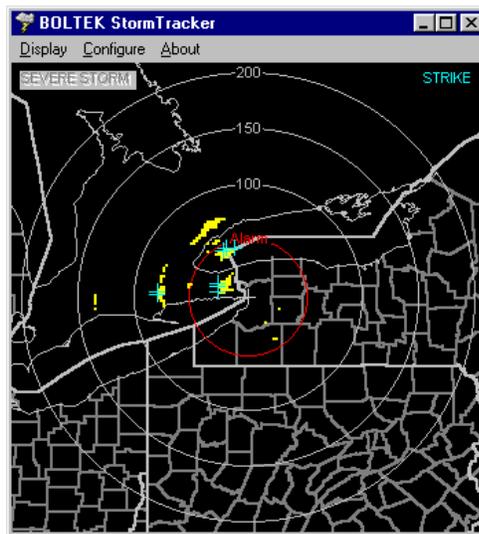




BOLTEK CORPORATION

Lightning Detection



***StormTracker* Lightning Detector**  
with PCI style receiver card

**Installation/Operators Guide**

**SEE NOTICES ON REVERSE**

BOLTEK LIGHTNING DETECTION

# *StormTracker* Lightning Detector

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## **Disclaimer**

*StormTracker* lightning data is only approximate and should not be used for safety applications. Strike and storm locations indicated and alarm statuses may be erroneous and should not be used to safeguard personnel, equipment or data.

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Boltek Corporation  
2316 Delaware Ave PMB 254  
Buffalo, NY 14216  
USA

210 Glendale Ave Suite 168  
St. Catharines, ON L2T3Y6  
Canada

Email: [info@boltek.com](mailto:info@boltek.com)  
Web: [www.boltek.com](http://www.boltek.com)  
Phone (905) 734-8045 • Fax (905) 734-9049

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## Warranty

Boltek Corp. warrants each new Boltek *StormTracker* Lightning Detector delivered to the customer to be free from defects in material and workmanship for a period of one year.

Should your Boltek *StormTracker* fail within the warranty period, telephone, fax, or email Boltek describing the problem you are encountering. If we can't solve the problem for you, we will give you an R.M.A. number to return the product for repair or replacement.

# Introduction

Congratulations on your purchase of the *StormTracker* Lightning Detector. You will find *StormTracker* to be a useful tool in determining if there is lightning in your area, finding the location of storms, and determining whether storms are coming your way.

*StormTracker* uses a direction-finding antenna to receive and locate the radio signals produced by lightning. The strength of the received signal is used to calculate approximately how far the strike is away. The combination of direction and distance allows the strike to be plotted onto a radar-like screen, the receiver location being the center of the screen with distance increasing outwards from the center.

As well as showing the current lightning activity, lightning data may be replayed in fast motion, displaying several hours of storm activity in a few seconds. You can see the natural progression of storms as they form and later die out.

*StormTracker* consists of:

- PCI style receiver board which you will install in your computer
- direction-finding antenna
- 50 foot antenna cable
- software on CD-ROM
- manual

You will need to:

- install the receiver board in your computer
- let Windows load the device drivers for the PCI card
- install the display software onto your computer's hard drive
- configure the software
- route the antenna cable
- mount the antenna
- wait for a thunderstorm

The installation section of the manual will take you through each of these steps. After completing these steps your *StormTracker* lightning detector should be operational. If you have difficulties getting your detector to work properly the troubleshooting section will help you determine the cause of the problem.

# Installation

Installation consists of three stages:

- 1) Installing the receiver board in the computer
- 2) Installing software onto your hard disk
- 3) Installing the antenna and routing the cable

## **StormTracker – PCI Installation Instructions**

There are three steps to installing your new PCI StormTracker card:

1. Installing the StormTracker – PCI receiver card in your computer.
2. Installing the Windows device driver.
3. Installing the Boltek StormTracker lightning display software.

You need to do all three steps, even if you will be using Lightning/2000 or NEXSTORM display software.

## **INSTALLING THE PCI CARD IN YOUR COMPUTER**

Locate a free PCI card slot on your computer motherboard. PCI connectors are usually white in color, whereas the older style ISA connectors are usually black. Plug the *StormTracker* card into the PCI slot and screw the card down. Make sure the card is fully seated in the PCI connector. Also make sure the other cards in your computer are fully seated in their connectors as plugging in a new card can unseat existing cards.

## INSTALLING THE WINDOWS DEVICE DRIVER

Turn on your computer. When Windows restarts it will detect the new StormTracker card and ask for a device driver.



Insert the *StormTracker* CD-ROM in your CD-ROM drive and click on Next.



Make sure CD-ROM drive is checked and click Next.



Windows should find *StormTracker*'s INF file on the CD-ROM and install the device drivers for the card.

## INSTALLING THE BOLTEK *STORMTRACKER* DISPLAY SOFTWARE

StormTracker will run on any computer that can comfortably run Windows (usually a Pentium). You require 4 megabytes of free disk space to install the software. Additional disk space will be needed to hold the strike data files. An additional megabyte is recommended if you will not be keeping your old data files. Many megabytes may be used each storm season if you will be keeping your old data files.

Using Windows File Manager, Windows Explorer or the Windows Run command line execute

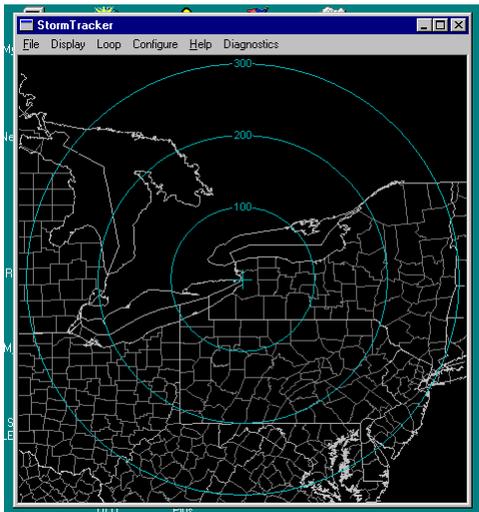
**A:\Setup.exe**

to install StormTracker. The install program will create a \STORMWIN directory on your hard drive and copy the necessary files.

Open and close your CD-ROM drive to autorun the setup program. If setup.exe does not start automatically open My Computer or Windows Explorer and select the Boltek CD-ROM. Double click on setup.exe to run the installation program.

Once the setup is complete you will be prompted to restart your computer. Click on OK to reboot. You have now completed the installation procedure.

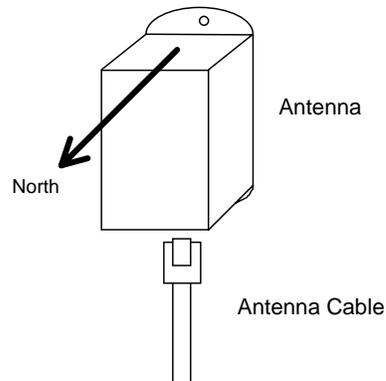
Once the computer has been rebooted you can run the *StormTracker* lightning display program. Click on Start, and then on Programs. There will be a new option called Boltek. Select Boltek and you will see the StormTracker – PCI program listed. Click on StormTracker – PCI to start the display program.



## Installing the Antenna

The antenna is housed in a small black plastic box that must be mounted vertically on a non-metallic support. The antenna cable plugs into the bottom of the antenna housing. When mounting the antenna ensure the correct side of the antenna faces north. The cable plugs into the bottom of the antenna with the front of the antenna facing north.

The front of the antenna corresponds to the top of the computer screen. If the antenna does not face north the top of the computer screen will not be north.



Provided there are no large metal objects to block the radio signals, mounting the antenna 6 feet high is ok. Mounting the antenna 12 feet high is good. 20-25 feet is better.

### **LIGHTNING**

Receiving lightning signals does not cause lightning to strike. Your LD-250 antenna is less likely to be struck by lightning than your anemometer, since the antenna does not need to be above the roof line. Still though you must exercise common sense when choosing a location for your antenna. If you mount the antenna on a ten foot pole on the highest point on your roof, with no trees or television tower nearby you are asking for lightning to strike.

Your best protection against lightning is to mount the antenna indoors. Radio waves will pass right through a wood building. Lightning is more likely to strike a tall tree, television antenna, copper plumbing vent, satellite dish, telephone line, power lines, or CB antenna. If you do mount the antenna outdoors make sure there are plenty of ground paths for lightning nearby (such as those just mentioned), and higher than the antenna.

The LD-250 receiver board has surge suppression in its input to protect against voltages induced into the antenna cable. It is also a good idea to purchase a surge suppressor to plug your computer into. If you have a modem try to find one that will protect your phone line as well. Lightning often enters through the telephone line. Both your computer and surge suppressor will need to be grounded.

The antenna may be mounted indoors or outdoors. Try to mount the antenna as high as possible (without making it a lightning rod). Mounting the antenna high will keep it away from noise sources and will improve the maximum range.

In a wood framed house, the second floor or attic is often a good location for the antenna. This places the antenna above the most common sources of interference: televisions, lights and appliances, yet leaves it in a good location to receive lightning signals. Mount the antenna to the drywall or attic rafter away from screws, nails, electrical wiring, and other metal objects. If your house has aluminum siding (vinyl siding is ok), foil-lined insulation, or any other metal coating, you might have problems receiving with the antenna indoors, as the metal may shield radio waves from the antenna.

**DO NOT MOUNT THE ANTENNA SO AS TO ATTRACT LIGHTNING.** The antenna does not need to be the highest object in the area to receive lightning signals.

**DO NOT LOCATE THE ANTENNA NEAR AN OBJECT WHICH IS LIKELY TO BE STRUCK BY LIGHTNING.** Objects such as television antennas, CB antennas, power lines, phone lines and tall trees are natural targets for lightning. Keep the antenna and cable away from anything which might be struck by lightning. Lightning can jump from one object to another in its search for ground.

The antenna may be mounted with nylon cable ties, or with nylon bolts through the mounting flanges (available at a hardware store). Do not use steel screws to mount your antenna, as the antenna must not be near any metal objects.

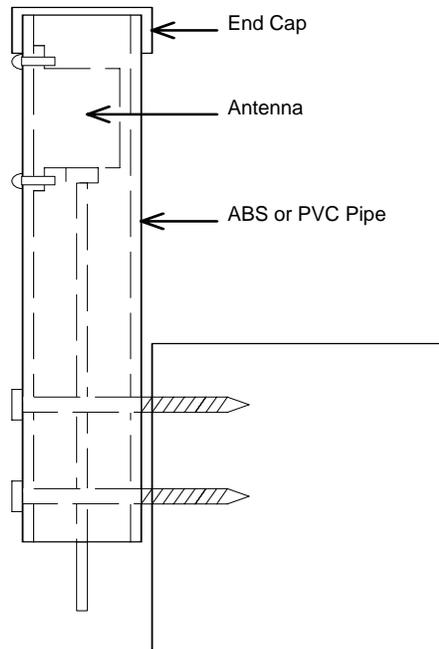
If mounting the antenna outdoors, care must be taken to protect the antenna connector from moisture. While the antenna is completely waterproof the antenna connector must be sheltered from rain. Place the antenna inside a non-metal housing such as a length of ABS or PVC pipe with an end cap covering the top. Keep a small opening on the bottom to allow condensation to drain out. ABS or PVC pipe, fittings and glue may be purchased from a hardware store plumbing department. Mark NORTH on the outside of the pipe to help in orienting the antenna correctly.

Fasten the cable to the wall or support about 6-12" below the antenna. Leave a bit of slack in the cable near the antenna so that there is no strain on the connector from the wire.

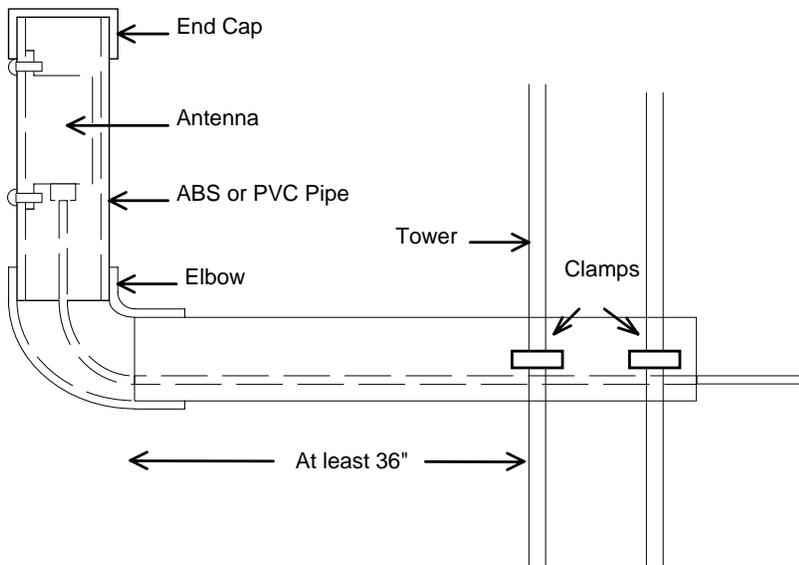
If you find the 50' antenna cable provided is not long enough you may purchase a Boltek extension cable. This allows you to locate the antenna up to 200' from your computer.

You may also purchase a replacement cable at any computer store selling network hardware. Any Category 5 cable up to 200 feet will work. See Appendix C for information on making your own antenna cable.

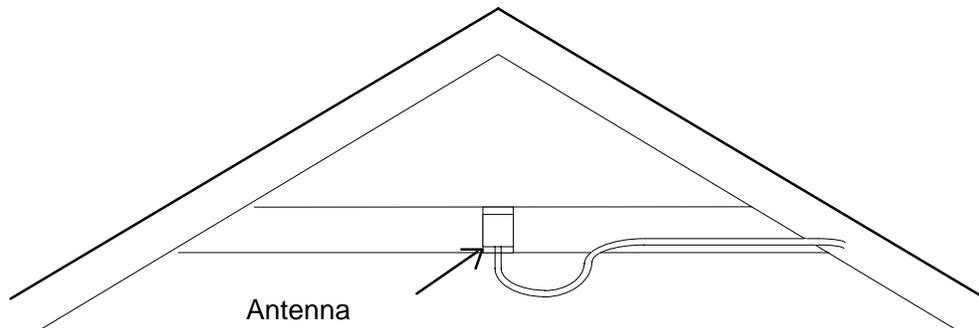
### Antenna Mounting Suggestion – Outdoor



### Antenna Mounting Suggestion - Outdoor



## Antenna Mounting Suggestion - Attic



## Antenna Mounting Examples



Here an antenna is mounted in an attic. PVC plumbing hardware is used to attach the antenna to the framing. The vertical pipe is not cemented to allow the antenna to be rotated slightly for fine-tuning direction. The front of the antenna must face exactly north.



Here an antenna is mounted in a shed using PVC plumbing hardware purchased at a local hardware store. The antenna is attached using nylon cable ties.



Here the antenna is attached to the drywall in the second floor bedroom of a house. The antenna is mounted on the wall using PVC plumbing hardware purchased at a local hardware store. The antenna is attached to the PVC pipe with nylon screws. The vertical piece of PVC pipe is not cemented so that the antenna can be rotated to fine-tune the direction.

Mount the antenna between studs to keep it away from nails and screws. Look for electrical outlets on the wall to determine if there is wiring behind the drywall. Keep the antenna away from electrical wiring, to reduce the chance of picking up noise.



Here the antenna is mounted to the side of a pole using ABS sewer pipe.



The mast is 1 ½ inch PVC while the container for the detector is 3 inch PVC mounted to a tripod on the roof.

# StormTracker Software

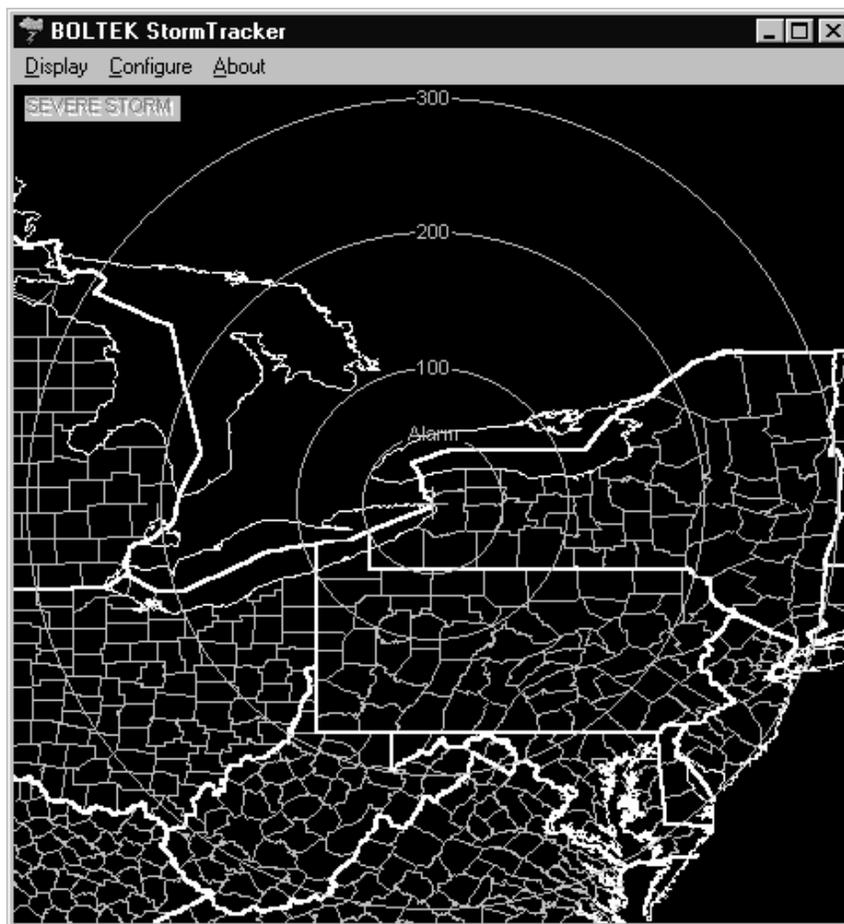
## Configuring the Software

To start the *StormTracker* program, execute:

**STORMWIN.EXE**

If you accepted the default directory during installation the program will be in the \STORMWIN directory.

You will be placed at the *StormTracker* main menu screen.



If you are getting a large number of noises/minute see the Troubleshooting section at the end of the manual.

## Working the Menus

There are two ways of getting around the menu screens. You can usually use either the mouse or the keyboard.

### Using the Mouse

You can get around the menus by clicking on the menu name or field name or on the field itself. Click with the left mouse button. To close a dialog box click on OK to save your changes or Cancel to lose your changes.

### Using the Keyboard

You will often see one letter of a menu option highlighted. As a shortcut to opening the menu, you can hold down the Alt key while pressing the highlighted letter.

For example, from the main *StormTracker* screen you can use the following Alt key shortcuts:

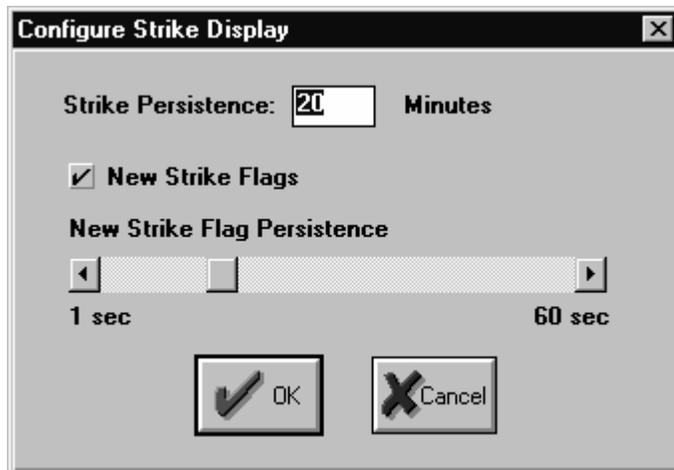
- Alt-D Opens Display Menu
- Alt-C Opens Configure Menu
- Alt-A About StormTracker Menu Option
- Alt-F4 Exits *StormTracker*

Within a Dialog Box (a pop-up window)

TAB	Moves forward from field to field
Shift-TAB	Moves backwards from field to field
Enter	Accepts the Changes and Closes Box
Esc	Cancel a Dialog Box

## Configuring the Strike Display

Here you can set certain options that change the way strike data is displayed. These settings do not affect the way strike data is recorded.



### Strike Persistence

Persistence is the length of time a strike is displayed on the screen before it is erased from the screen. When looping this refers to accelerated time. For example, when playing back at 30 minutes/second with a persistence of 30 minutes each strike will be displayed for one second.

Regardless of the persistence setting, the program will display no more than 2000 strikes on the screen at one time.

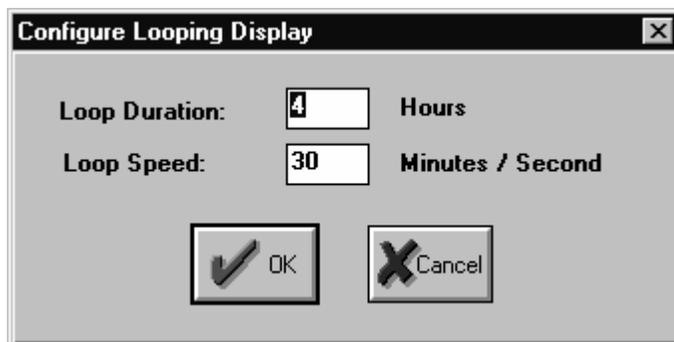
### New Strike Flags

New Strike Flags are small blue crosses that show where new strikes are happening. On a screen showing hundreds or thousands of strikes it can be difficult to see where new strikes are occurring. These flags will highlight the new strikes allowing you to see which storm cells are most active.

### New Strike Flag Persistence

New Strike Flag Persistence is the length of time each flag is displayed on the screen.

## **Configuring the Display Loop**



### Loop Duration

This is used to set how far back you want to go when displaying recent activity. Enter the number of hours. For example to display the last 8 hours of activity enter 8 hours. The display will start 8 hours ago and display all strikes received up to the current time.

### Loop Speed

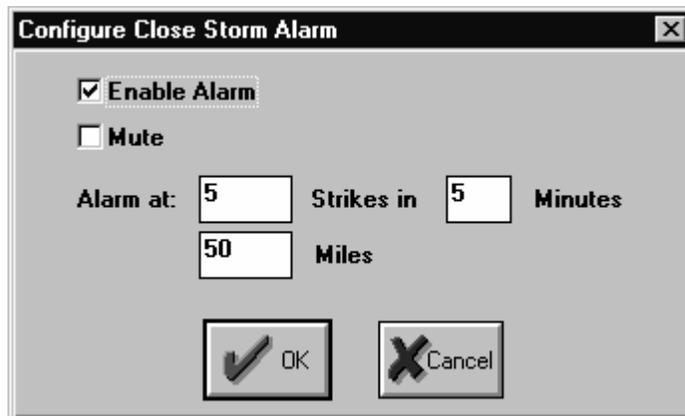
This is the speed the display will replay back in minutes per second. For example to see 30 minutes worth of lightning strikes each second enter the number 30.

You may find your playback rate slows down when replaying storms with very high strike rates (large number of strikes/minute). Your computer is doing its best to playback at the correct rate but there are just too many strikes.

## **Configuring the Close Storm Alarm**

The software can notify you of a thunderstorm that comes closer than a predefined distance by sounding an alarm tone from the computer's internal speaker or by playing a WAV audio file through your computer's sound board. Once the storm moves farther than this distance the alarm shuts off. Strike Beeps and Noise Beeps will not sound if an alarm tone is sounding.

To configure the alarm (enable or disable the alarm, or change the alarm tone frequency) select Configure...Close Storm Alarm... from the main *StormTracker* screen.



### Enabled / Disabled

If you would like an alarm to sound to warn of close lightning strikes select Enabled. If you do not want the alarm to sound select Disabled.

### Mute

This checkbox will be checked if the alarm is currently active but has been muted.

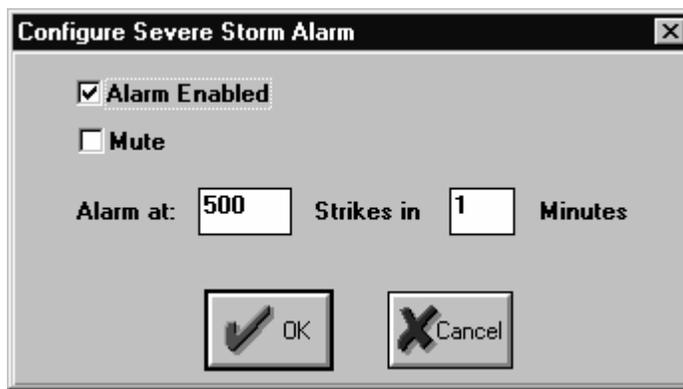
### Alarm At

Once the strike rate (strikes / minute) exceeds this number the alarm will sound. Once the strike rate falls below this number the alarm will stop sounding.

## Configuring the Severe Storm Alarm

The software can notify you of a severe thunderstorm by sounding an alarm tone from the computer's internal speaker or by playing a WAV audio file through your computer's sound board. If the strike rate exceeds a preset number of strikes per minute the alarm will activate. Once the number of strikes drops below the alarm setpoint the alarm shuts off. Strike Beeps and Noise Beeps will not sound if an alarm tone is sounding.

To configure the alarm (enable or disable the alarm, or change the alarm tone frequency) select Configure...Severe Storm Alarm... from the main *StormTracker* screen.



### Enabled / Disabled

If you would like an alarm to sound to warn of high lightning strike rates select Enabled. If you do not want the alarm to sound select Disabled.

### Mute

This checkbox will be checked if the alarm is currently active but has been muted.

### Alarm At

Once the strike rate (strikes / minute) exceeds this number the alarm will sound. Once the strike rate falls below this number the alarm will stop sounding.

## Configuring the Display Screen

Here you can set certain options that change the way strike data is displayed. These settings do not affect the way strike data is recorded. The two display ranges (200 and 300 miles) each have their own configuration screen.



### Distance Rings

Place a check in the Distance Target box if you would like target rings drawn around the center of the display screen. Distance Rings can be helpful in judging how far away a storm is. Enter the number of rings in the box to the right.

Your *StormTracker* should have a maximum range of approximately 300 miles. Three rings would give 100 miles per ring. Four rings would give 75 miles per ring. Keep in mind that while the strike's direction is accurate, the distance from you to the lightning strike is only an approximation. Due to the variation in lightning strength there will be some ambiguity in the strike's distance away.

### Label Rings

If you place a check in the Label Rings check box the distance (in miles or kilometers) will be written on each ring.

### Crosshairs

Place a check in the Crosshairs box if you would like a small cross placed at the center of the display screen to mark your location.

### Invert BMP Colors

Placing a check in the Invert BMP Colors check box will cause BMP background maps to be displayed in negative, for example a map with a white background will display with a black background.

This check box will have no effect if you are using a MAP format background map.

### Background Maps

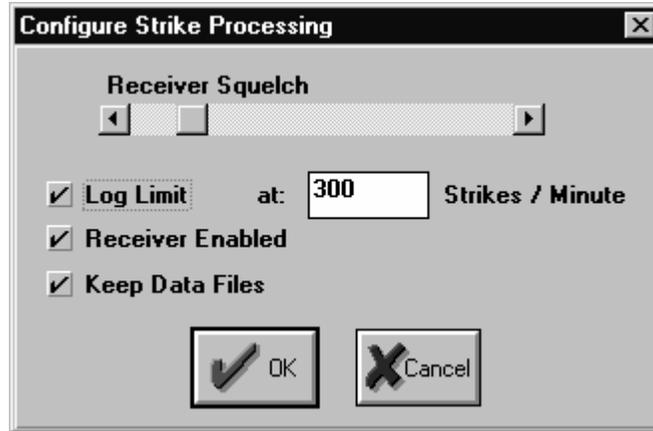
Background maps may be in either MAP format or BMP format. MAP format is a proprietary Boltek vector map format. BMP format is a standard bitmap format. BMP maps may be created in any paint program, for example Microsoft Paint included with Windows. See the manual section "Making Background Maps" for more information on making your own background maps.

To see which maps are available on your hard drive click on the Browse Maps button (or press B or Alt-B) in the Configure Screen menu. Double-click on the map you would like to use.

### Miles or Kilometers

StormTracker can display distances in either miles or kilometers. If miles is selected the two display ranges will be 200 and 300 miles. In kilometers the two display ranges will be 320 and 480 kilometers.

## **Configuring Strike Processing**



### Receiver Squelch

This is the received signal level which must be exceeded before *StormTracker* will analyze the signal.

If you set the squelch control too high you will ignore weak lightning strikes, reducing your range. Ideally the squelch control should be at the lowest setting. If you are getting a large number of noise strikes with no lightning activity, try raising the squelch control up a few steps. If you need to raise the control any more than half way you have a noise problem. See the "Troubleshooting" section for help on locating the source of the noise.

### Log Limiting

A thunderstorm can produce a large number of lightning strikes each minute, often several hundred. So many strikes can occur that your computer can have trouble playing them back in a loop. The playback will slow down when the strike rate exceeds a certain number of strikes/minute. (While the exact number depends on how fast your computer is, playback will probably slow down when there are more than 50-100 strikes/minute playing back at 15-30 minutes/second.)

Log Limiting will limit the number of strikes per minute which are logged to the data file on your hard disk. You should limit the Log Limit strike rate to a value that your computer can playback at the speed you normally playback. A good starting point would be to Log Limit at 50 strikes/minute. If you find playback still slows down more than you like you might try limiting at 40, or 30 strikes/minute.

Log Limiting will not affect the integrity of your data. You will still see all the storm cells. The only side effect of Log Limiting is that you will no longer know the true Strike Activity Rate

(received strikes/minute) when playing back data. The strike rate will be limited to the Log Limit value you enter.

### Disable / Enable Receiver

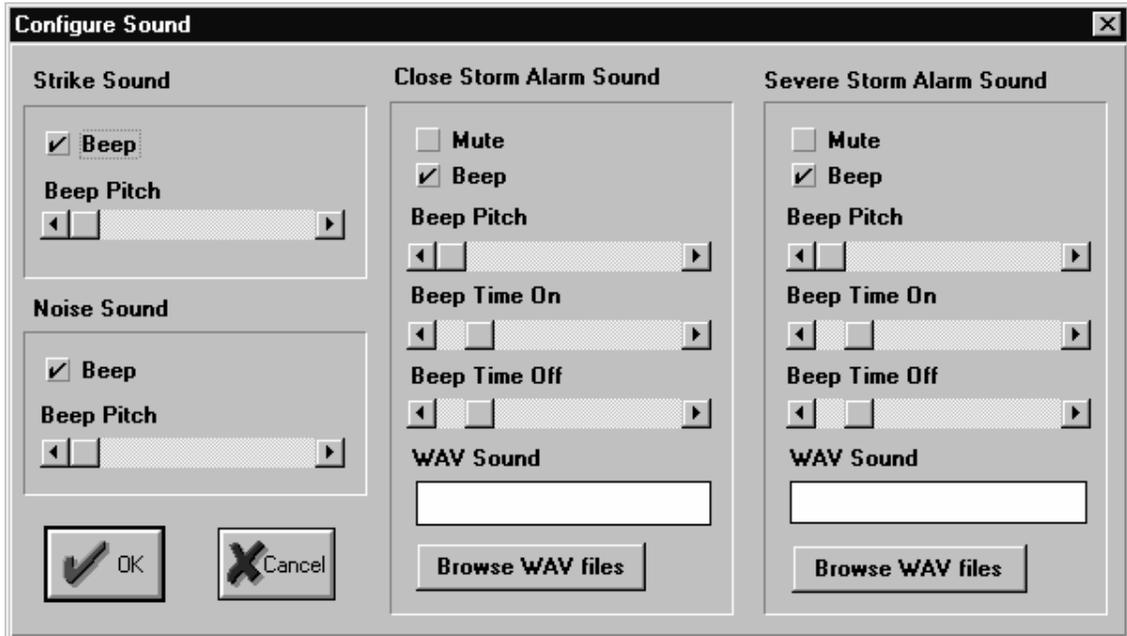
If you are running the *StormTracker* software on a computer that does not have a receiver installed (for viewing data files) you should disable receiver checking.

### Keep / Delete Old Strike Data Files

If you would like to keep your strike data files for later viewing select Keep Old Data Files. If you are not interested in viewing old data select Delete Old Data Files.

If you are keeping old data files you will need extra disk space to hold the data files. The main display screen shows how much free disk space you have. Check the disk space periodically to ensure you are not running out of space. You can delete old data files from your hard disk using Windows File Manager or Windows Explorer.

## Configuring Sound



### Strike Beeps

A Strike Beep is a beep from the computer's internal speaker generated every time a valid signal is received. To enable Strike Beeps place a check in the Strike Beep check box.

### Noise Beeps

A Noise Beep is a beep from the computer's internal speaker generated every time a signal is received which *StormTracker* determines to be noise, or for which the direction or distance is unclear.

Both Strike Beeps and Noise Beeps are useful in identifying and locating interference problems. A beep from the computer can often be correlated with a light switch be flipped or an appliance being turned on or off.

Frequent or constant noise beeps are an indication that something nearby is generating interference.

#### Alarm Mute

This checkbox will be checked if the alarm is currently active but the beep tone has been muted.

#### Beep Pitch

This is the frequency of the alarm tone which will sound from the computers internal speaker when the alarm activates.

#### Beep Time On / Beep Time Off

Time On and Time Off are used to create a pulsed alarm tone. To create a continuous alarm tone set the Time Off to minimum.

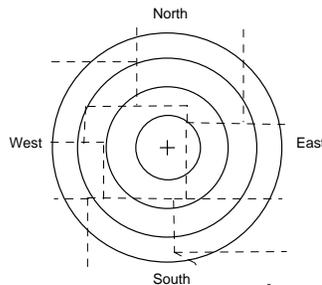
#### WAV Sound

If you have a sound board installed in your computer you can configure *StormTracker* to play an audio WAV file every time a sound activates. This prerecorded audio file can be played instead of beeps or in addition to beeps from the computers built-in speaker.

# Tracking Storms

*StormTracker* can tell an approaching storm from a receding one. *StormTracker* can tell if there is one storm cell or many. You can see if there are large active cells, or small weak ones.

By playing back a "movie" of recorded strike data you can see storm cells build, move, and die out. You can see storm cells passing by and others approaching.



The *StormTracker* software displays lightning strikes on a graphics screen. Like a radar screen, you are located in the center. The distance from the center to the edge of the screen is about 300 miles. You can configure *StormTracker* for as many range rings as you like. With three range rings and a range of 300 miles, each ring will correspond to 100 miles. With four rings each one will represent 75 miles.

To track thunderstorms simply run the *StormTracker* software. The program will continuously monitor the receiver board. Each lightning strike detected within the 300 mile range will cause the computer to beep (unless you turn the beeps off) and display the location of the strike.

As long as the *StormTracker* program is running it will receive and log lightning strikes. Strikes will continue to be received while you are at the main menu, in a configuration screen, displaying current activity, displaying recent activity, or displaying archived data.

## Strike Direction

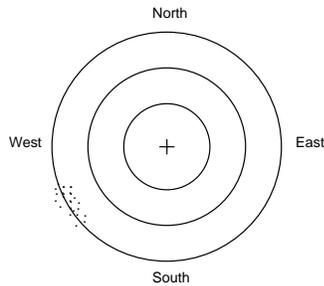
*StormTracker's* direction finding capabilities are useful in determining whether a storm is likely to pass your way. By looking at the direction a storm is from you, and the direction of the wind (or of prevailing winds), you can determine whether a storm is likely to pass over your location.

## Strike Distance

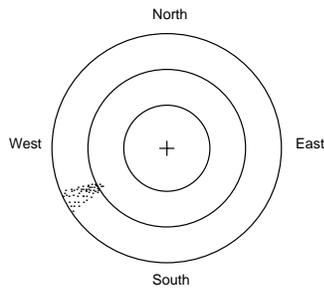
*StormTracker* is able to provide an estimate of how far each strike is away from you. *StormTracker* uses the strength of the received signal to calculate the distance from the strike. Some strikes in a storm are strong while others are weak. Strong strikes will appear to be closer than they really are, while weak strikes will appear to be farther.

## Interpreting the Data

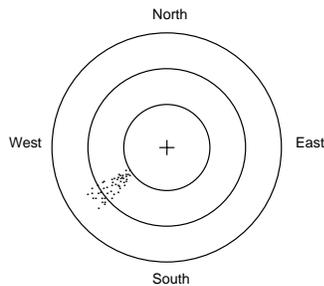
The *StormTracker* display screen is not quite like a radar screen. Due to the variation in lightning strength a storm cell will produce a "pie-slice" shaped group of strikes on the computer display. With practice you will get good at reading the data.



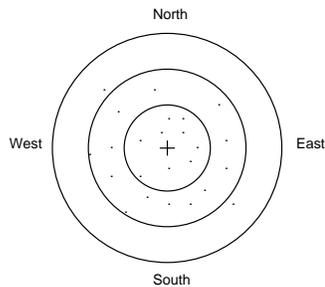
A storm that is far away, 250-300 miles, will produce strikes only near the perimeter of the screen.



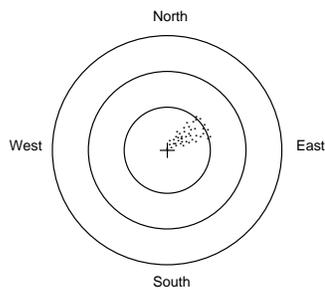
As the storm comes closer, 150-200 miles, strikes will start to appear in the area between the perimeter and the center, closer to your location.



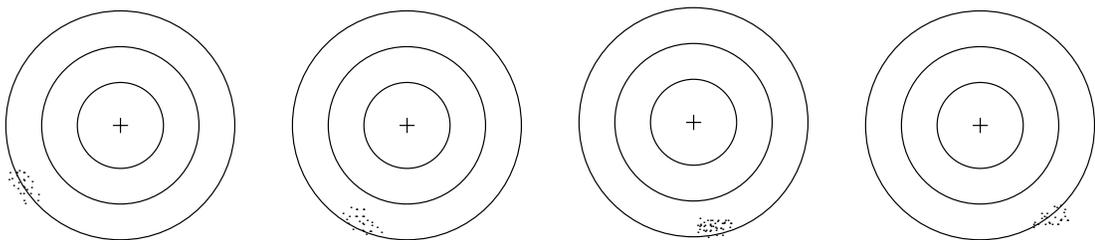
As the storm moves even closer a greater proportion of the strikes will appear close to the center. The storm is now close enough that you will receive both the strong strikes as well as weak strikes in the storm. Strong strikes appear closer than they actually are, while weak strikes appear farther away. This tends to produce a pie-slice shaped storm cell. To find the true location of the storm look at the area nearest the center of the screen. The tip of the cell will come closer as the storm comes closer. Ignore the weaker strikes on the outside of the tip.



Once the storm is directly overhead strikes will appear seemingly at random on the screen. With the storm overhead, strikes are now coming from all directions. With the storm so close, even very weak discharges can be received, and strikes will appear everywhere on the screen. This will last only a short while until the storm passes over.

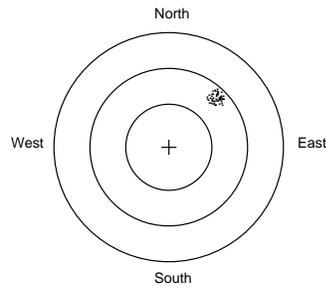


Now that the storm has passed overhead the antenna can once again find a single direction for the storm, and you will see the storm moving away from you.



If a storm cell does not get closer with time it will not hit you. Since thunderstorms are so localized you will find that most storm cells will pass you by.

## Receiving Interference



Electrical appliances and light dimmers can create electromagnetic signals similar to lightning. If you see a tight cluster of strikes which does not move, you are probably receiving an interference signal. There is usually a very high noise count when receiving interference.

Lightning strikes usually come in bursts of one, two or three strikes followed by a period with no strikes. An interference signal will usually produce continuous noises and/or strikes.

If this happens often you may want to relocate the antenna farther from the source of interference. See the Troubleshooting section at the end of the manual for more information on interference.

## Receiver Range

*StormTracker* has a range of about three hundred miles. Occasionally, strong storms farther than 300 miles away may be detected.

The receiver's maximum range will be affected by antenna height. While you can receive storms with the antenna at virtually any height, you will have maximum range with antenna mounted at least 25 feet above ground.

Other factors which could affect range are metal objects located near the antenna. Metal objects can block the radio waves from getting to the antenna, reducing the range. A large steel shed or other metal object nearby could block lightning signals, resulting in reduced range in that direction. Try to mount the antenna as far as possible from large metal objects, preferably above the object.

# Making Background Maps

StormTracker may be run without a background map but the display is much more interesting and informative when strikes are displayed over a map of your area. If you choose to make your own maps (rather than purchase them from Boltek) there are a few things you need to know.

Background maps for the Windows software must be stored in BMP format. Windows Paintbrush or Windows Paint may be used to create these files. If you have PCX format map files for the DOS software you can also convert those files to BMP format for the Windows software.

You will need to create two map files, one for the 200 mile range and another for the 300 mile range. Both maps must be centered on the location of the StormTracker system. The distance from the center to the edges of the map correspond to the display range, either 200 or 300 miles. The map is not centered in the bitmap file but is located on the left side, in order to maintain compatibility with the DOS maps.

Format:	BMP
Bitmap Size:	640x480 pixels
Map Size:	486x480 pixels
Map Center:	246, 240

# Troubleshooting

**Problem:** There is a very high noise count.

**Reason:** There is something producing noise in the low frequency range *StormTracker* uses to detect lightning. It is most likely an electrical device near the antenna.

*StormTracker* is a radio receiver sensitive to all sources of radio frequency energy. Lightning is one source but there are many others. Interference can appear as either excessively large number of noises (>50 noises/minute) or as a cluster of lightning strikes which appear suddenly and do not move with time. Interference usually appears as a continuous stream of strikes and/or noises (apparent when you turn on strike and noise beeps) whereas a thunderstorm tends to produce randomly spaced bursts of strikes.

**Solution:** First try raising the Receiver Squelch slightly to see if you can make the receiver ignore the noise. The Squelch control is found on the Configure Processing screen. If you need to raise the squelch control more than half-way you will be sacrificing some range and should try to solve the noise problem.

To locate the source of the noise, first confirm the noise is coming in through the antenna. Shield the antenna from radio waves by placing an empty tin can upside down over the antenna. If the noise disappears then the antenna is picking up the noise signal. You should either relocate the antenna farther from the noise source (raising the antenna usually works best), or relocate the source of the noise. To identify the source of the noise, one by one turn off all electrical devices (including your computer monitor) until the noise stops.

If the noise does not stop when the antenna is shielded with a tin can the noise is coming in either through the antenna cable or the receiver board. Try relocating the antenna cable to see if the noise changes in any way. Try placing both the antenna and antenna cable inside a steel container close to the computer to see if the noise stops. Slowly remove the cable and begin to run it back to your desired antenna location. If the noise returns this should provide a clue as to what may be causing the noise.

If the noise continues despite the shielding, unplug the antenna cable from the receiver board. If the noise continues the receiver board is picking up noise from other boards in your computer. You will have to change the position of the board in your computer. Increase the separation between the *StormTracker* board and any other board. Or try placing different boards next to the *StormTracker* board. Do not place the computer's video board next to the *StormTracker* board.

Noise can come from:

- televisions
- computer monitors
- lights or appliances turning on or off
- light dimmers
- electric motors

Each of these can radiate radio signals in the same frequency range that *StormTracker* uses to detect lightning.

If you are experiencing noise problems you must take steps to prevent the antenna from receiving these interfering signals. This usually requires relocating either the antenna or the source of interference.

Televisions, monitors and light dimmers will produce a continuous stream of strikes and noise. Lights and appliances turning on and off will produce a single strike or noise as the device turns on or off.

The best way to prevent interference is to separate the antenna from the source of interference. The best way to separate the antenna is vertically. It is usually best to mount the antenna as high as possible. A small amount of vertical separation is equivalent to a larger amount of horizontal separation.

A portable AM radio tuned between stations can be a useful tool in locating a noise source. Listen for buzzing and clicking sounds that correspond with a *StormTracker* noise or strike. An electrical appliance turning on or off can produce a click or popping sound. Televisions, light dimmers, arc welders, motors, and computers will make a buzzing sound. If you find something which you suspect is producing interference to *StormTracker*, turn off the device to see if the noise problem is reduced.

**Problem: Very few strikes are displaying on the screen even though the strike count is very high, when in Display Recent Activity or Display Archived Data.**

**Reason:** You are trying to display strike data faster than your computer is capable, with Skip Strikes turned on. In an attempt to keep up with the fast display rate the program is skipping over strike data rather than displaying it. There are so many strikes to display that you are skipping more strikes than you are displaying.

**Solution:** Either slow down the playback rate (lower minutes/second rate) or turn off Skip Strikes in the Configure Screen... menu.

**Problem: Lightning strikes are being displayed but the direction is not correct.**

**Reason:** Your antenna is not correctly oriented.

**Solution:** Reorient the antenna so that the front faces north. See the Installing the Antenna section of the manual for more information on antenna orientation and location.