

# USER MANUAL

## INSTALLATION - OPERATION - MAINTENANCE





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# **1 HOW TO USE THIS MANUAL**

The manual is organised so that if you read it from start to finish you will have a good understanding of how the system operates, how it should be installed and how to use it. We realise however that different people will be involved in the installation and use of the system, so the following guidance is given.

When accessories have been purchased, please refer to the accessory manual for detailed information regarding installation and operation.

## **Physical Installation**

Section 5, Sensor Installation, covers the physical installation of the system.

The installation will involve mounting the sensor outside on a pole and running cables to a power source and your site warning system and/or IT system. A general maintenance contractor or electrician will be able to do this work.

## **Software Installation**

Section 6, Lightning Works Software, covers the installation of the software.

We have made the installation as easy as possible, so if you are generally happy installing software applications the process should not be too difficult. You may wish to consult your IT department about where to install the server part of the software.

## **Use and Maintenance**

Section 4, The BTD-200 System, describes how the system operates and how it can be configured to your needs. This section should be read by the person responsible for operating the system.

The last part of Section 6, Lightning Works Software, covers use of the Lightning Works software.

Maintenance requirements are discussed in Section 7, Maintenance.





## 2.5 Contacting Biral

If you would like technical assistance, advice or you have any queries regarding the operation of the sensor please do not hesitate to contact us.

Contact us by telephone on: + 44 (0)1275 847787

Contact us by email at: [enquiries@biral.com](mailto:enquiries@biral.com)

If you bought your system from a local agent, you may wish to contact them in the first instance. No matter how you got your system Biral is here to help.

## 2.6 One year warranty

The BTD-200 system comes with a one-year limited warranty against defective materials and workmanship. If you have any questions about the warranty, please contact Biral.

To help us to assist you please be sure to include the following information:

- Model of equipment
- Serial number of equipment
- Nature of defect
- Your full name, address, and contact details

## 2.7 If you need to return the sensor

The BTD-200 sensor should give you many years of trouble-free service but in the unlikely event that the equipment proves to be faulty and we have asked you to return the sensor to us, please address the equipment to:

BIRAL  
Unit 8 Harbour Road Trading Estate  
Portishead  
Bristol  
BS20 7BL  
UNITED KINGDOM

The customer is responsible for the shipping costs.

## 2.8 UKCA and CE Certification

All Biral's BTD sensors comply with the requirements for UKCA and CE marking. Once installed, it is the user's responsibility to ensure that all connections made to the equipment comply with all Local and National safety requirements.

## 2.9 Safety

### 2.9.1 Earthing

This product **MUST BE EARTHED**. Failure to install a suitable earth may result in inaccurate readings and/or damage to the product and attached equipment.



### 2.9.2 Operating Voltages

This product is intended for use with Non-Hazardous voltages only. The maximum permissible supply voltage is 30V DC. The maximum permissible voltage switched by the relays is 16V AC rms, 22.6V AC peak or 35V DC.










### 2.9.3 Inappropriate Use

Use of this product in a manner not described or specified in this manual may result in the protection provided being impaired.



### 3 SUPPLIED EQUIPMENT

The following equipment is supplied in the BTD-200 carton. Please check the contents carefully and immediately report any missing items to your supplier.

Picture	Part No.	No. Supplied	Description
	BTD20	1	BTD-200 Thunderstorm detection sensor
	BA.001	1	Universal AC Power adaptor Indoor use only
	BA.000	1	Serial Communications Interface Unit. Converts BTD-200 data signals to USB for connection to a computer
	BTD20.LW	1	USB Drive. Holds the user software as well as electronic copies of this manual and device drivers
	107495	1	6mm Hex key
	107494	1	3mm Hex key
	107511	1	This Manual

## 4 THE BTD-200 SYSTEM

This section explains the different ways in which the BTD-200 system can be installed and operated with other equipment such as user computers and alarm sounders. Please take the time to read this section as it will help you to understand the detailed instructions in later sections.

### 4.1 Overview

The BTD-200 sensor detects the presence of lightning flashes and the possibility of overhead lightning even before the first flash. The sensor must be mounted outside in an open area where it can sense changes in the Earth's electrostatic field caused by thunderstorms. The sensor can provide you with lightning warnings in the following ways:

- By direct connection to your site warning system using the internal relays
- By warnings on your computer using the supplied Lightning Works software
- By using the indicators and sounder on the BTD-200 Base Control Box
- By using the BTD-200 Wide Area Sounder
- Or any combination of the above

The other BTD-200 system components which, apart from the Lightning Works software, are sold separately, are described below.

#### **BTD-200 Lightning Works Software**

The Lightning Works Software is a multi-user application that runs on Microsoft operating system computers. It enables up to five users to view the status of the BTD-200 system and receive lightning Warnings and Alerts. The administrative user can configure the system and cancel Warnings and Alerts.

The application has two parts, a server, and a client. The server runs in the background on the computer that is connected to the BTD-200 sensor, this can either be a users' PC or a local server. The client software runs on each computer that requires access to the system. Any number of clients can be installed but only five can be connected at any time.

The client software may be installed on computers on the same network as the server or on remote computers connected to the server network via VPN or the internet.

#### **BTD-200 Direction Finder**

The Direction Finder accessory allows the BTD-200 to report both the range and direction of lightning flashes. The Direction Finder is mounted on an arm which attaches to the BTD-200 mounting pole, it is wired directly to the BTD-200 from which it takes its power.

When the Direction Finder is attached the Lightning Works software displays the location of each detected flash as a dot on the map overlay.

### **BTD-200 Lightning Works Messenger**

Lightning Works Messenger is a software application that works alongside the Lightning Works software to allow SMS and email messages to be sent automatically when the BTD-200 generates a thunderstorm warning, or a fault condition is detected.

Lightning Works Messenger can be installed on the same computer as the Lightning Works Server or on any other computer on the same local network. Commercial SMS messaging and email service providers are used to send the messages, a reliable internet connection is therefore essential.

### **BTD-200 Lightning Works Server Admin**

The Lightning Works Server Admin is an application that works alongside the Lightning Works Server to enable remote client connections across the internet. The Lightning Works Server Admin must be installed on the same computer as the Lightning Works server.

A separate manual is provided for remote connections and Lightning Works Server Admin.

### **BTD-200 Base Control Box**

The Base Control Box provides a simple means of visualising the system warnings and operational state without the need for a computer. Designed to be installed in an indoor environment, the Base Control Box also has relays for connection to your site warning system. The relays have the same function as those in the BTD-200 sensor.

You can connect your computer or server directly to the Base Control Box using either USB or Ethernet, this replaces the data connection from the BTD-200 to the computer. You may wish to use the Base Control Box in this way when it is located close to your existing site warning system, perhaps in a plant room, but you also wish to use the Lightning Works software to monitor and configure the system.

When the BTD-200 communications link is connected to the Base Control Box the connection to your computer or server can only be from the Base Control Box via the USB or Ethernet output. Direct connection from the BTD-200 to a user computer is not possible if a Base Control Box is used.

### **BTD-200 Wide Area Sounder**

The Wide Area Sounder provides a very loud audible warning of thunderstorm activity. The sounder is designed to be audible at 700m (2,300') in open country.

Intended for outdoor installation the Wide Area Sounder should be mounted as high as possible for maximum range and to avoid hearing damage to anyone very close to the horns.

The Wide Area Sounder is controlled by a data link that may come from either the BTD-200 or the Base Control Box. The ability to connect to either the BTD-200 or Base Control Box is provided to make installation as flexible and easy as possible.

Due to the high power output of the horns the Wide Area Sounder is mains powered. An option for solar power with battery backup is also available for sites without mains power.

### **BTD-200 Radio Module**

The BTD-200 Radio Modules allow wired data connections between the various system components to be replaced with a radio link, greatly simplifying system installation. Where Radio Modules are used one must be connected to the BTD-200 but it is not necessary for all data connections in the system to use them. Radio Modules can be used for the following data connections:

- BTD-200 to User Computer
- BTD-200 to Base Control Box
- BTD-200 to Wide Area Sounder

The Radio Module can connect to the user computer or Base Control Box using a cable up to 100m (328') long. This allows the Radio Module to be located outside for optimum range.

The Radio Modules are available for licence free use in the EU, USA and Canada.

### **BTD-200 Field Test Unit**

The BTD-200 Field Test Unit (FTU) is intended for checking the operation of Biral BTD-200 thunderstorm warning systems and any connected accessories. It simulates lightning flashes, strong electric fields and charged precipitation.

## **4.2 System Configurations**

A BTD-200 system can be put together in several ways depending on the needs of the user and the chosen equipment. This section looks at the features available to the user in various configurations.

### **4.2.1 Standalone Use**

The simplest possible configuration. The BTD-200 sensor connects to your site warning system using the built in relays. Three relays provide the following functions:

- Fault Relay                      Held in the closed position when the BTD-200 is powered and working correctly.
- Alert Relay                      Activates when overhead lightning is detected.
- Warning Relay                      Activates when distant or vicinity lightning or the risk of an overhead storm is detected.

The BTD-200 sensor does not require any user input to operate, only power, so a connection to a user computer or Base Control Box is not necessary.

As there are some options that you can configure to your requirements, you may find it useful to connect the BTD-200 to a computer before installation for configuration. The following options are configurable using the Lightning Works software:

- Alert and Warning Relay Operating Mode and Duration      The Alert and Warning relays can be configured to either operate for a short time at the start and end of an Alert or Warning period, or to close for the entire duration. For more details see Section 4.5.
- Relay Inactive Time      It is possible to set the relays so they do not operate between two set times. This can help to stop annoying your neighbours at night when Warnings and Alerts are not needed. For more details see Section 4.5.2.3.
- Set Local Time      It is important to ensure the BTD-200 is set to local time if the relay deactivation function is to be used
- Detection Range Limits      The ranges used to trigger overhead, vicinity and distant lightning Warnings and Alerts can be adjusted if required. For more details see Section 4.4.1.
- Number of Flashes for Warning      The number of distant and vicinity flashes required to trigger a Warning can be adjusted if required. For more details see Section 4.4.3.

#### 4.2.2 Connected Directly to a Computer

The BTD-200 can connect directly to a user's computer or a group of computers on a local network using either a wired data connection or a Radio Module link. The Lightning Works software can then run on up to five networked computers allowing lightning warnings to be displayed along with system health status.

An administrative user can configure the operation of the BTD-200 and cancel any lightning Warnings or Alerts. When an Administrator cancels a Warning or Alert the BTD-200 relays are reset, as are the Warnings and Alerts displayed to normal users. Normal users can observe Warnings and Alerts and cancel the warning sound generated by their computer. Normal users cannot cancel the BTD-200 Warnings or Alerts for other users, nor can they reset the BTD-200 Warning and Alert relays.

The BTD-200 is supplied with a Serial Communications Interface Unit to connect the wired data connection to the USB port of a computer. When good quality data cable is used the cable length can be up to 1,000m (3,280'). To protect the computer from any electrical damage caused by lightning induced surges on the data line, the Serial Communications Interface Unit electrically isolates the cable from the computer. Using any other serial to USB adaptor risks severe damage to the computer.

Connecting the BTD-200 to a computer does not stop you using the BTD-200 relays to connect to your site warning system. Using the Lightning Works software provides an additional level of control over the warning system as Warnings and Alerts can be cancelled from the Administrators computer if required.

#### 4.2.3 Remote Connection

The Lightning Works application allows remote users to connect to the BTD-200 through the internet or VPN. The BTD-200 must be connected to local computer with internet access for remote access operation. Remote connection also allows one computer to connect to many BTD-200 sensors.

#### 4.2.4 Using Lightning Works Messenger

When the BTD-200 is connected to a user's computer running the Lightning Works software, the Lightning Works Messenger provides the capability of automatically sending SMS and email messages when thunderstorm activity or a fault is detected. Lightning Works Messenger can run on any computer on the same local network as the Lightning Works Server or through a remote connection. It does not interfere with the normal operation of the BTD-200 sensor or the Lightning Works software, nor does it reduce the number of available Clients that can run.

Warning messages are sent using third party SMS and email service providers who independently charge for this service. Lightning Works Messenger communicates with the messaging service providers over the internet, therefore the computer on which it is installed must have a reliable internet connection.

#### 4.2.5 Connected to a Base Control Box

Connecting the BTD-200 to a Base Control Box provides three additional capabilities as described below:



- The system health status and any lightning Warnings and Alerts are displayed using indicator lights on the front panel. A local sounder operates when either a lightning Warning or Alert is active. Switches allow both the local and system warnings to be reset. Other switches allow the local sounder and the BTM Warning and Alert relays to be activated for a short period allowing you to easily test the operation of your site warning system.
- The Base Control Box has three relays that operate in exactly the same way as the relays in the BTM-200. This provides a convenient way to connect the BTM-200 to your site warning system when the BTM-200 is remote from the site warning equipment.
- The Base Control Box provides both USB and Ethernet connections to the user's computer or network allowing use of the Lightning Works software to control and monitor the BTM-200 system. The Ethernet connection can be very useful in providing a convenient way of connecting the BTM-200 system to your local network, it also provides an enhanced degree of lightning surge protection to your IT system. When connected to a computer using either USB or Ethernet both the Base Control Box switches and the Lightning Works Software can be used simultaneously to monitor thunderstorm activity and cancel Warnings and Alerts.

Connecting the BTM-200 to a Base Control Box does not stop you using the BTM-200 relays, indeed the relays in both the BTM-200 and Base Control Box can be used at the same time.

When a Base Control Box is connected to the BTM-200, any connection to a user's computer or network must be made through the Base Control Box USB or Ethernet connection.

#### 4.2.6 Using the Wide Area Sounder

The Wide Area Sounder can be connected to either the BTM-200 or a Base Control Box using a wired data connection. The ability to connect to either the BTM-200 or the Base Control Box provides greater flexibility in locating the various components of your lightning warning system. Radio Modules can be used to replace the data link between the BTM-200 and the Wide Area Sounder, including situations where a Base Control Box is also connected using a Radio Module. The Wide Area Sounder can also be wired to a Base Control Box that is connected to the BTM-200 using a Radio Module. Only one Wide Area Sounder can be installed in a BTM-200 system.

The Wide Area Sounder operates in the same way as the BTM-200 relays when signalling Warnings and Alerts, that is a tone can be generated for a short period at the start and end of thunderstorm activity or the tone can be generated for the

duration of the thunderstorm activity. A number of tones are available such that different tones can be used to signal the start and end of thunderstorm activity and to differentiate between Warnings and Alerts. The operating mode is always the same as that set for the BTD-200 relays, whilst the tones generated are configurable using switches inside the enclosure.

Using the Wide Area Sounder does not disable the relays in either the BTD-200 or the Base Control Box. A Wide Area Sounder can also be connected to a BTD-200 that is not connected to either a Base Control Box or a user computer system, this configuration is very much like the Standalone Use described in Section 4.2.1.

## **4.3 Other Equipment You May Have Purchased**

### **4.3.1 BTD-200 Power Cable**

Power Cable is available to connect between the BTD-200 and the supplied mains adaptor. Cable is available in standard lengths of 20m (65'), 50m (164') and 100m (328'). Other lengths are available on request.

### **4.3.2 BTD-200 Data Cable**

Data Cable is available for wired connections between the BTD-200 and either the Base Control Box or your computer. The cable is also used to connect the Radio Modules to the BTD-200, Base Control Box, Wide Area Sounder and Serial Interface Unit. Cable is available in standard lengths of 20m (65'), 50m (164') and 100m (328'). Other lengths are available on request to a maximum of 1,000m (3280').

### **4.3.3 Wide Area Sounder Data Cable**

Data Cable is available for wired connections between the BTD-200 or Base Control Box and the Wide Area Sounder. Cable is available in standard lengths of 20m (65'), 50m (164') and 100m (328'). Other lengths are available on request to a maximum of 1,000m (3280').

### **4.3.4 Radio Module Mounting Kits**

Radio Module kits are supplied with mounting adaptors appropriate to the kit. A mast mounting kit is available for instances where the standard mounting kit is not suitable.

- BTD-200 Radio Module Mast Mounting Kit. Includes a mounting arm and cable required to mount the Radio Module on the mast below the BTD-200.

### **4.3.5 BTD-200 Earthing Kits**

For correct operation the BTD-200 must be connected to a suitable earth/ground connection. Earthing kits, consisting of a 2.4m (7.9') earth rod and either 2m (6.5'), 5m (16') or 10m (32') of 10mm<sup>2</sup> (7 AWG) copper cable are available from Biral.

### **4.3.6 BTD-200 Mounting Pole**

For mounting the BTD-200 to a level concrete base a 1.50m (59") high pole with 250mm (10") square base is available.

### **4.3.7 BTD-200 Wall Mounting Bracket**

For mounting the BTD-200 to a wall. The bracket provides a convenient way to stand the mounting pole 445mm (17.5") away from the wall avoiding roof overhangs. The mounting pole is not included in the kit and should be sourced locally.

## 4.4 Understanding Warnings and Alerts

This section explains the meaning of Warnings and Alerts for the BTD-200 system and what causes them to be triggered. In this manual the words Warning and Alert when written with a capital letter refer to the type of warning the BTD-200 has generated because of thunderstorm activity.

### 4.4.1 Lightning Range Bands

The BTD-200 uses three lightning range bands when signalling Warnings and Alerts and for displaying information on the Lightning Works software, these are Overhead, Vicinity and Distant. The three bands are represented by concentric circles centred on the BTD-200. When the size of the band is given the value is the distance from the BTD-200 to the outer edge of the band. The size of the bands can be adjusted using the Lightning Works software, the allowable values and the defaults are given in the table below.

Range Band	Allowable Range	Default
Overhead	1 km (or 1 mile) to Vicinity -1	8 km (5 miles)
Vicinity	Overhead +1 to Distant -1	16 km (10 miles)
Distant	Vicinity +1 to 35 km (22 miles)	35 km (22 miles)

### 4.4.2 Lightning Alerts

An Alert is the most important lightning warning the BTD-200 produces. An Alert is signalled when one or more lightning flashes have been detected in the Overhead range band. This means a thunderstorm could be directly over you and you should decide immediately what action to take.

### 4.4.3 Lightning Warnings

A Warning has lower importance than an Alert but still means there is a risk of thunderstorm activity in your immediate area. A Warning is signalled when any combination of the following events is detected.

- Lightning flashes detected in the Vicinity range band
- Lightning flashes detected in the Distant range band
- A strong electric field detected above the BTD-200
- Electrically charged rain, hail or snow falling on the BTD-200

To allow you to control when a Warning is signalled the number of flashes required in the Vicinity and Distant range bands can be set using the Lightning Works software. The number of flashes that can trigger a Warning and the default is shown in the table below.

Range Band	Number of Flashes	Default
Vicinity	1, 2 or 3	1
Distant	1, 2, 3, 4 or Never Warn	2

A Warning is triggered when the required number of flashes occur in either range band within the Warning Delay Period. The default for the Warning Delay Time is 15 minutes but you can change this to any value in the range 10 to 30 minutes using the Lightning Works software.

For the Distant range band, if Never Warn is selected no Warnings will be generated by lightning in this range band no matter how many flashes occur there.

**Increasing the number of flashes required to generate a Warning or Alert or setting the Distant range band to Never Warn may reduce the effectiveness of the BTD-200 system as a Thunderstorm detection and warning device. Always ensure your chosen settings are consistent with your site safety requirements.**

## 4.5 How the Relays Work

The BTD-200 and the Base Control Box each have three relays that can be used to connect to your site warning system. The relays on the Base Control Box function in exactly the same way as those in the BTD-200, either or both sets of relays can be used. The way these relays operate and how they can be configured is explained in this section.

### 4.5.1 Fault Relay

This relay is provided as a simple way to monitor the health of the BTD-200 system. When the BTD-200 system is powered, and all the system components are operating correctly the relay contacts will be closed. If the power is lost or a fault is detected in any system component the relay contacts will open. The relay therefore provides a failsafe method of monitoring the status of the system.

To avoid transient faults that only last for a few moments being reported the fault condition must be present for a configurable period before the relay opens. If power to the BTD-200 is lost however the relay contacts will open immediately. The relay will remain open for a configurable period after a fault is cleared.

The delay times are set using the Lightning Works software. See Section 10.2.3 for details of default values and parameter range.

## 4.5.2 Warning and Alert Relays

Although the Warning and Alert relays are triggered by different types of thunderstorm activity the way in which they work is the same. There is a choice of two operating modes and the relays can be set to not come on during a set part of the day or night.

### 4.5.2.1 Relay Mode 1

This is the default operating mode for the Warning and Alert relays. In this mode when an Alert or Warning is generated the relay closes for a set time to signal the presence of thunderstorm activity, the relay then opens and stays open until no further thunderstorm activity has been detected for a set time, at this point the relay closes for a short time to signal the end of the thunderstorm activity. This mode of operation is useful where you do not wish to annoy people in the area by having the sounders operating for the entire duration of a storm.

Using the Lightning Works software, the following times are configurable.

- |                            |  |
|----------------------------|--|
| • Warning Active On Time   | The duration for which the Warning relay closes to signal the start of thunderstorm activity.  |
| • Warning Active Off Time  | The duration for which the Warning relay closes to signal the end of thunderstorm activity.  |
| • Warning Persistence Time | <p>The time delay from the BTD-200 detecting the last instance of thunderstorm activity and the closing of the relay to signal the end of the Warning.</p> <p>This parameter is also used to set the delay between a Warning being cancelled and the system responding again to thunderstorm activity.</p> |
| • Alert Active On Time     | The duration for which the Alert relay closes to signal the start of thunderstorm activity.  |
| • Alert Active Off Time    | The duration for which the Alert relay closes to signal the end of thunderstorm activity.  |
| • Alert Persistence Time   | <p>The time delay from the BTD-200 detecting the last instance of thunderstorm activity and the closing of the relay to signal the end of the Alert.</p> <p>This parameter is also used to set the delay between an Alert being cancelled and the system responding again to thunderstorm activity.</p>    |
| • Cancellation Delay Time  | If a Warning or Alert is cancelled by a user, the relay will close for the Active Off Time to signal the cancellation. If the Warning or Alert is cancelled during the Active On Time the relay will immediately   |

open for the Cancellation Delay Time before closing again for the Active Off Time. In this way the cancellation is distinguished from the activation.

See Section 10.2.4 for details of default times and parameter range.

#### 4.5.2.2 Relay Mode 2

In this mode the relay closes for the entire time the thunderstorm activity is detected.

Using the Lightning Works software, the following times are configurable.

- **Warning Persistence Time**      The time delay from the BTD-200 detecting the last instance of thunderstorm activity and the opening of the relay to signal the end of the Warning.  
This parameter is also used to set the delay between a Warning being cancelled and the system responding again to thunderstorm activity.
- **Alert Persistence Time**      The time delay from the BTD-200 detecting the last instance of thunderstorm activity and the opening of the relay to signal the end of the Alert.  
This parameter is also used to set the delay between an Alert being cancelled and the system responding again to thunderstorm activity.

See Section 10.2.5 for details of default times and parameter range.

#### 4.5.2.3 Relay Inactive Time

To avoid the site warning sounders causing a nuisance when the site is unoccupied, at night for example, the Alert and Warning relays can be disabled between a start and end time.

The Relay inactive time is set using the Lightning Works Software. The inactive period start and end times are entered using the 24-hour clock format. The BTD-200 internal clock is used to control the switching time, make sure it is set to local time.

See Section 10.2.6 for details of default times and parameter range.

## **4.6 BTD-200 Data Archive**

The BTD-200 communicates with the Lightning Works software and Base Control Box by sending digital messages over the primary communications link. The Lightning Works software archives these messages on the server computer, so they can be exported at a later date. You might want to do this to see when Warnings and Alerts were generated on a particular day or to prove that you have an effective lightning warning system in operation.

Historical data is exported from the Lightning Works software as CSV files that can be opened in most spreadsheet applications. See Section 6.8.3.4 for details of the export process. See Section 9 for help interpreting archived data.

The Base Control Box is also able to archive the primary communications messages, in a text format, if a SD memory card is fitted. Please refer to the Base Control Box manual for full details.



## 5 SENSOR INSTALLATION

### 5.1 Site Selection

It is very important for the successful operation of the BTD-200 that it is installed at a suitable site. Please consider the following when selecting your installation site:

**Ideal site** (gives best performance)

- Flat, level ground with no obstacles higher than approximately 20cm (10") (including vegetation) within 2m (79") of the sensor
- BTD-200 mounted on a pole that extends 1.50m (59") above ground level
- No obstacles of any kind closer than approximately 3 times their height
- No overhead obstructions (e.g. cables)
- No frequent movement of people, animals or vehicles within 10m (33")
- No large ferrous metal objects within 20m (65'). Only applicable when a Direction Finder is used.

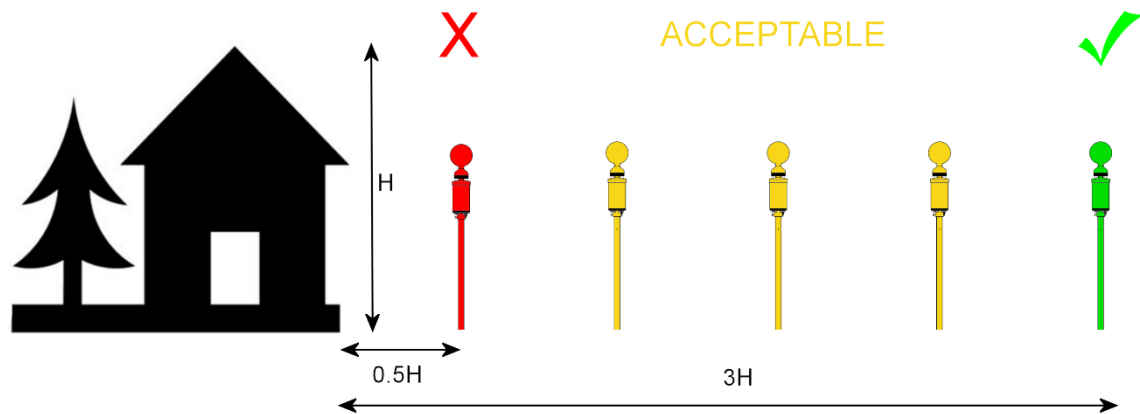
**Acceptable site**

- Sensor can be positioned on a flat roof using a 1.50m (59") pole, or 1.5m (59") above the roof level using a wall bracket.
- No obstacles that are higher than the BTD-200 closer than half their height above the sensor base.
- No overhead obstructions (e.g. cables).
- No frequent movement of people, animals or vehicles within 5m (16').

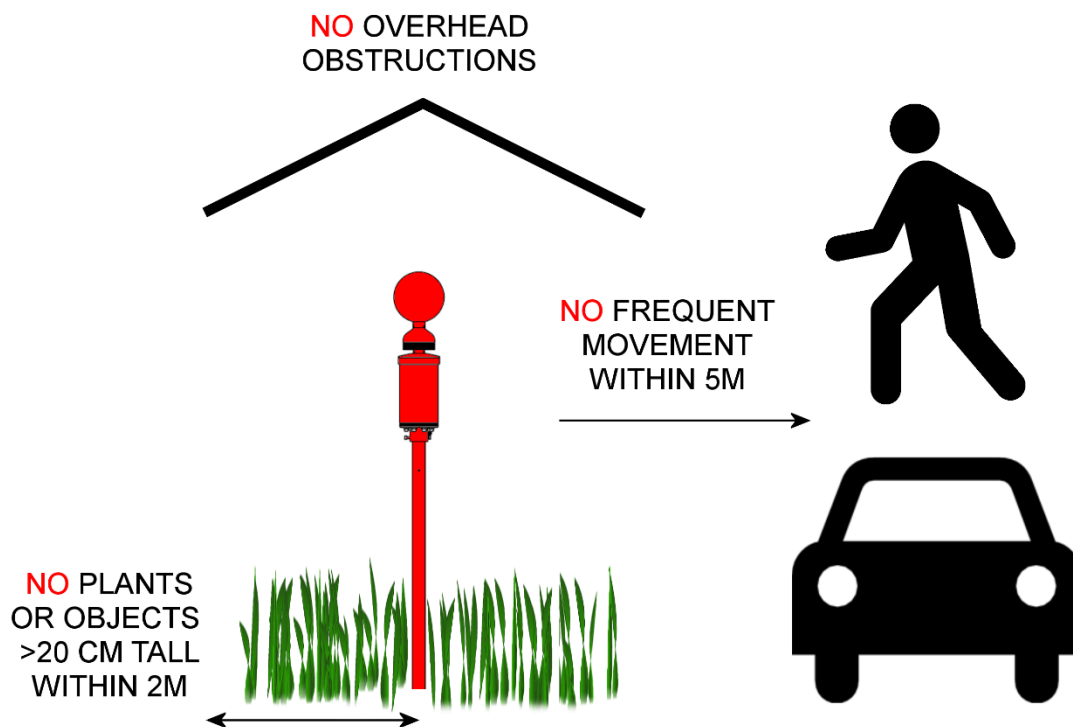
**Unacceptable site** (likely to severely reduce sensor performance)

- Overhead obstructions.
- Obstacles that are higher than the BTD-200 closer than half their height above the base of the sensor mounting pole.
- Frequent movement of people, animals or vehicles within 5m (16').

A pictorial summary of these site requirements is shown in Figure 5-1 and Figure 5-2 below.



**Figure 5-1 Obstacle Distances**



**Figure 5-2 Site Suitability Considerations**

### 5.1.1 Site Correction Factor

When the installation site is not ideal, the distance to lightning discharges as reported by the BTD-200 may be greater or less than it should be. This can be corrected using the Site Correction Factor. Calculating the Site Correction Factor is described in Section 8.

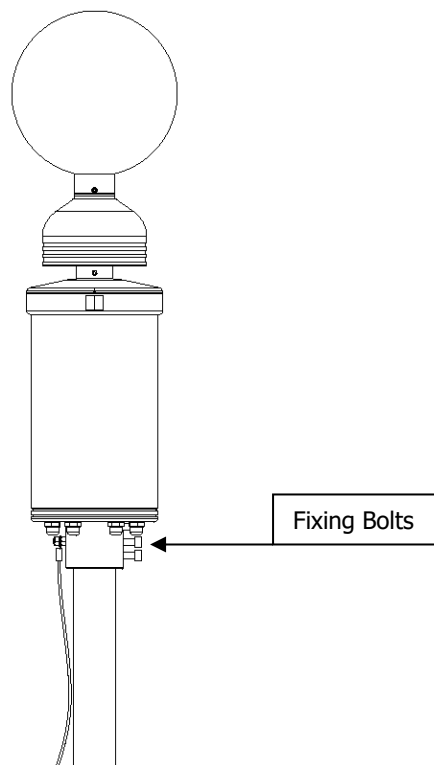
When the Direction Finder is used, large ferrous metal objects and metal framed buildings can distort the local magnetic field causing the direction of a lightning strike

to be offset. This can be corrected using Direction Finder Offset setting as described in Section 6.8.2.14.

## 5.2 Mounting the BTD-200 to a Pole

Mount the BTD-200 to a suitable pole as shown in Figure 5-3 below. The pole can have any outside diameter between 46mm and 53mm (1.8" to 2.0") with a height of 1.5m (59") above ground level. A mounting pole suitable for use with concrete foundations is available from Biral if required (Part No. BA.017).

Place the BTD-200 on top of the pole and tighten the two fixing bolts using the supplied 6mm hex key.

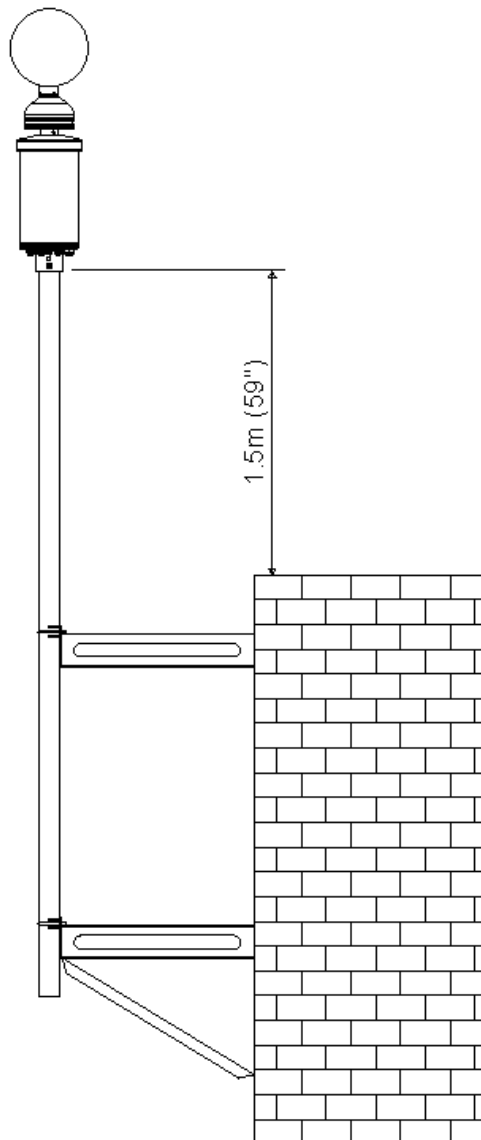


**Figure 5-3 BTD-200 Pole Mounting**

### 5.3 Mounting the BTD-200 to a Wall

Use the BTD-200 wall mounting kit (Part No. BA.023) or suitable alternative to provide a secure fixing for the mounting pole. The wall mounting kit does not include the pole as the length required will vary with the installation. Suitable poles have an outside diameter between 46mm and 53mm (1.8" to 2.0"). Aluminium poles are recommended, especially if a Direction Finder is used. See Figure 5-4 below for suitable locations.

Always mount the base of the BTD-200 at least 1.5m (59") higher than the wall or roof level.



**Figure 5-4 BTD-200 Wall Mounting**

**Note:** When mounting a sensor at height it may be safer to make all electrical connections before mounting.

## 5.4 Installing an Earth Connection

An earth (ground) connection is necessary for correct operation of the BTD-200. The earth connection also protects the BTD-200 and any attached accessories against damage from electrical surges caused by lightning.

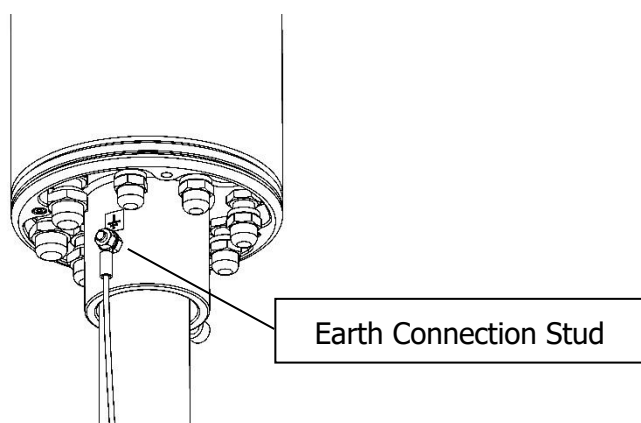
**If the sensor is not adequately earthed the BTD-200 will not work correctly and the warranty will be invalid.**

This product **MUST BE EARTHED**. Failure to install a suitable earth may result in inaccurate readings and/or damage to the product and attached equipment.



For lightning surge protection, Biral recommends the use of 10mm<sup>2</sup> (7 AWG) copper cable and an earth rod where no suitable earth connection is available. Earthing kits, consisting of a 2.4m (7.9') earth rod and either 2m (6.5'), 5m (16') or 10m (32') of cable are available from Biral.

Connect the earth wire to the M6 threaded stud as shown in Figure 5-5 below. A M4 earth stud is provided inside the BTD-200 on the chassis for connection of a protective ground wire associated with wiring to the relays.



**Figure 5-5 BTD-200 Earth Connection**

## 5.5 Removing and Refitting the Outer Cover

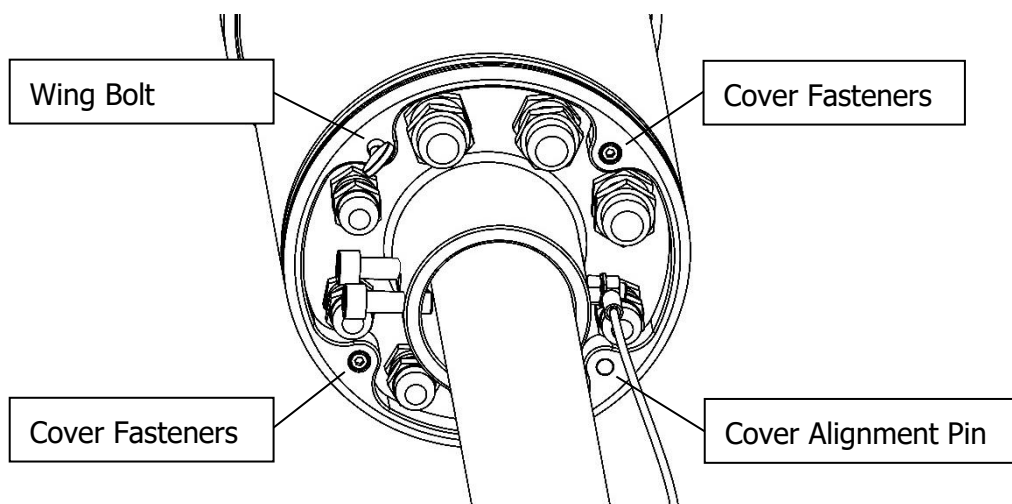
To remove the main cover, loosen the two hex head captive fasteners shown in Figure 5-6 below with the supplied 3mm Hex key. Whilst supporting the cover, turn the "wing bolt" shown in Figure 5-6 clockwise to push the cover away from the main body. It may be necessary to gently pull the cover down once the wing bolt is fully screwed in. Carefully lower the cover until it is supported by the earth strap that connects the cover to the main body.

**Take care not to damage the main printed circuit board when the cover is lowered.**

**Take care not to allow rain or water to enter the enclosure.**

**Unscrew the wing bolt until the threaded end is level with the inner surface of the cover to allow refitting of the cover.**

To refit the outer cover carefully raise the cover and guide it over the bottom plate and internal components, taking care not to trap the earth strap or other wires. Align the cover using the marks on the top plate and cover rim, gently rotate the cover until it slots on to the alignment pin. Push the cover fully home and secure in place using the three captive hex head fasteners.

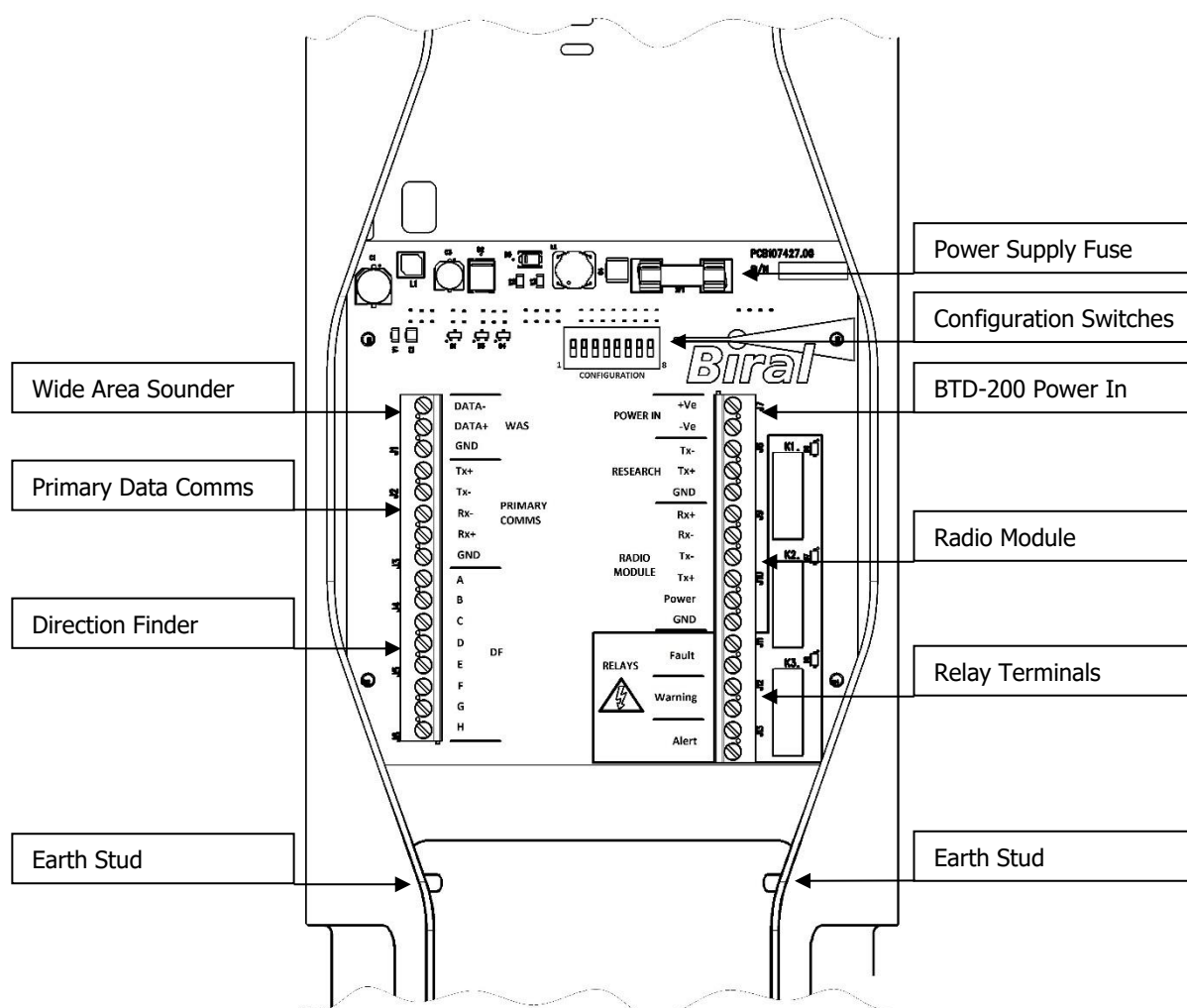


**Figure 5-6 Cover Fasteners**

## 5.6 Setting Your Configuration

Before the BTD-200 can operate you must tell it about the other components in the system, this is done using the Configuration Switches inside the BTD-200.

With the power to the BTD-200 disconnected or turned off and the outer cover removed, locate the System Configuration switches on the terminal board. See Figure 5-7. The Configuration Switches are numbered 1 to 8 working from left to right. When supplied all switches except number 1 will have the rocker pushed up in the closed position, this is the default condition for the BTD-200 connected to a User Computer with no other system components. Use Table 5-1, on the next page, to set the switch positions for the other components you have in your system. Work through the table from switch 1 to 8 to ensure you have not missed either a component or a method of connection. To select a system component or method of communication push the rocker switch down to the open position.



**Figure 5-7 BTD-200 Terminal Board**

Switch Number							
1	2	3	4	5	6	7	8
User Computer Fitted	BCB Fitted	WAS Fitted	BTD-200 has Radio Module	User Computer or BCB has Radio Module	WAS has Radio Module	WAS has wired Connection to BCB	Direction Finder

**Table 5-1 Configuration Switch Settings**

**For example**, if you have a Direction Finder and your BTD-200 is connected to a User Computer using a Radio Module and there are no other components, the switches should be as follows:

Switch Number							
1	2	3	4	5	6	7	8
Open	Closed	Closed	Open	Open	Closed	Closed	Open

If you add additional components to your system in the future, you will need to update the configuration settings.



## 5.7 Connecting Power to the BTD-200

### 5.7.1 Mains Power Supply and Cable

The BTD-200 is supplied with a universal AC mains to DC power adaptor. This power adaptor is suitable for indoor use only. The output of the power adaptor is fully isolated from the mains input supply and ground connection. If required a user supplied DC power source may be used provided it meets the following minimum requirements.

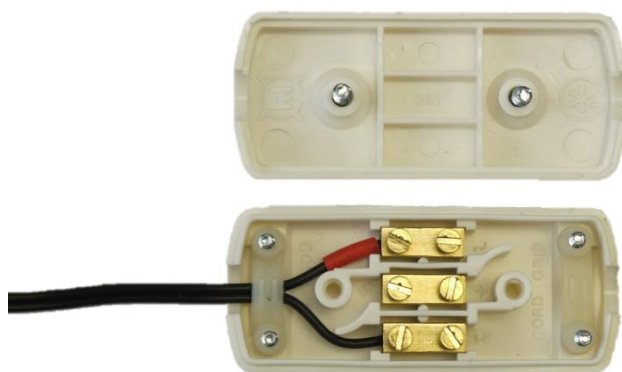
Output Voltage	9 to 30 V DC
Output Power	Not less than 10 W
Output Noise & Ripple	40mV pk-pk max
Output Isolation	Fully isolated to appropriate safety standards

**WARNING** – Operating outside of the specified voltage range will PERMANENTLY DAMAGE the sensor. In battery or solar operated systems, a battery disconnect switch MUST be used.

To connect between the power adaptor and the BTD-200 use a suitable twin core cable, twisted pair or shielded construction is recommended. Power cable is available from Biral in lengths of 20m (65'), 50m (164') and 100m (328'). Other lengths are available on request.

For cable lengths of less than 100m wires sizes of 0.33mm<sup>2</sup> (22 AWG) or greater are recommended. The maximum wire size accepted by the BTD-200 terminals is 2.08mm<sup>2</sup> (14 AWG). Five of the cable glands on the base of the BTD-200 accept cable diameters from 3.5mm (0.14") to 7mm (0.28") and three accept cable diameters from 4.5mm (0.18") to 10mm (0.39").

The supplied power adaptor is fitted with a terminal block for easy connection to the power cable, Figure 5-8. The RED connection is positive.



**Figure 5-8 Power Adaptor Terminal Block**

### 5.7.2 Connecting to the BTD-200

Before attempting to connect the power cable, make sure the power is turned off.

Remove the outer enclosure as described in Section 5.5. Ensure the power cable is passed through the main cover from the bottom before passing the cable through a suitable cable gland on the base of the BTD-200. Take care to avoid looping the cable around the cover's earth strap or you will not be able to refit the cover.

Strip the power cable outer insulation back approximately 35mm (1.3"). Strip the conductor insulation back 7mm (0.28"). Connect the power lead to the power terminals of the terminal board as shown in Figure 5-7. Secure the cable in place by tightening the cable gland, do not over tighten as this will damage both the cable and cable gland.

When all connections are complete, and the configuration has been set refit the outer cover as described in section 5.5.

## **5.8 Connecting the Primary Data Cable**

This connection is only required if a cabled connection to the user computer system or a Base Control Box is used.

The data cable provides the communication link between the BTD-200 and either the users main computer or the Base Control Box when wired communications are used. The communications link uses a full duplex RS422 configuration with a fully isolated interface. A Serial Communications Interface Unit is provided with the BTD-200 to provide an easy method of connecting to the user computer USB port.

### **5.8.1 Data Cable Requirements**

To avoid data communication errors and to ensure maximum connection length a good quality screened twisted pair cable with three pairs of conductors is required. The cable should have a characteristic impedance close to 120Ω, an overall screen and a conductor size of not less than 0.2mm<sup>2</sup> (24AWG). BTD-200 data cable is available from Biral in lengths of 20m (65'), 50m (164') and 100m (328'). Other lengths are available on request.

### **5.8.2 Connecting the Data Cable to the BTD-200**

Before attempting to connect the data cable, make sure the power is turned off.

Remove the outer enclosure as described in Section 5.5. Ensure the cable is passed through the main cover from the bottom before passing the cable through one of the cable glands on the base of the BTD-200. Take care to avoid looping the cable around the cover's earth strap or you will not be able to refit the cover.

Strip the cable outer insulation back approximately 150mm (6") and remove the foil screen. Sleeve the bare screen drain wire and fit a 4mm (#8) ring terminal. Connect the ring terminal to one of the earth studs below the terminal board. Making sure you keep the wires of each twisted pair together, trim the wires to approximately 50mm (2") and strip the insulation back 7mm (0.28"). Connect the twisted pairs to the PRIMARY COMMS terminals on the terminal board as shown in the table below and Figure 5-7. The wire colours shown relate to Biral supplied cable, if you have provided your own cable the colours may differ.

Secure the cable in place by tightening the cable gland, do not over tighten as this will damage both the cable and cable gland.

<b>PRIMARY COMMS</b>			
<b>Terminal Marking</b>	<b>Signal</b>	<b>Wire Colour</b>	
Tx+	Transmitted from BTD-200 +	Red	Pair 1
Tx-	Transmitted from BTD-200 -	Black	
Rx-	Received by BTD-200 -	Black	Pair 2
Rx+	Received by BTD-200 +	White	
GND	Communications Ground	Green	Pair 3
	Not Used – cut off	Black	
Earth Stud	Cable Screen	Bare wire	

When all connections are complete, and the configuration has been set refit the outer cover.

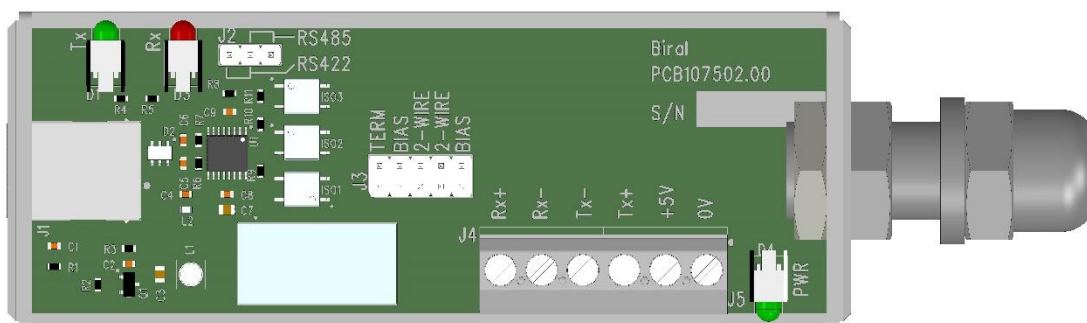
### 5.8.3 Serial Communications Interface Unit Connections

The Serial Communications Interface Unit is provided to connect the BTD-200 to the USB port of a computer. See Section 6.4 to help you decide which computer you should connect to. If you have a Base Control Box in your system you do not need the Serial Communications Interface Unit, the primary data cable connects directly to the Base Control Box.

Having run the primary data cable from the BTD-200 to the location of the computer cut off any excess cable, always ensuring enough remains to easily reach the computer. Always remember to keep the two wires of each pair together. Remove 60mm (2.4") of the outer cable insulation and screen and strip the individual wire insulation back 7mm (0.28"). Cut off the screen drain wire and the black wire of the green and black pair, they are not connected at this end.

Open the Serial Communications Interface Unit enclosure by gently pulling the sides of the top cover out and up. There are two sets of jumpers on the printed circuit board labelled J2 and J3 as shown in Figure 5-9 SCIU Connections & Jumpers below; ensure the shorting links are fitted as follows:

- J2 Link fitted in RS422 position
- J3 TERM Fit link across pins
- J3 BIAS Remove Link or fit to one pin only
- J3 2-WIRE Remove Link or fit to one pin only
- J3 2-WIRE Remove Link or fit to one pin only
- J3 BIAS Remove Link or fit to one pin only



**Figure 5-9 SCIU Connections & Jumpers**

Pass the prepared cable through the cable gland. Connect the wires to the connector terminals as shown in the table below. The conductor colours listed in the table below relate to Biral supplied cable, if you have provided your own cable the colours may differ.

Serial Communications Interface Unit Marking	BTD-200 Terminal Marking	Signal	Wire Colour	
Rx+	Tx+	Transmitted from BTD-200 +	Red	Pair 1
RX-	Tx-	Transmitted from BTD-200 -	Black	
Tx-	Rx-	Received by BTD-200 -	Black	Pair 2
Tx+	Rx+	Received by BTD-200 +	White	
5V		Not Used – Do not connect	Black	Pair 3
0V	GND	Communications Ground	Green	
		Cable Screen – Not Used	Bare Wire	

**Do not** connect the cable screen to the ground connection or ground wire. The screen should be cut off and left unconnected at this end of the cable.

Once the wires have been attached to the connector adjust the position of the cable in the cable gland and gently tighten the gland nut to securely grip the cable. Reassemble the Serial Communications Interface Unit by sliding the top cover down over the base. Make sure to orientate the cover so that the marking "POWER" on the side of the cover is at the cable gland end. Insert the USB cable into the Serial

Communications Interface Unit but **Do not** connect the Serial Communications Interface Unit to the computer using the USB cable at this point.

## 5.9 Connecting to the Relays

The relays are provided for direct connection to an external site warning system. The operation of the BTD-200 relays is described in Section 4.5.

**The Relays are intended to switch Non-Hazardous voltages only.**

The maximum permissible voltage switched by the relays is 16V AC rms, 22.6V AC peak or 35V DC.



### 5.9.1 Relay Type and Capacity

All the relays are single pole, single throw, normally open (SPST-NO). The relay contacts are open when no power is applied. The Fault relay is open in the fault condition. The Warning and Alert relays are closed when the warnings are active.

The BTD-200 relays can safely switch the following loads.

Maximum Voltage:	16V AC rms, 22.6V AC peak or 35V DC
Maximum Current:	5A

Under no circumstance should the operating voltage or current be exceeded. Ensure a suitable external fuse or other current limiting device is included in the relay circuit to prevent damage in event of a short circuit.

### 5.9.2 Relay Cable Requirements

The type and size of cable required will be dependent on the voltage and current switched, which will be dependent on the site warning system. The length of cable required will also need to be considered to ensure the voltage drop is not significant.

The BTD-200 relay terminals will accept cables sizes in the range 0.13mm<sup>2</sup> (26AWG) to 2.08mm<sup>2</sup> (14AWG). If you are unsure about the cable requirements consult a qualified electrical contractor.

### 5.9.3 Connecting to the relays

Before attempting to connect the relays, make sure the power to the BTD-200 and the site warning system is turned off.

Remove the outer enclosure as described in Section 5.5. Ensure the relay cable is passed through the main cover from the bottom before passing the cable through

one of the cable glands on the base of the BTD-200. Take care to avoid looping the cable around the cover's earth strap or you will not be able to refit the cover.

Wire the external site warning system to the Fault, Warning and Alert relay terminals on the terminal board as required. The insulation strip length is 7mm (0.28"). The position of the relay terminals on the terminal board is shown in Figure 5-7.

### **5.10 BTD-200 Status Indicator**

An indicator light is located on the base of the BTD-200 to provide a visual check of the sensor's status. When the BTD-200 is powered and operating without any faults the indicator will show steady green. If a fault is detected the indicator will flash on and off.

If a fault is indicated immediately after installation, check the wiring of any attached accessories and the configuration switches of section 5.6.

## 6 LIGHTNING WORKS SOFTWARE

### 6.1 Introduction

The Lightning Works software allows up to five users to view Warnings and Alerts generated by the BTD-200 system on networked PCs. One of the users can be an administrator who can also configure the system and reset Warnings and Alerts.

The Lightning Works software has two parts, a server that runs on the computer with the connection to the BTD-200 system, and a client that runs on any computer used to view or control the system. The server software must be installed on only one computer, but you can install the client on as many computers as you wish, including the one with the server part of the software. If you install the client on more than five computers only the first five users to run the software will be able to connect to the system.

The information provided in this manual describes how to install and operate the server and client software when all the computers are on the same local network. This is the most common situation where all computers are in the same building.

If you wish to have a client at a remote location connected via VPN or the internet, it is necessary to follow the instructions provided in the Lightning Works Remote Connections manual. **Before attempting any remote connection, setup at least one local client by following the instructions in this manual.**

### 6.2 Software Licences

#### 6.2.1 Lightning Works Licence

BTD-200 Lightning Works software remains the property of Biral and is protected by appropriate copyright law and international treaty provisions. The Licensee is granted the right to use the software, but not to de-compile or to in anyway alter the composition of the software. The software contains information of commercial value and worth to Biral.

No other warranties except those expressly set out above are implied or should be inferred. Biral makes no warranty concerning the fitness of the BTD-200 Thunderstorm Detector or its Lightning Works software for a particular purpose or use. Biral does not warrant, guarantee or make any representations regarding the use or the results of the use of the BTD-200 Thunderstorm Detector or the software.

In no event will Biral, its Directors or employees be liable for direct, indirect, incidental, exemplary or consequential damages, expenses, or losses arising out of the use, or inability to use the BTD-200 or Lightning Works software.

### 6.2.2 Google Maps End User Licence

The BTD-200 Lightning Works software uses Google Maps/Google Earth services to provide the map display. To install the Lightning Works software, it is necessary to accept the terms of the Google Maps/Google Earth Additional Terms of Service described at [https://maps.google.com/help/terms\\_maps.html](https://maps.google.com/help/terms_maps.html) and Google Privacy Policy at <https://www.google.com/policies/privacy/>.

### 6.2.3 Data Privacy

Other than described in the Google Privacy Policy as described in Section 6.2.2, the Lightning Works software has no data privacy implications.

## 6.3 Compatible Operating Systems

Both the Lightning Works server and client applications have been tested for use with the following Microsoft operating systems:

- Windows 10
- Windows 11
- Windows Server 2016 Standard
- Windows Server 2019 Standard

The software may work with other Microsoft operating systems, but this has not been tested.

**Note:** The Lightning Works Software is not compatible with 32-bit computers.

## 6.4 Choosing the Server Computer

In a system where the BTD-200 system connects to your computer system using the Serial Communications Interface Unit the Lightning Works server software must be installed on the computer connected to the Serial Communications Interface Unit.

The computer can be any networked PC running a current Microsoft 64-bit operating system or a network server running a Microsoft 64-bit operating system. The Lightning Works client software does not have to be installed on the computer running the server, but it is helpful if it is.

The computer running the Lightning Works server must be running for any other users to see the BTD-200 system information and warnings. For this reason, choose a computer that is always on when any user might want to see the system warnings on their computer. Ensure sleep and hibernate functions are disabled as they cause the computer to stop the Server application if the computer is left powered but not used.



Although the Serial Communications Interface Unit provides complete electrical isolation between the BTD-200 system and the USB connection to protect your IT system, there is still a small possibility that a lightning strike on or very close to the BTD-200 cable could result in damage to the computer. Take this into account when choosing which computer to use.

**Note:** Biral does not recommend using a laptop computer as the server if it is connected directly to the Serial Communications Interface Unit. Laptop computers do not have an earth connection and are therefore more vulnerable to electrical surges on any connected equipment.

## **6.5 Installing the Serial Communications Interface Unit Driver**

The Serial Communications Interface Unit connects to your computer using a USB connection, driver software may have to be installed for it to work correctly. Follow these steps to install the device on your computer. See Section 6.4 to decide which computer to use for your connection.

1. Connect the USB cable from the Serial Communications Interface Unit to your chosen computer. It does not matter if the BTD-200 is powered or not at this stage.
2. Your computer should automatically detect the device and start the installation process. Click on the message that appears in the Notification Area of the task bar to view progress.
3. If your computer is connected to the internet Windows should automatically locate and install the correct and most up to date driver. If you are not connected to the internet you will need to use the drivers on the USB drive supplied with the BTD-200. Detailed guides for installation of the drivers are included on the USB drive.
4. Once the Serial Communications Interface Unit is correctly installed apply power to the BTD-200.
5. You can now continue installing the Lightning Works software.

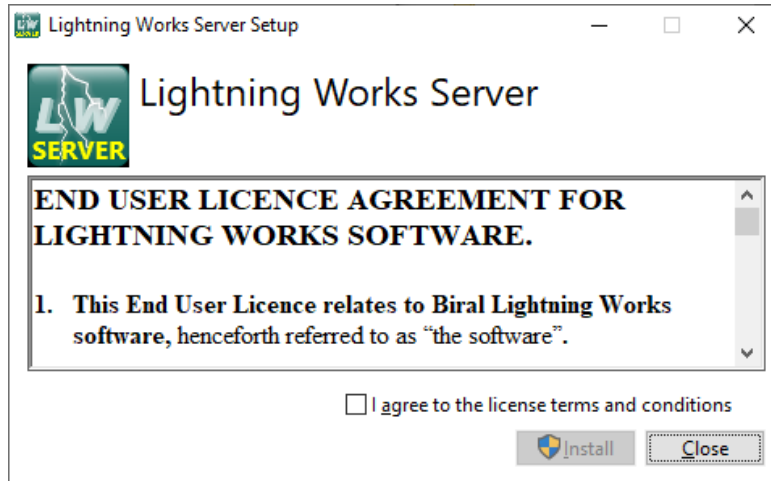
## **6.6 Installing the Lightning Works Server Software**

### **6.6.1 Installing Server Software**

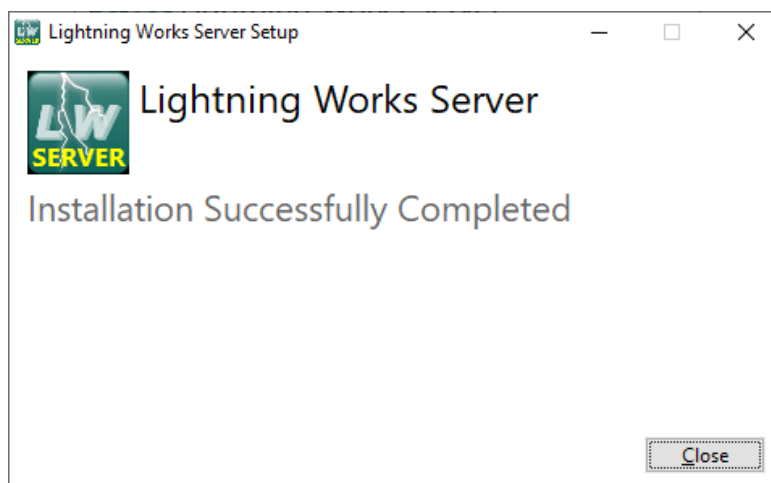
To install the Lightning Works Server software on a computer, follow the steps below.

1. Insert the BTD20.LW USB Drive into a suitable USB port of the computer, wait for the drive to be recognised and then use file explorer to locate the Lightning Works Server folder. Open the folder.

2. Double click on the **Lightning Works Server Setup** application to start installation.
3. The server software can only install in the default program directory of your computer.
4. To install the server software, you must accept the End User licence terms and conditions. Please read the licence terms and check the agree box to proceed with installation.



5. When the software has successfully installed you will see the following window. The software is now running and will start automatically whenever the computer is started.



### 6.6.2 Running the Lightning Works Server Software

The server software runs as a service on your computer so does not have a program icon. The server software will start automatically whenever the computer is started.

If you wish to check the software is correctly installed and running at any time, search for Services in your computers Control Panel. Select View Local Services to view all services running on your computer. The Lightning Works Server software will be listed as "BIRAL BTD200 Service, check the status is "started" or "running".

### 6.6.3 Removing the Lightning Works Server Software

To remove the Lightning Works Server software, select Programs and Features in your computers Control Panel. Locate the Lightning Works Server entry in the list and click on it. Use the Uninstall option at the top of the list to remove the server software.

**Note:** Uninstalling the Lightning Works Server will permanently delete all saved thunderstorm data. See section 4.6 for more details of saved data.

## 6.7 Installing the Lightning Works Client Software

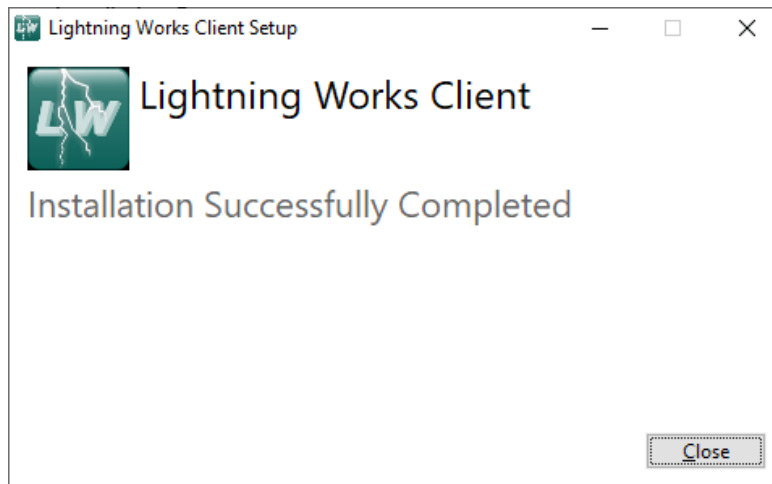
To install the Lightning Works Client software on a computer, follow the steps below.

1. Insert the LTD20.LW USB Drive into a suitable USB port of the computer, wait for the drive to be recognised and then use file explorer to locate the Lightning Works Client folder. Open the folder.
2. Double click on the **Lightning Works Client Setup** application to start installation.
3. The client software can only install in the default program directory of your computer.



4. To install the client software, you must accept the End User licence terms and conditions. Please read the licence terms and check the agree box to proceed with installation.

5. When the software has successfully installed you will see the following window and the Lightning Works Client program icon will be added to the desktop and start menu.



The software is now ready to use.

#### 6.7.1 Removing the Lightning Works Client Software

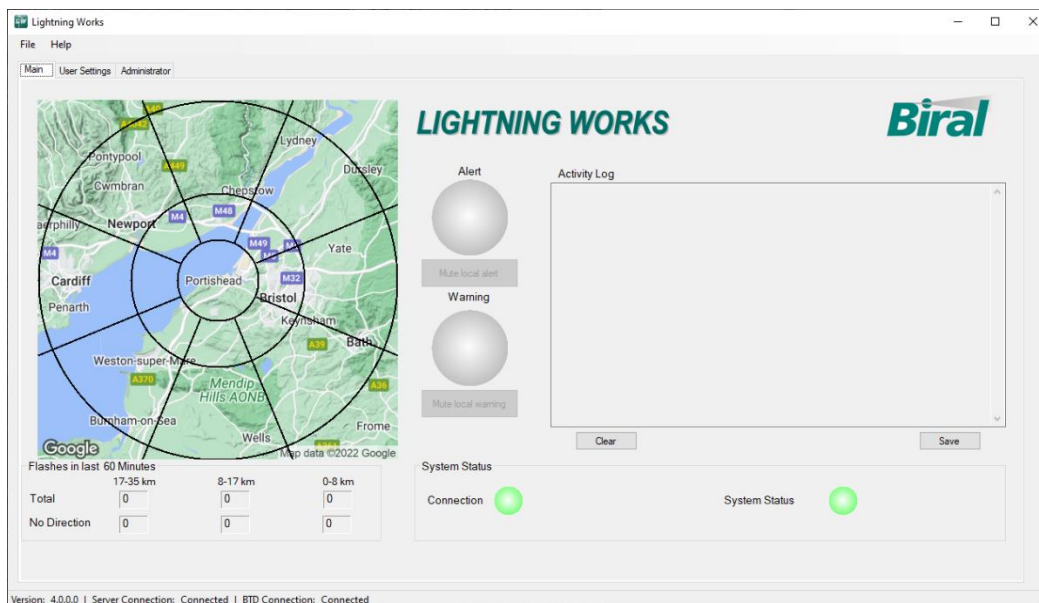
To remove the Lightning Works Client software, select Programs and Features in your computers Control Panel. Locate the Lightning Works Client entry in the list and click on it. Use the Uninstall option at the top of the list to remove the client software.

### 6.8 Configuring the Lightning Works Software

Once the Lightning Works server and client software have been installed and power is applied to the BTD-200 the Lightning Works client can be started to configure the system. Configuration is not essential but allows a map to be displayed and other settings to be adjusted to your requirements.

#### 6.8.1 Running the Lightning Works Client

Start the client software using the Lightning Works Client icon. An initial window will appear showing the connection status of the system as not connected. If the BTD-200 system has been correctly installed this will be replaced by the Main tab as shown in Figure 6-1. This may take several minutes depending on the performance of the computer. If the Main tab does not appear check that the BTD-200 is turned on, the configuration code has been correctly set on the switches inside the BTD-200 and that all connections are correctly wired. The green Status Indicator on the base of the BTD-200 will be illuminated or flashing if power is correctly applied. See section 5.10 for details of the Status Indicator function.

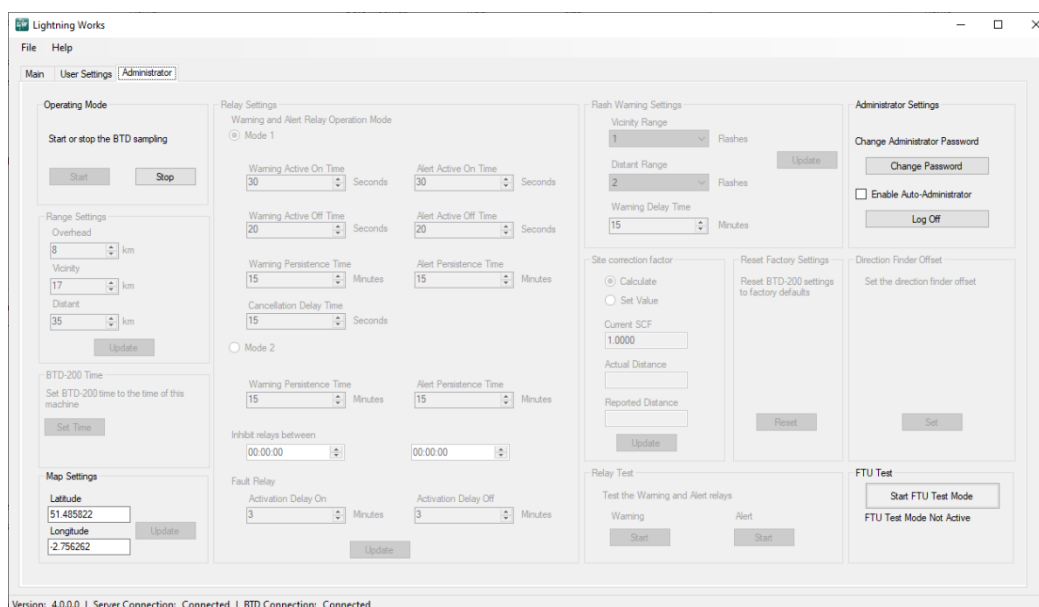


**Figure 6-1 Main Tab**

## 6.8.2 Administrator Functions

To change any of the system settings and silence system wide Warnings and Alerts it is necessary to log in as an administrator. Click on the Administrator tab and enter the default Administrator password, admin.

The Administrator tab will appear as in Figure 6-2 below.



**Figure 6-2 Administrator Tab**

Whilst the BTU-200 is sampling it is not possible to change any system settings other than the Administrator password, all other settings will be greyed out. To allow changes to be made click on the Stop button in the Operating Mode section of the tab.

**Note:** When sampling is stopped the BTD-200 system is not monitoring for thunderstorm activity and no Warnings or Alerts will be produced. The system will automatically return to sampling mode after ten minutes if no further changes are made on the Administrator tab.

To return to the Main tab whilst still logged on as an Administrator simply click on the Main tab. This will allow system wide Warnings and Alerts to be silenced from this PC without having to log on again as an Administrator.

Clicking on the Log Off button will log you off as an Administrator and return you to the Main tab.

#### 6.8.2.1 Changing the Administrator Password

To change the Administrator password, click on the Change Password button. A new window will appear, enter the existing password and then the new password in each of the new password boxes. To complete the operation, click the update button. There are no restrictions on the length of the password, or the type of characters used. The default password is admin.

**Note:** If the Administrator password is forgotten the only way it can be reset is to reinstall the server software. It is suggested a note of the password is kept in a secure location. Reinstalling the server software will result in a loss of the data archive.

#### 6.8.2.2 Auto-Administrator Function

Certain system operations such as cancelling system wide Warnings and Alerts and changing system settings can only be performed by an Administrator. To remove the need for the Administrator password to be entered each time such actions are taken the client software can be configured as an Auto-Administrator by ticking the Enable Auto-Administrator box in the Administrator Settings area of the tab. Whenever the client software is started on a PC with Auto-Administrator enabled the software will start as an Administrator.

**Note:** Only one Administrator can be active on a BTD-200 system at any time. If another client attempts to log on as an Administrator or another client set for Auto-Administrator is started Administrator access will be refused.

#### 6.8.2.3 Range Settings

The Range Settings area of the Administrator tab allows you to set the Overhead, Vicinity and Distant range bands. The function of the range bands is described in Section 4.4.1.

The Overhead band cannot be set lower than 1km (1 mile) and the Distant band cannot be set higher than 35km (22 miles) and values of adjacent bands cannot overlap. Use the User Settings tab to display distances in kilometres or miles.

To change the Range Settings, enter your desired values and click the update button.

**Note:** Changing the Distant range band causes the scale of the map on the main screen to change. Map updates will only occur if the computer is connected to the internet.

#### 6.8.2.4 Setting the System Time

The BTD-200 has an internal clock that is used to timestamp each message it sends out and to control the relay inactive time. To set the BTD-200 clock to the same time as your PC click on the Set Time button in the BTD-200 Time area of the screen. You may want to perform this action every few months to ensure the BTD-200 clock remains synchronised to your PC clock.

If the BTD-200 time is more than 10 minutes different from the PC time a warning will be displayed in the BTD-200 Time area of the Administrator tab.

**Note:** The BTD-200 does not automatically update for daylight saving. If your region uses daylight saving you will have to manually set the BTD-200 when the clocks change.

#### 6.8.2.5 Map Settings

For a map to be displayed in the Main tab the coordinates of the BTD-200 must be entered in the Map Settings area. The default coordinates are set to Biral's Portishead, UK, location causing a map of this area to be displayed.

Coordinates are entered in a decimal point format such as 51.491729 -2.757886. For an alternative map to be displayed the computer on which the Lightning Works client is installed must be connected to the internet. For computers that are not connected to the internet please follow the instruction in section 6.8.2.5.1 below.

An easy way to find the coordinates of your BTD-200 sensor is to use Google Maps.

- First, locate the location where the BTD-200 has been installed
- Right click on the location and select "What's here?" from the list of options
- A side panel slides out with the coordinates shown at the top in decimal format
- Copy and paste the first number into the Latitude box in the Map Settings area of the Lightning Works software Administrator tab. Don't include the comma!
- Copy and paste the second number into the Longitude box in the Map Settings area of the Lightning Works software Administrator tab

- Press the Update button to complete the operation

Once a map has been downloaded from the internet it will be displayed even if the client computer is no longer connected to the internet.

#### 6.8.2.5.1 Offline Map Generation and Housekeeping

With default settings the Lightning Works client uses a live connection to Google Maps™ to generate the maps for any location and distant lightning range band setting. For customers who cannot access Google Maps™ or who do not have an internet connection, it is possible to use offline maps stored on the client computer. These maps are generated using the Offline Map Generation and Map Housekeeping function of the client software. Maps may be generated on an internet connected computer and then copied to the offline client computer. The Lightning Works client software does not need to be connected to a BTD-200 sensor to generate offline maps. Maps for multiple locations may be saved on the client computer.

To access the Offline Map Generation and Map Housekeeping function, from the File Menu select the Mapping menu item which will bring up the Mapping dialog as shown below.

The screenshot shows a software dialog box titled "Mapping" with a subtitle "Offline Map Generation and Map Housekeeping". The dialog contains several input fields and buttons. On the left, there is a checked checkbox for "Download Maps". Below it are text boxes for "Latitude" (54.5213698) and "Longitude" (-2.918381). Further down are spinners for "Distant Range (km)" (35) and "Distant Range (miles)" (22). At the bottom left is a text box for "Map Width (km)" (70). In the center, there are three buttons: "Clear Cache Folder", "Generate All Sizes", and "Generate Map". On the right, there is a "Map Type" dropdown menu set to "Terrain", a "System Language Code" field set to "en", and a note "Leave blank for map default Language Code". At the bottom are "OK" and "Cancel" buttons. The "OK" button is highlighted with a blue border.

**Figure 6-3 Offline Map Generation**

#### **Overview**

The mapping dialog controls the generation of offline maps and some features of online maps.



Lightning Works maps are displayed to the scale set by the distant lightning range band, this being the limited for reported lightning. As the lightning range bands can be set in either kilometres or miles the scale of the map changes depending on the distance units setting in the User Settings tab. You may choose to generate a single offline map for a given distant lightning range band setting or generate maps to cover all possible values of the distant lightning range band. If you intend to change between kilometres and miles for display units, you must generate maps for both settings.

The Latitude and Longitude values entered in the mapping dialog select the centre point of the generated map, i.e., the location of the BTD-200. Remember these values only affect the generation of offline maps, to make a map active the correct latitude and longitude must be entered in the Map Settings section of the Administrator tab.

When using offline maps, the latitude and longitude values entered in the Map Settings section of the Administrator tab must be **exactly** the same as those used to generate the offline map. If they are different no map will be displayed. Offline maps are automatically displayed in the Main tab provided an offline map with the correct location and distant lightning range band setting has been generated.

When the Mapping dialog is open the map shown in the Main tab will reflect the mapping dialog settings. The Main tab map will revert to the latitude, longitude and range band settings of the Administrator tab when the Mapping dialog box is closed.

### **Download Maps Check Box**

Check this box:

- When the client computer is connected to the internet and Google Maps™ is available.
- When you wish to generate maps for offline use.

Uncheck this box:

- When the client computer is **not** connected to the internet or Google Maps™ is **not** available.

### **Latitude and Longitude Text Box**

Enter the location of the BTD-200 sensor. Values are entered in decimal degree format.

### **Distant Range Text boxes**

Either the km or miles text box will be active depending on the Units setting in the User Settings tab. Enter the value for the distant lightning range band to be use with the offline map.

**Clear Cache Folder Button**

You can erase all previously generated offline maps by clicking on this button.

**Generate All Sizes Button**

Click on this button to generate offline maps for all possible values of the distant lightning range band. Remember, you will need to do this for both kilometres and miles if you wish to switch between display units when offline.

**Generate Map Button**

Click on this button to generate a single offline map for the current location and distant range band setting.

**Map Type Button**

Use the dropdown dialog box to select your required map type. This setting controls both online and offline maps.

**System Language Code Text Box**

For some regions Google Maps™ allows map text to be displayed in several languages. Leave the text box blank for the Google default setting. Enter a language code, i.e. en for English(US), for another language.

**Map Folder Location**

Offline maps are stored in the following folder %localappdata%\Biral\Lightning Works Client\Map Files.

**Using Offline Maps on Another Computer**

To use offline maps generated on one computer on another, copy the contents of the Map Files folder to the same folder on the offline computer.

#### 6.8.2.6 Relay Settings – Mode 1

The operation of the relays is described in Section 4.5, read this section carefully before making any changes to the Relays Settings.

Relay Mode 1 is the default setting for the BTD-200. To select this mode, click on the Mode 1 radio button followed by the Update button at the bottom of the Relay Settings area.

The seven time periods associated with Mode 1 relay operation can be configured using the boxes below the Mode 1 radio button. After making your changes click on the Update button at the bottom of the Relay Settings area.

#### 6.8.2.7 Relay Settings – Mode 2

The operation of the relays is described in Section 4.5, read this section carefully before making any changes to the Relays Settings.

To select Mode 2, click on the Mode 2 radio button followed by the Update button at the bottom of the Relay Settings area.

The two time periods associated with Mode 2 relay operation can be configured using the boxes below the Mode 2 radio button. After making your changes click on the Update button at the bottom of the Relay Settings area.

#### 6.8.2.8 Relay Inactive Time

The Warning and Alert relays can be inhibited for a set period each day as described in Section 4.5.2.3.

Enter the times between which you want the relays to be inhibited in the two boxes under the heading “Inhibit relays between”. After making your changes click on the Update button at the bottom of the Relay Settings area.

The times are entered in HH:MM:SS format. To never disable the relays, enter 00:00:00 in both boxes.

**Note:** The time used for this function is the BTD-200 internal clock time, make sure you have set the internal clock to local time if using this function.

#### 6.8.2.9 Fault Relay

The operation of the Fault Relay is described in Section 4.5.1.

The on and off activation delay times are set by entering the desired value in the appropriate box and clicking the Relay Settings Update button at the bottom of the screen.

#### 6.8.2.10 Flash Warning Settings

The conditions which cause the BTD-200 system to report Warnings and Alerts is adjusted by the controls of the Flash Warning Settings area. The operation of these controls is described in Section 4.4.3.

To adjust the settings, select or enter the required values in the dropdown and text boxes and click on the Update button.

#### 6.8.2.11 Site Correction Factor

The function of the Site Correction Factor is described in Section 5.1.1. To adjust the site correction factor, enter the actual and reported distance to a thunderstorm in the text boxes and click on the Set button. The current site correction factor value is displayed in the same area, the default value is 1.

See Section 8 for information on estimating the actual distance to a thunderstorm.

#### 6.8.2.12 Relay Test

The operation of the Warning and Alert relays on both the BTD-200 and the Base Control Box, and therefore any equipment connected to them, can be tested using the buttons in the Relay Test section of the Administrator Tab.

Clicking on the Warning or Alert buttons will switch the relay on, the text on the button will change from Start to Stop. Clicking on the button when the button text is Stop will switch the relay off.

#### 6.8.2.13 Factory Default Settings

The BTD-200 can be reset to the factory settings using the Reset button in the Reset Factory Settings of the tab.

#### 6.8.2.14 Direction Finder Offset

If a Direction Finder is fitted to the system, the Direction Finder Offset controls will appear in the User Settings tab.

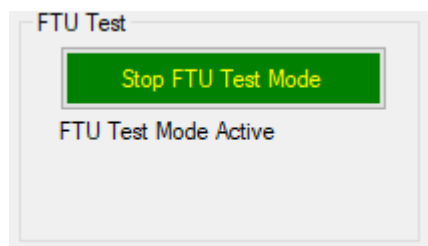
Depending on the site where the BTD-200 and Direction Finder is installed it may be necessary to correct an offset in the directions reported for lightning flashes. The procedure for determining if a direction correction is necessary is described in the BTD-200 Direction Finder manual.

To enter the Direction Finder Offset click on the Set button in the Direction Finder Offset area of the Administrator tab. A dialogue box will open, enter the angular offset in whole degrees and click on the Set button.

#### 6.8.2.15 Field Test Unit

The Field Test Unit (FTU) is an accessory used to prove correct operation of the BTD-200 sensor by simulating thunderstorm activity. The FTU generates signals calibrated for a use with the BTD-200 sensor factory default settings. Before an FTU can be used the BTD-200 must be suitably configured using the controls in the FTU Test section of the Administrator tab. The controls allow the current settings to be stored before testing and restored once testing is complete.

Press the "Start FTU Test Mode" button **before** using the FTU to prepare the BT-D-200. A progress bar will appear. The button will become green and the text will change to "Stop FTU Test Mode" once the BT-D-200 is ready for testing. "FTU Test Mode Active" will be displayed below the button. "Starting FTU Test Mode" will be displayed in the activity log on the Main tab.

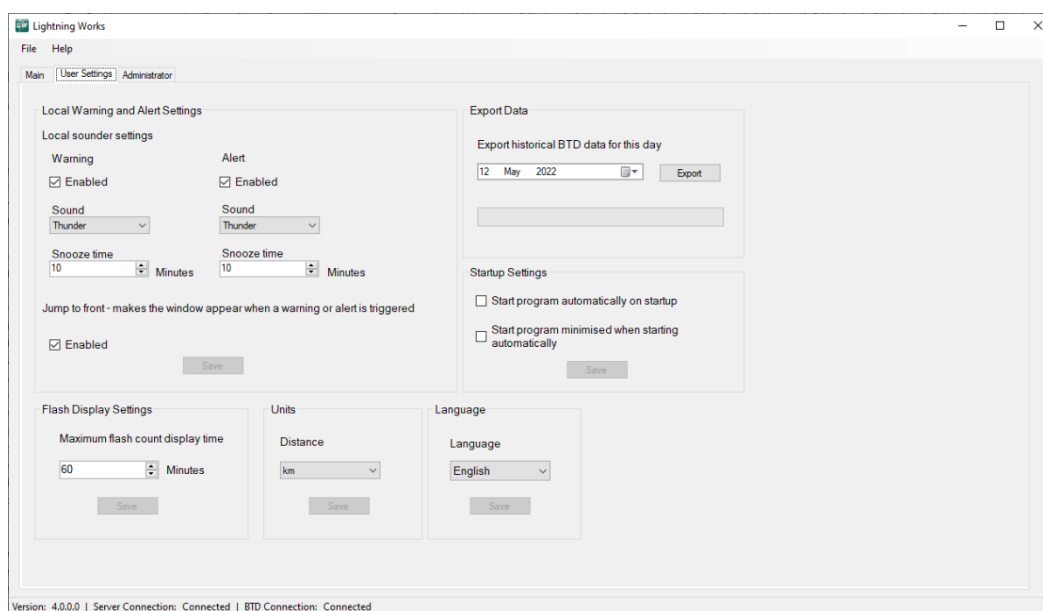


**Figure 6-4 Active FTU Test Mode**

On completion of testing with the FTU, pressing the "Stop FTU Test Mode" button will restore the BT-D-200 settings to those in place before the test. This will be indicated by the text "Stopping FTU Test Mode" being displayed in the activity log on the Main tab and the button text will change back to "Start FTU Test Mode".

### 6.8.3 User Settings

The Lightning Works Software allows each user to configure how information is presented to them. These settings apply only to the individual user and unlike the Administrator settings do not alter the overall system operation. To access the user settings, click on the User Settings tab. Figure 6-5 below shows the User Settings tab.



**Figure 6-5 User Settings Tab**

#### 6.8.3.1 Local Warning and Alert Sounds

When a Warning or Alert is issued by the BTD-200 the user's computer can be set to play a sound through the PC's speaker. For this function to work the PC speaker must be enabled and turned on. The sound will be played every 30 seconds until either the Warning or Alert state clears or it is locally cancelled.

You can control if Warnings and Alerts play a sound by ticking the Enabled box in the Local Warning and Alert Settings area of the User tab.

You can change the sound played by selecting from the list in the selection box under Sound. When you select a new sound, the sound will be played for you as a preview.

Click the Save button at the bottom of the Local Warning and Alert Settings area to save your changes.

#### 6.8.3.2 Local Warning and Alert Snooze Time

When a normal user cancels a Warning or Alert the indicator will stop flashing and the sound will stop being played. After the Snooze time the indicator will resume flashing and the sound will start playing if the Warning or Alert is still active for the BTD-200 system.

The length of time a Warning or Alert is snoozed for can be set by entering the required time in the Snooze Time dialogue box. The maximum snooze time is 30 minutes.

Click the Save button at the bottom of the Local Warning and Alert Settings area to save your changes.

#### 6.8.3.3 Application Jump to Front

The Lightning Works window can be set to jump to the front of all other applications on your desktop when a Warning or Alert is generated.

To enable this function, check the Enabled box under the Jump to Front text in the Local Warning and Alert Settings area of the User Tab.

Click the Save button at the bottom of the Local Warning and Alert Settings area to save your changes.

#### 6.8.3.4 Exporting System Data

As discussed in Section 4.6, you can export system data as CSV files. Archived data is exported one day at a time in a single CSV file.

To export archived data, enter the required date in the Export Data area drop down box of the User Settings tab and click on the Export button. A Save As file window will appear to allow you to select the desired file name and save location.

#### 6.8.3.5 Startup Settings

The Lightning Works client application can be configured to automatically start when the computer is turned on, this is the recommended setting to avoid missing warnings of thunderstorm activity.

To enable Auto Start check the Enabled box in the Startup Settings area of the User Settings tab.

The application can automatically start minimized to avoid cluttering your display. Check the Enable Minimized box in the Startup Settings area of the User Settings tab to activate this function.

Click on the Save button to confirm your settings.

#### 6.8.3.6 Flash Display Settings

When the BTD-200 detects a lightning flash the number of flashes detected increments in the Flashes section of the main tab. The length of time a flash is included in the display total can be set by using the Flash Display Settings area. For example, if the Flash Display Time is set to 10 minutes the totals in the Flashes area of the screen will be the number of flashes detected in the last 10 minutes.

Enter the required time in the text box and click on the save button. The allowable range is 10 to 120 minutes.

#### 6.8.3.7 Display Units

The units used to display distances throughout the Lightning Works application can be set to either kilometres or miles.

To change the display units, select the required units from the drop-down dialogue box in the Units area of the User Settings tab. Click the Save button to confirm your choice.

#### 6.8.3.8 Language

Each user can select the language used by the Lightning Works client application. The language can be changed at any time without restarting the application.

To change the language, click on the drop-down list in the Language area of the User Settings tab. Select the desired language and then click the save button.

#### 6.8.4 Updating the Language File

Occasionally, Biral may issue updated language files to include new languages. New languages files can be installed by selected the "Install Updated Language File" menu item in the Help menu. This will display an Open dialog where the updated language file can be selected and installed. Language files will be called "Languages.db". New language files become active immediate after installation.

### 6.9 Using the Lightning Works Software

#### 6.9.1 Running the Lightning Works Client

It is recommended the Lightning Works Client application is configured to auto start so that it is always running when your computer is on. See Section 6.8.3.5 for details of configuring Auto Start.

To manually start the client software double click on the Lightning Works Client icon. An initial window will appear showing the connection status of the system as not connected, once a connection is established the application's Main tab will appear as in Figure 6-1.

#### 6.9.2 Lightning Works Controls

##### 6.9.2.1 Map Display

The map display area in the top left of the Main tab will display a Google terrain map of the area around the BTD-200 if the coordinates have been set; see Section 6.8.2.5 for details of setting the coordinates. The three circles that overlay the map represent the overhead, vicinity, and distant warning bands. The distant circle will always fill the entire area and therefore the map scale will change with this setting. See Section 6.8.2.3 for details of changing the warning band ranges.

When lightning is detected within one of the range bands that causes a Warning or Alert to be generated the entire band on the map overlay will change colour. The band colour change will remain until the Warning or Alert clears.

When a Direction Finder is attached to the BTD-200 the distant and vicinity circles of the map display area will be divided into eight equal segments by black lines. When a lightning strike is detected only the segment in which the lightning occurred will change colour. Additionally, a black dot will appear to show the location of the lightning strike. The segment colour change will remain until the Warning or Alert clears. The black dots representing the lightning strikes will fade away over the time set by the Flash Display Setting on the User Settings tab, see section 6.8.3.6.

If the BTD-200 is not in sampling mode, i.e. not detecting thunderstorm activity, NOT SAMPLING will be displayed in a large font in the Map display area.



#### 6.9.2.2 Flashes Display Area

Located below the Map display area, the Flashes section displays the number of lightning flashes detected for each range band in the last display period. The total number of lightning flashes is displayed along with the number of lightning flashes without direction information. The No Direction section will only be displayed when a Direction Finder is attached to the BTD-200. See the Direction Finder manual for an explanation of no direction flashes. The display period has a default of 60 minutes but can be changed in the User Settings tab, see Section 6.8.3.6 for details.

#### 6.9.2.3 Alert and Warning Indicators

The Alert and Warning indicators are located to the right of the Map display area. When a Warning or Alert is generated, the respective indicators will flash amber and red.

In the normal user mode, a Mute button appears below the indicator when it is active. Clicking on the button will stop the indicator from flashing but it will remain illuminated, any warning sound will also stop. See Section 6.8.3.2 for more details about snoozing Warnings and Alerts.

In Administrator mode a third larger Clear All button appears below the Warning indicator when either a Warning or Alert is generated. Clicking on this button clears both Warnings and Alerts for the entire system including all users. The Warning and Alert relays will be reset, and any Wide Area Sounder connected to the system will be silenced. The generation of new Warnings or Alerts will be inhibited for the persistence time, see section 4.5 for more information on persistence times.

**The Clear All button should only be used if you are sure it is safe to cancel the Warning or Alert generated by the BTD-200 system.** You will be asked to confirm the action.

#### 6.9.2.4 Activity Log

The righthand section of the Main tab is dedicated to the Activity Log. This area will display all Warnings and Alerts and the cause as they are detected by the BTD-200. When no thunderstorm activity is detected, nothing is added to the activity log, during a thunderstorm the log can update every 2 seconds. The Activity Log can have up to 1000 entries.

There are two buttons below the Activity Log display area, Clear and Save. The clear button erases all entries currently in the Activity Log. Once cleared the data cannot be recovered. The Save button brings up a file save window that allows the entire Activity Log to be saved as a text file.

### 6.9.2.5 System Status Display Area

The System Status display area is in the bottom right part of the Main tab and shows information about the health of the system hardware and the connections between the system components.

The Connection indicator shows the status of the connections between the components of the system. The indicator can show the following:

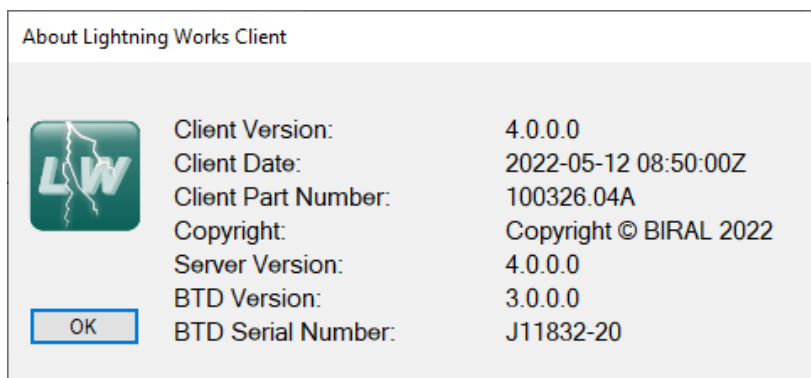
Solid Green	All components correctly connected
Flashing Green	Connected to the Lightning Works server but <b>NOT</b> the BTD-200
Solid Red	Disconnected from the Lightning Works server and the BTD-200
Flashing Red	Attempting to connect

The System Status indicator will be a steady green if all the system components are operating correctly, it will flash red if any component is registering a fault condition.

In Administrator mode a View Details button appears next to the System Status indicator. Clicking on the button causes a new window to popup that displays detailed information about the health of the system components. You may be asked to relate this information to Biral if you require technical assistance with your installation.

### 6.9.3 Software and Hardware Revision

The About window, accessible from the Help option in the main menu provides useful information about the software revisions of the Lightning Works Server and Client and the firmware version of the BTD-200. The serial number of the BTD-200 sensor is also shown. See Figure 6-6 below.



**Figure 6-6 About Window**

This information may be needed when upgrading part of your system or installing new components.

## **7 MAINTENANCE**

The BTD-200 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.

### **7.1 Clearing Vegetation**

Ensure that no vegetation has grown up around the BTD-200 that could interfere with operation. See Section 5.1 to be reminded about the required site conditions.

### **7.2 Cables, Corrosion and Fasteners**

The BTD-200 is made from aluminum 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. Pay particular attention when wall brackets are used, and the BTD-200 is installed at height.

When the BTD-200 is installed in a very corrosive environment, such as close to the sea or in some industrial areas, some discolouration of the sphere may occur. If this happens, clean the sphere, and apply a thin coat of light oil using a cloth.

Check the condition of all cables going to the BTD-200. Ensure the cables are secured so they cannot be damaged by moving around in the wind.

### **7.3 General Cleaning**

It is recommended that any heavy buildup of spider webs and dirt is removed from the BTD-200 sensor. 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.

### **7.4 Fuse Replacement**

The power supply to the BTD-200 is protected by a fuse located on the terminal board. See Figure 5-7 for details of the fuse location.

In the unlikely event that the fuse fails it should be replaced by a fuse of the same rating. The specification of the fuse is as follows:

Type:	20 mm
Speed:	Anti Surge
Current:	2 A
Voltage:	250 V

If the fuse continues to fail check the power supply voltage is in the range 9V to 30V DC. If the supply voltage is correct, contact your local supplier or Biral for further assistance.

## **8 ADJUSTING THE SITE CORRECTION FACTOR**

If the BTD-200 is installed at a different height than recommended, on the roof of a building or close to tall objects, the lightning distance reported by the detector may be inaccurate. If you notice a systematic difference between actual distance to a storm and distance reported by your BTD-200, you will need to re-calibrate the detector by entering the actual and reported distances to lightning in the Site Correction Factor section of the Administrator tab.

### **8.1 Finding the Actual Lightning Distance**

There are several options to independently find the actual distance to lightning, some of the best are detailed below. You can find the lightning distance reported by the BTD-200 for each flash in the Activity Log section of the Main tab.

For all the methods discussed below, to increase confidence of the comparison distances, it is best to compare many flashes and find a typical distance reported by the BTD-200 and the independent method. Always make sure that you are comparing lightning flashes detected by the BTD-200 and an independent method which occurred at the same time.

#### **8.1.1 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](http://www.lightningmaps.org).

Identify individual flashes that are shown by both the BTD-200 and the lightning location network and record the distance reported by the BTD-200 and the distance from the BTD-200 to the flash as shown on the lightning location network. For best results choose a small localised storm and average the BTD-200 distance and lightning network distance for several flashes.

#### **8.1.2 Rain Radar**

If the storm is small and isolated, use an online rain radar site, normally available from your national weather service, to find the heaviest precipitation. This is normally where the lightning is found.

Average the distance reported by the BTD-200 for several lightning flashes and estimate the distance from the BTD-200 location to the heart of the storm on the rainfall radar.

### 8.1.3 Visible Lightning

If lightning is within about 10 km you should be able to see the lightning flash and hear the thunder, especially at night. To determine the distance to the lightning flash, measure the time between seeing the flash and arrival of thunder, in seconds. Divide this time by 3 to find the distance to lightning in kilometres (divide by 5 for miles). For each measured flash record the distance reported by the BTD-200. As before average the distances you calculated and those reported by the BTD-200 over several flashes for best results.

You will find this process easier if you choose a storm that is not too active, so that you do not confuse individual lightning flashes. Avoid using nearby flashes, closer than 5km, as it is hard to accurately measure the time in such cases.

## 8.2 Entering the Site Correction Factor

In the Actual Distance box of the Site Correction Factor (SCF) area, enter the distance between the sensor and lightning as found by one of the methods described above. It does not matter what units you use (kilometres, miles etc.) providing they are the same for both the Actual and Reported boxes. In the Reported Distance box, enter the distance reported by the BTD-200 for the same lightning activity, using the same units as for the actual distance (e.g. kilometres). Click on the SET button to complete the process. Check the value in the Current SCF box has changed. The BTD-200 has now been re-calibrated to measure the correct distance for your site.

## 9 UNDERSTANDING EXPORTED DATA

### 9.1 Introduction

The Lightning Works software can export archived BTD-200 data in CSV format. Archived data is always exported as one file for an entire day. If you require data for a longer period, it is necessary to export multiple files. The file name and location is chosen at the time the file is saved. Each exported file starts with a header line that describes the data. CSV is a simple text format where data fields of numbers or letters are separated by a comma (,). CSV files are easily processed in spreadsheet and word processing applications.

**Note:** Microsoft Excel removes leading zeros when importing CSV files. This has no impact on the data, but the messages will not look as described below when displayed in Microsoft Excel.

### 9.2 Message structure

When operating, the BTD-200 exchanges status messages with the rest of the system every 60 seconds, when thunderstorm activity is detected warning messages are exchanged every 2 seconds. The Lightning Works Server software archives these messages so that the Client can export the data in a single format.

Archived data is exported in CSV file format with each message on a separate line. The first line in the file is a header to assist with identifying the fields in subsequent lines. The format of the data is as follows:

```
NFDATA:,1,2020-01-06,00:00:53,129,1,0,0,0,0001,0001,0000,0001,0000,1,0,0,0,
2000-01-01,00:00:00,0,0,0,2000-01-01,00:00:00,0,0,0,2000-01-01,00:00:00,0,0,0,
2000-01-01,00:00:00,0,0,0
```

Field No.	Field Name	Description
1	Header	NFDATA: Marks the no flash message
2	Sensor ID	Always 1
3	Date	BTD-200 date. DD/MM/YY
4	Time	BTD-200 Time. HH:MM:SS
5	Configuration	Records the configuration using the binary values of the BTD-200 configuration switches. Displayed as a decimal integer.
6	Operating Mode	0 = Not sampling 1 = Sampling
7	Warning State	0 = No Warning

		1 = Warning active 2 = Warning cancelled by administrator
8	Alert State	0 = No Alert 1 = Alert active 2 = Alert cancelled by administrator
9	System Health	0 = All components OK 1 = BTD-200 fault 2 = User Computer fault 4 = Base Control Box fault 8 = Wide Area Sounder fault 16 = Direction Finder fault 32 = Radio Module fault 64 = Configuration Fault When multiple faults occur the fault values are added together.
10	BTD-200 Status	0 = OK 1 = OK Any value greater than 1 represents a fault condition.
11	User Computer Status	0 = Not connected 1 = OK Any value greater than 1 represents a fault condition.
12	Base Control Box Status	0 = Not connected 1 = OK Any value greater than 1 represents a fault condition.
13	Direction Finder Status	0 = Not connected 1 = OK Any value greater than 1 represents a fault condition.
14	Wide Area Sounder Status	0 = Not connected 1 = OK Any value greater than 1 represents a fault condition.
15	Relay State	0 = No relays active 1 = Fault relay active – System OK



		2 = Warning relay active 4 = Alert relay active When multiple relays are active the values are added together.
16	Flash Count	The number of lightning flashes detected in the last 2 seconds
17	Warning Indicator	0 = No thunderstorm activity detected 1 = Charged precipitation or distant lightning flash detected 2 = Corona with or without charged precipitation, or vicinity lightning flash detected 3 = Overhead lightning flash detected
18	Warning Flags	0 = No thunderstorm activity detected 1 = Corona detected 2 = Charged precipitation detected 4 = Corona and charged precipitation detected 8 = Distant lightning flash detected 16 = Vicinity lightning flash detected 32 = Overhead lightning flash detected When multiple phenomenon occur, the values are added together.
19	Flash 1 date	Date of the first detected lightning flash in the last 2 seconds. DD/MM/YY
20	Flash 1 Time	Time of the first lightning flash detected in the last 2 seconds. HH:MM:SS
21	Flash 1 Time (Milliseconds)	Milliseconds from field 16 of first lightning flash.
22	Flash 1 Distance	Distance of first lightning flash detected in the last 2 seconds in decametres.
23	Flash 1 Direction	Value is 0 to 360 in degrees. 999 = no direction data available.
24	Flash 2 Date	Date of the second lightning flash detected in the last 2 seconds. DD/MM/YY
25	Flash 2 Time	Time of the second lightning flash detected in the last 2 seconds. HH:MM:SS
26	Flash 2 Time (Milliseconds)	Milliseconds from field 21 of second lightning flash.

27	Flash 2 Distance	Distance of second lightning flash detected in the last 2 seconds in decametres.
28	Flash 2 Direction	Value is 0 to 360 in degrees. 999 = no direction data available.
29	Flash 3 Date	Date of the third lightning flash detected in the last 2 seconds. DD/MM/YY
30	Flash 3 Time	Time of the third lightning flash detected in the last 2 seconds. HH:MM:SS
31	Flash 3 Time (Milliseconds)	Milliseconds from field 26 of third lightning flash.
32	Flash 3 Distance	Distance of third flash detected in the last 2 seconds in decametres.
33	Flash 3 Direction	Value is 0 to 360 in degrees. 999 = no direction data available.
34	Flash 4 Date	Date of the fourth lightning flash detected in the last 2 seconds. DD/MM/YY
35	Flash 4 Time	Time of the fourth lightning flash detected in the last 2 seconds. HH:MM:SS
36	Flash 4 Time (Milliseconds)	Milliseconds from field 31 of fourth lightning flash.
37	Flash 4 Distance	Distance of fourth flash detected in the last 2 seconds in decametres.
38	Flash 4 Direction	Value is 0 to 360 in degrees. 999 = no direction data available.

## 10 SPECIFICATIONS

### 10.1 Measurement

Lightning detection	Cloud-to-ground, intracloud and cloud-to-cloud lightning.
Thunderstorm activity for advanced warning of lightning	Charged precipitation and strong electric field
Lightning detection range	35 km, 21.7 miles
Range resolution	1 km
Detection efficiency	95% for a single lightning flash 99% for storm with 2 lightning flashes 99.9% for storm with 3 lightning flashes For flashes within 35 km
False alarm rate	< 2%
Maximum flash rate	120 per minute
Maximum update rate	2 seconds

### 10.2 Configuration Parameters

#### 10.2.1 Lightning Range Band Parameters

Variable	Default	Range
Overhead Lightning Range Band	8 km	1 to 33 km (1 to 20 miles)
Vicinity Lightning Range Band	16 km	2 to 34 km (2 to 21 miles)
Distant Lightning Range Band	35 km	3 to 35 km (3 to 22 miles)

#### 10.2.2 Lightning Warning Flash Requirements

Variable	Default	Range
Vicinity Flashes per Warning	1	1 to 3
Distant Flashes per Warning	2	1 to 4 and never warn
Warning Delay Period	15 mins	10 to 30 mins

#### 10.2.3 Fault Relay Parameters

Variable	Default	Range
Fault Relay On Delay Time	3 mins	2 to 5 mins
Fault Relay Off Delay Time	3 mins	2 to 5 mins

#### 10.2.4 Relay Mode 1 Parameters

Variable	Default	Range
Warning Active On Time	30 s	30 to 120 s
Warning Active Off Time	20 s	20 to 120 s
Warning Persistence Time	15 mins	5 to 30 mins
Alert Active On Time	30 s	30 to 120 s

Alert Active Off Time	20 s	20 to 120 s
Alert Persistence Time	15 mins	5 to 30 mins
Cancellation Delay Time	15 s	0 to 30 s

#### 10.2.5 Relay Mode 2 Parameters

Variable	Default	Range
Warning Persistence Time	15 mins	5 to 30 mins
Alert Persistence Time	15 mins	5 to 30 mins

#### 10.2.6 Relay Inactive Time

Variable	Default	Range
Relay Inactive Start Time (HH:MM:SS)	00:00:00	00:00:00 to 23:59:00
Relay Inactive Stop Time (HH:MM:SS)	00:00:00	00:00:00 to 23:59:59

### 10.3 Outputs

User computer or Base Control Box	Wired serial connection 4 wire (RS422)
Wide Area Sounder	Wired serial connection 2 wire (RS485)
Relays	3 Relays with SPST-NO volt free contacts: Alert state Warning state Fault All relays 16 VAC, 35V DC 5A
Connection method	Screw terminals

### 10.4 Cables and Glands

BTD-200 Cable glands	5 off 3.5mm (0.14") to 7mm (0.28") 3 off 4.5mm (0.18") to 10mm (0.39")
Power Cable (For lengths less than 100m, 328')	Recommended cable. 22AWG or greater, twisted pair or shielded construction.
Primary Data Connection Cable	Recommended cable. 24AWG or greater, 3 twisted pairs, overall screen. 120Ω characteristic impedance.
Terminal sizes (All BTD-200 connections)	26AWG to 14AWG 3mm flat blade screwdriver

## 10.5 Power Requirements

BTD-200 Supply Voltage	9 to 30 V DC
BTD-200 Power Consumption	Less than 6 W (DC)
Mains Power Adaptor	110 to 240 VAC 50 to 60Hz 24 V DC Output

**Warning** – Operating outside of the supply voltage range will PERMANENTLY DAMAGE the sensor. In battery or solar operated systems, a battery disconnect MUST be used.

## 10.6 Environmental

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

## 10.7 Certification and Compliance

UKCA and CE marked	
EMC	EN61326-1:2013 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	

## 10.8 Physical

Material	Stainless steel, epoxy powder paint coated aluminium, PTFE and nylon
Colour	Silver, White and Black
Weight	4.3kg, 9.5lbs Sensor only
Height	675mm, 26.6"
Diameter	200mm, 7.9"

## 10.9 Maintenance

Selftest capability	Standard feature
Visual inspection	6 to 12 months
Warranty	1 year

### **10.10 Included with Sensor**

Universal input mains power supply adaptor
Optically isolated Serial RS422 to USB adaptor (SCIU)
Manual
Lightning Works software on USB drive
3mm and 6mm Hex keys

### **10.11 Lightning Works Software**

Multi-user capability. Maximum of 5 simultaneous users
Supports remote access using VPN and internet
Map overlay showing lightning distance bands
Sensor health status display
System configuration window
Warning state cancellation buttons
Automatic data logging
Data export of logged data in CSV format

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