OPERATING MANUAL

BTD-1 Accessory

Direction Finder

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Contents

General Information

1.1 BTD-1 Direction Finder Description

The BTD-1 Direction Finder allows the BTD-1 sensor to report the direction of lightning flashes in addition to their distance from the sensor. The location of lightning flashes is shown on the Lightning Eye software map display as a series of dots which fade with time. The Direction Finder thus allows the BTD-1 system to provide a clear picture of the track of thunderstorms in the area.

2 SUPPLIED EQUIPMENT

The following equipment is supplied in the Direction Finder carton. Please check the contents carefully and immediately report any missing items to your supplier.

- Direction Finder, mounted on support arm with cable and U-bolt attached
- 2 Black nylon cable ties

3 Sensor Installation

The Direction Finder mounts to the BTD-1 sensor mounting pole below the sensor. The BTD-1 Direction Finder connects to the BTD-1 through a dedicated connection port.

3.1 Mounting the Direction Finder

The Direction Finder is supplied attached to the mounting arm with the cable attached. Mount the arm to the pole below the BTD-1 sensor using the supplied U-bolt as shown in Figure 4-1 below.

Ensure the arrow on the side of the **Direction Finder is pointing to True North**. If the Direction Finder is not accurately aligned to North, the reported lightning location will not be correct.

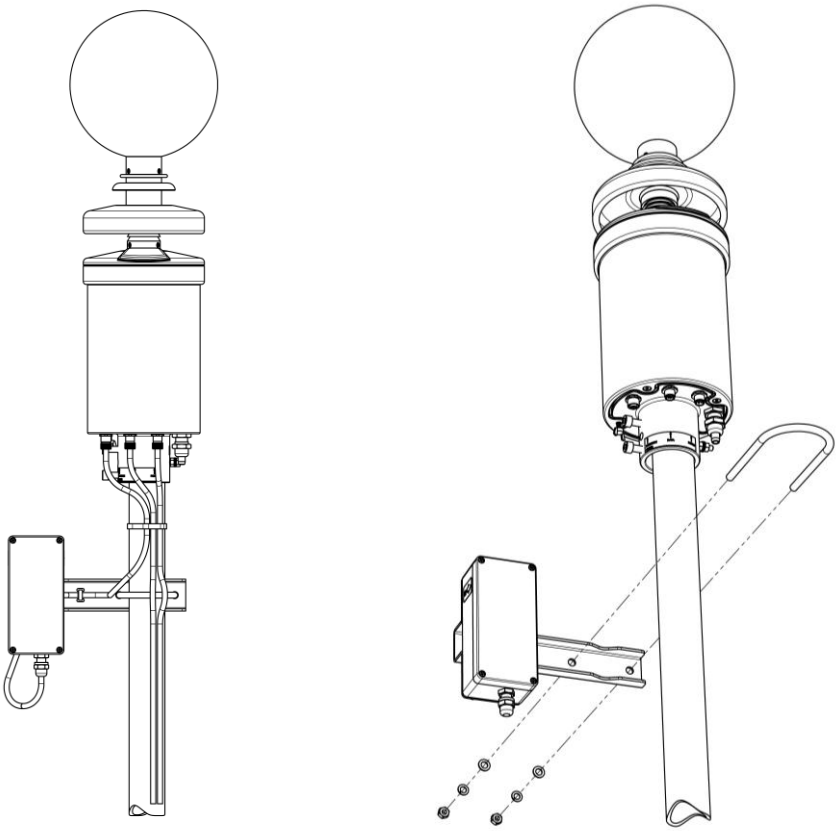


Figure 3-1 Direction Finder Mounting

3.2 Connecting the Direction Finder

Connect the flying lead of the Direction Finder to the associated port on the BTD-1. Once connected, the BTD-1 will automatically recognise the direction finder. This can be checked by using the command **DFCONNECTED?** which will respond with:

DF CONNECTION:,01,00 (DF Connected)

DF CONNECTION:,00,00 (DF Disconnected)

If removed, the BTD-1 should be power cycled to clear any direction finder disconnection errors.

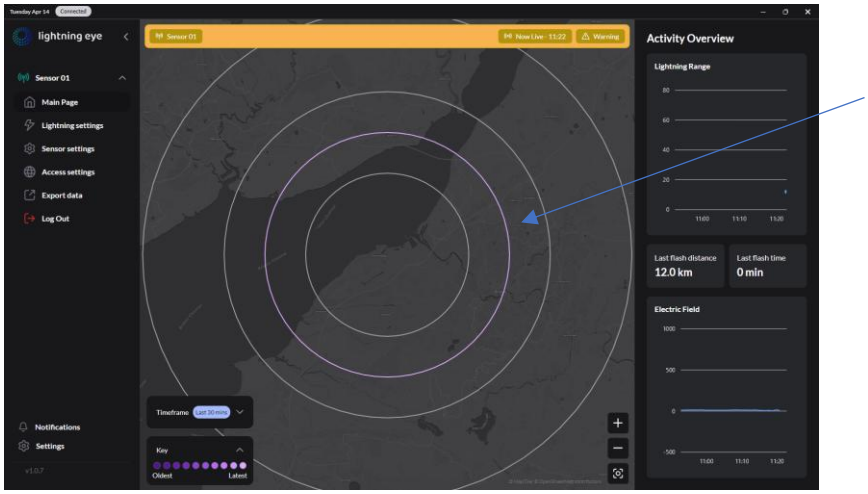
4 Using the Direction Finder

4.1 General

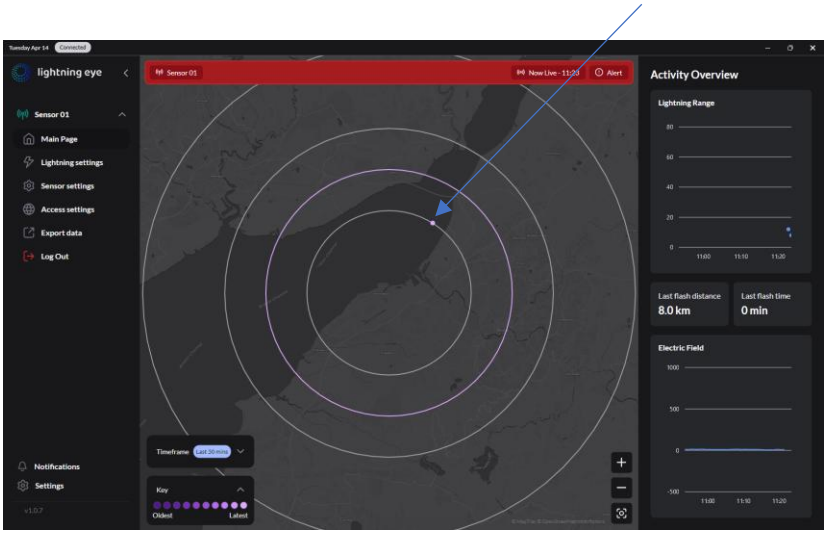
After the Direction Finder has been installed the BTD-1 system will provide bearing information of lightning flashes. When used in conjunction with the Lightning Eye software, the mapping functional is improved, providing dots for flash locations versus a ring. Note, it is not possible for the direction finder to identify a direction for all lightning flashes.

4.1.1 Lightning Eye Display

For systems without a direction finder or where a lightning bearing has not been obtained the map will show lightning as a band at the range indicated by the BTD-1.



For systems with a direction finder fitted and the direction finder has provided a bearing, a dot shall be drawn at the range and bearing provided.



4.2 Systems Integration

Where a lightning flash bearing has been identified it shall be presented within the flash data of the broadcast message. The bearing is also saved within the flash memory.

See below broadcast message with bearing information highlighted:

Field	Description	#chars
<00>,	Message Start	5
DATA:,	Message Header	6
ID,	Sensor ID Number	3
DDMMYY,HHMMSS,	Current BTD Date/Time	14
WW,	Warning/Alert flags	3
CCCC,	Active Flags (Prewarnings, other features)	5
BBBB,	System Level Status	5
BB,	Relay Status	3
+VVVVVV,	E-Field Data	8
AA,	Number of flashes in message	3
UUU,	Flash Index Number	4
DDMMYY,HHMMSS,	Flash 1 Date & Time	14
CCC,	Milliseconds	4
XXXXXX,	Distance to flash in metres	7
XXX,	**Direction to flash in degrees**	**4**
TTTT,	Flash Flag	5
DDMMYY,HHMMSS,	Flash 2 Date & Time	14
CCC,	Milliseconds	4
XXXXXX,	Distance to flash in metres	7
XXX,	**Direction to flash in degrees**	**4**
TTTT,	Flash Flag	5
DDMMYY,HHMMSS,	Flash 3 Date & Time	14
CCC,	Milliseconds	4
XXXXXX,	Distance to flash in metres	7
XXX,	**Direction to flash in degrees**	**4**
TTTT,	Flash Flag	5
DDMMYY,HHMMSS,	Flash 4 Date & Time	14
CCC,	Milliseconds	4
XXXXXX,	Distance to flash in metres	7
XXX,	**Direction to flash in degrees**	**4**
TTTT,	Flash Flag	5

5 Maintenance

The BTD-1 Direction Finder requires no routine maintenance; however, it is recommended the following checks are carried out at least annually to ensure your system continues to work reliably.

5.1 Cables, Corrosion and Fasteners

The Direction Finder is made from glass reinforced plastic and stainless steel so should not corrode; however, we recommend that all mounting hardware and associated fasteners (nuts and bolts) are checked to ensure they are corrosion free and tight.

Check the condition of the cable going to the BTD-1. Ensure the cable is secured so it cannot be damaged by moving around in the wind.

5.2 General Cleaning

It is recommended that any heavy build-up of dirt is removed from the Direction Finder. This can be achieved with a brush and water hose as required.

Small amounts of detergent can be used to clean the sensor if desired but make sure the sensor is thoroughly rinsed to remove all traces of detergent.

6 Adjusting the Direction Finder Offset

If the Direction Finder is not correctly aligned to True North or if there are local distortions in the Earth's magnetic field the reported direction may have an offset. The offset is not usually large but may be noticeable when the map display is compared to a lightning location network. The following sections describe how to determine the size of the offset and apply a correction. Where the local magnetic field is distorted the correction may not remove completely the offset for all reported directions.

6.1 Finding the Actual Lightning Direction

There are several options to independently find the actual direction to lightning, some of the best are detailed below. You can find the lightning direction reported by the BTD-1 for each flash by exporting the flash data.

For all the methods discussed below, to increase confidence of the comparison distances, it is best to compare many flashes and find a typical direction reported by the BTD-1 Direction Finder and the independent method. Always make sure that you are comparing lightning flashes detected by the BTD-1 and an independent method which occurred at the same time.

6.1.1 National Lightning Location Network

Lightning detection by a national lightning location network is usually the best option for locating lightning flashes as you can see individual flashes in near real-time. This service can normally be found on your national weather service website or good quality lightning data sites such as www.lightningmaps.org.

Identify individual flashes that are shown by both the BTD-1 and the lightning location network and record the direction reported by the BTD-1 and the direction from the BTD-1 to the flash as shown on the lightning location network. For best results choose a small localised storm and average the BTD-1 direction and lightning network direction for several flashes.

To determine the direction of the flash as reported by the lightning network it may be necessary to printout the lightning network's map display and then measure the direction between North and flashes at the sensor's location. The direction is measured clockwise from North at the sensor's location to the flash reported by the lightning network.

Where possible combine the results from several storms in different directions around the BTD-1. For each flash subtract the BTD-1 direction from the lightning network direction. Calculate the average difference between the BTD-1 direction and that of the lightning network to obtain the offset value.

6.2 Entering the Direction Finder Offset

The Direction Finder offset is entered in the Direction Finder Offset section of the Sensor Settings tab of the Lightning Eye software. Details of how to enter the offset are given Light Eye user manual.

7 Specifications

7.1 Measurement

Direction	Resolution 1°

7.2 Power Requirements

Supply Voltage	Powered by BTD-1 Sensor
Power Consumption	Less than 3 W (DC)

7.3 Environmental

Operating temperature	-20°C to 50°C
Relative humidity	0 to 100%
Protection rating	IP66
Wind speed	60 m/s
Altitude	-200m to 2,000m
Shock and vibration	Land based fixed installation

7.4 Certification and Compliance

CE marked	
EMC	EN61326-1:2021 Industrial immunity, industrial emissions
Compliance with EN50536:2011+A1:2012 for a Class 1 detector	
Performs in accordance with IEC 62793 for a Class A detector	
RoHS and WEEE compliant	

7.5 Physical

Material	Stainless steel, glass filled epoxy plastic
Colour	Silver, grey
Weight	1.4kg, 3lbs Sensor and mounting bracket
Height	220mm, 8.6”
Width	90mm,3.5”

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NOTES

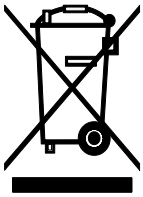
WARRANTY

The manufacturer is required to respond to the "factory warranty" only in those cases provided by the Consumer Rights Act 2015. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (12 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product.
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product.

TECHNICAL INFORMATION

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased.
We reserve the right to change technical specifications and dimensions to fit the product requirements without prior notice.

DISPOSAL INFORMATION



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.

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