shell. Care should be taken to ensure that these areas have adequate exposure to water. If the entire housing is to be clamped, it is recommended that the clamp be made of thermally conductive material such as aluminum.

   The DF2 has an internal thermal self-protection feature which will disable the output if the LED array or driver electronics overheats. In this case, the RED diagnostic LED in the center of the front face will illuminate and a thermal error flag will show in the communications string (discussed later). The image below shows an overheat condition.


Diagnostic LED
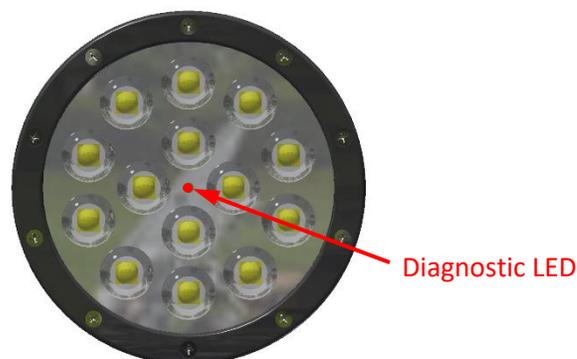
- **Communications:** Dragonfish-II communicates via serial port using either a RS232 or two-wire RS485 protocol (configured at the factory when ordered), running at **19200bps, 8-N-1-N**. For both serial types, a single host serial port may be used with up to 255 lights sharing the same two wires. Each unit is assigned a unique soft-address (0-254), and behaves as a slave device on the network. That is to say, it is always listening, but will only obey and respond to commands or queries from the master (host PC or control box), when the command matches its address. It is important that devices on the same serial port do not share the same address, or collisions will result. Address 255 is reserved as a "broadcast" address (all receive). Address 0 is the default address.

- **Network Termination:** In multi-drop serial networks, termination resistor(s) are often required to ensure reliable communications over extended distances. Dragonfish-II has its own internal termination resistors that can be enabled or disabled through a serial command (discussed later).

  It is possible to operate without proper termination, especially at the relatively low baudrate of 19200bps, but if communications problems are experienced, you may need to enable or disable termination resistors in one of the lights in the network, or on the host computer.

III. **SOFTWARE CONTROL**

The Dragonfish-II light comes with a Windows-based application which provides a basic graphical user interface (GUI) for setting-up and controlling Arctic Rays Dragonfish Series units. While multiple devices can be present on the same port, the GUI only controls one at a time.
To install, ensure that your computer is running Windows 7 or newer, and run the "setup.exe" program. The application screen is shown below.
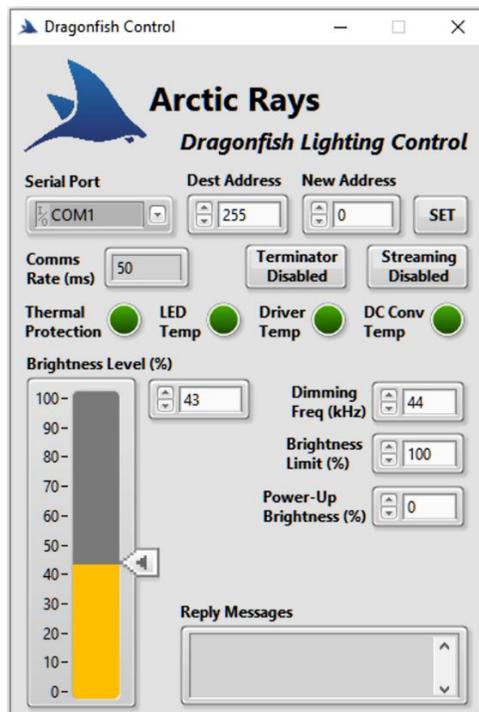
- **Communications Settings:** Before attempting to communicate with the DF2, verify the serial port and destination address for the unit you are trying to communicate with are correct. Address "255" is considered "broadcast" and will be answered by all devices. Use address 255 when setting up a new unit, or when only one unit is connected to the port and you are unsure of its address. Address 0 is default.

  To change the address of a unit, set the "New Address" field, verify that the destination address is correct, and press the "SET" button.

  To enable/disable the serial termination resistor, toggle the "Terminator" button. Its color and text will indicate the current state of the resistor (GREEN = enabled). Terminators are disabled by default.
  To enable/disable continuous output of status data, toggle the "Streaming" button. Its color and text will indicate the current state of the resistor (GREEN = enabled). Streaming is disabled by default.

  Device address, streaming, and termination settings are stored in non-volatile memory and retained after power cycle.

- **Brightness Slider:** The brightness level of the DF2 light can be changed using the slider or numeric control field, from 0-100%. This setting is NOT retained after power cycle.

- **Fault Indicators:** There are several green/red indicators which show over-temperature faults and the status of the internal thermal self-protection feature. If an over-temperature indicator displays RED, the DF2 light will not operate, and its diagnostic LED will be lit.

- **Dimming Frequency:** This sets the PWM frequency used for LED light dimming. Default is 44kHz. This setting is retained after power-cycle.

- **Brightness Limit:** This sets the maximum brightness level allowed by the DF2 light. Default is 100%. This setting is retained after power-cycle.

- **Power-Up Brightness:** This sets the brightness level used on power-up. Default is 0% (OFF). In the case where the DF2 is used without serial control, this parameter can be used to set the brightness level for ON/OFF operation. This setting is retained after power-cycle.

- **Reply String:** This field shows the text of the replies from the DF2 to commands issued by the GUI program, and any streaming messages.

- **Rate:** This field shows the DF2 communications update rate in milliseconds.

SERIAL COMMUNICATIONS PROTOCOL:

The protocol explained below can be used for 3rd party devices to communicate with and control Arctic Rays Dragonfish Series Lights. The DF2 communicates via multi-drop RS232 or half-duplex (two-wire) RS485, at **19200bps, 8-N-1-N**. All DF2s are considered "slave" devices. This is to say, they will not obey or reply to any commands from the master (host computer or controller) unless they are properly addressed.

All commands are sent as ASCII text, begin with the '$' (0x24) character, and should be terminated by a line feed <LF> (0x0A).   The command format is a comma-delimited string:

<div align="center">

"$Address,Cmd,Param1,…ParamN<LF>"

</div>

Where "Address" is the destination address, "Cmd" is the command from the host, and "param1…N" are the command parameters (if needed). Normal addresses are 0-254 (default is 0). Address 255 is reserved as a "broadcast" address, and will be obeyed by all units on the port.

Normal replies are comma-delimited, begin with the '#' (0x23) character, followed by the address of its origin, the reply type, and the message content. No replies will be issued after broadcast commands. The format is as follows:

<div align="center">

"#Address,Type,Message<LF>"

</div>

COMMAND LIST:

"?": GET STATUS.   Return all current parameters.

> *EXAMPLE COMMAND: "$1,?<CRLF>"*
> *REPLY FORMAT: "#Address,?,Brightness,Flags<LF>"*
>
> **Where the reply fields are…**
> **"#":** This is a reply message.
> **"Address":** Address of the unit replying
> **"?":** The command type being replied to (status)
> **"Brightness":** Current brightness level (0-100%)
> **"Flags":** ASCII-encoded Hexadecimal value that indicates errors (0x00 = All OK).
>
> <u>BIT ASSIGNMENTS:</u>   Bit 0: Thermal protection disabled
>   Bit 1: LED array overtemp
>   Bit 2: Driver circuit overtemp
>   Bit 3: DC Converter overtemp

"s": SETTINGS.   The settings command returns all stored settings as follows:

> *EXAMPLE COMMAND: "$1,s<LF>"*
> *REPLY FORMAT: "#Address,S,Term,Start,Lim,Freq<LF>"*
>
> **Where the reply fields are…**
> **"#":** This is a reply message.

"Address": address of the unit replying
"S": The message type (settings)
"Term": State of the serial termination resistor (0=disabled, 1=enabled)
"Start": Start-up brightness level (0-100%)
"Lim": Brightness limit (0-100%)
"Freq": PWM Dimming Frequency (kHz)

"b": SET BRIGHTNESS.   This command sets the brightness level of the torch light from 0-100% (off to max). The second parameter tells the light to store the setting as the new power-up brightness or not (1=save, 0=do not save). Reply is a status (?) message.

EXAMPLE COMMAND: "$1,b,65,0<CRLF>"

"p": SET POWER-UP BRIGHTNESS.   Sets the desired power-up brightness level (default is 0 = off). This allows the light to operate at a fixed setting whenever it is powered-up, without any further serial commands. The setting is saved in non-volatile memory for preservation after power-cycle. Reply is a settings (S) message.

EXAMPLE COMMAND: "$1,p,35<CRLF>"

"l": SET BRIGHTNESS LIMIT.   Sets a brightness limit to ensure that a user command or power-up setting can never exceed a specified power draw (default is 100 = no limit). The setting is saved in non-volatile memory for preservation after power-cycle. Reply is a settings (S) message.

EXAMPLE COMMAND: "$1,l,85<CRLF>"

"f": SET DIMMING FREQUENCY.   Sets the LED PWM dimming frequency, from 20-50 kHz (default is 44kHz). The setting is saved in non-volatile memory for preservation after power-cycle. Reply is a settings (S) message.

EXAMPLE COMMAND: "$1,f,44<CRLF>"

"c": SET CONTINUOUS OUTPUT.   Enables or disables continuous output. If enabled, the DF2 light will continuously transmit status messages at a rate of 1Hz. Other commands can be issued anytime while the unit is streaming. Setting is saved in non-volatile memory for preservation after power-cycle. Streaming will automatically begin on power-up. Follow command with a single parameter: 0=disable or 1=enable. Streaming is disabled by default. This command issues no reply, but status (?) messages will begin immediately after reception.

EXAMPLE COMMAND: "$1,c,0<CRLF>"

"v": GET VERSION.   Displays device and firmware version information.

EXAMPLE COMMAND: "$1,v<CRLF>"
EXAMPLE REPLY: "#1,v,Arctic Rays Dragonfish-II. FW:v1.4 Mar 02 2020 12:01:04 L.Frey"

"a": SET ADDRESS.   Sets new slave address (0-254) and saves in non-volatile memory for preservation after power-cycle. Unit must be power-cycled before change takes effect. *_*NOTE:_ If a device's address is unknown, broadcast this command (addr. 255), with only one unit on the port.*

EXAMPLE COMMAND: "$1,a,10<CRLF>"

"r": SET TERMINATION RESISTOR.   Enables or disables the internal serial termination resistor. Setting is saved in non-volatile memory for preservation after power-cycle. Follow command with a single parameter: 0=disable or 1=enable.

EXAMPLE COMMAND: "$1,r,1<CRLF>"

--------- END OF DOCUMENT ---------