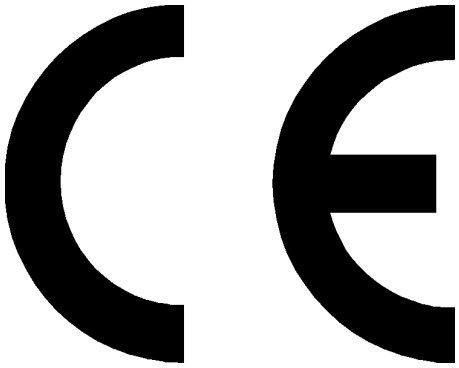
BaseStation SBS-1

Reference Manual

V 1.0.3



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Index

Introduction

This manual is a reference guide to the BaseStation SBS-1 application. If you have just started using your system then you should first consult the Getting Started manual.

Document Conventions

☞ A paragraph with this symbol contains a handy tip that will help you use the BaseStation application more efficiently.

A paragraph with this symbol contains an important point that you need to understand.

A paragraph with this symbol warns you about possible problems you might encounter.

SBS-1 : Front Panel LED Indicators Description

LED INDICATORS (viewed from the front – running left to right)

Power Indicator	USB Connection to PC Validated	SBS-1 Connected To BaseStation	Updating Non Volatile Memory	Reserved	Reserved	Bar graph of aircraft activity. Left to Right Orientation			
Red	Yellow	Green	Orange	Red	Yellow	Blue	Blue	Blue	Blue

Screen Layout

The main screen of the application looks something like this:

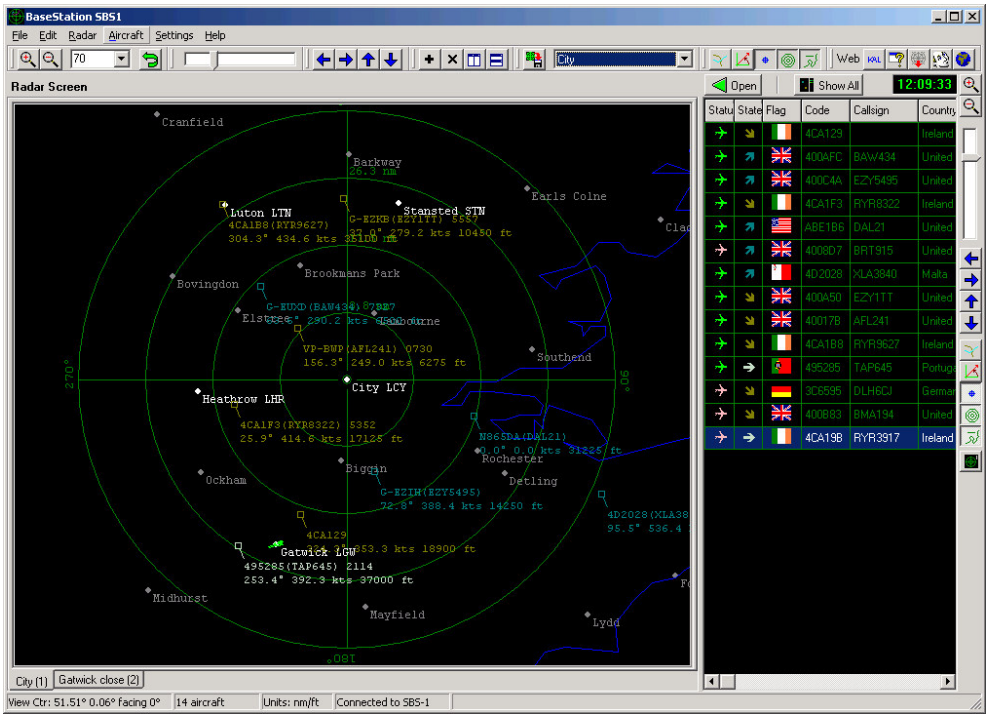


Figure 1: Application main screen

On the left is the Radar Screen and on the right is the Aircraft List. In between them is a splitter control – which you can drag in and out with the mouse to change the width of the Aircraft List.

At the top is the toolbar, which contains shortcuts to the most used menu items.

Along the right-hand side is the sidebar, which contains additional shortcuts to view commands and is also the only interface element that remains visible when in full screen mode (see Sidebar).

You can also “pop” the Aircraft List “in and out” by clicking on the Aircraft List Expand Button (the button with a green triangle and the caption “Open”). The picture below shows the screen after it has been “popped open”:

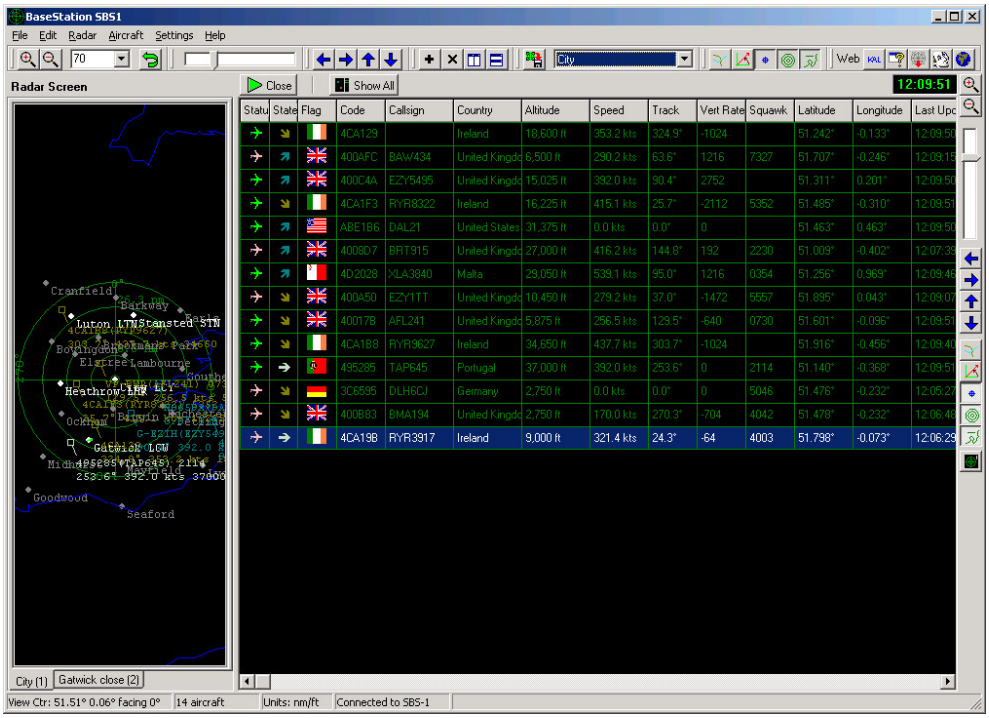


Figure 2: Application main screen with aircraft list expanded

To “pop the list closed” simply click on the Aircraft List Expand button again.

Radar Screen

The radar screen looks something like this:

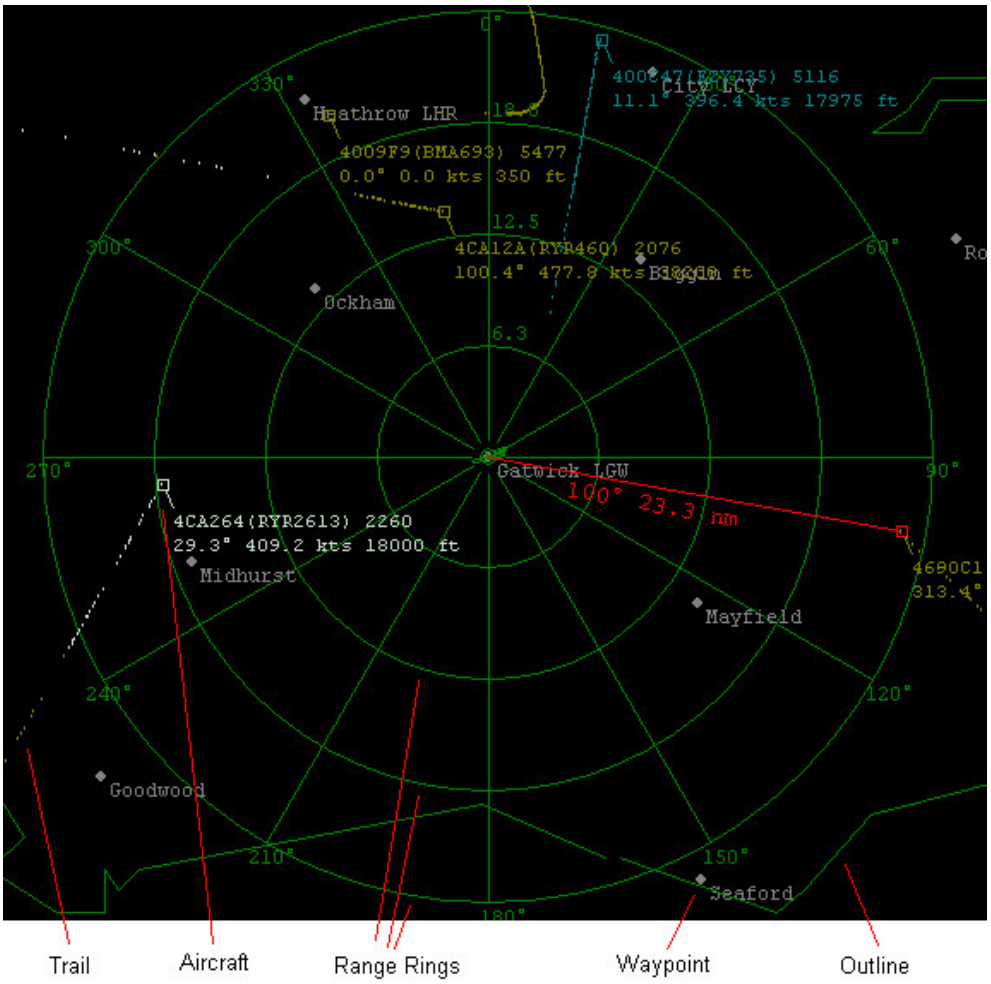


Figure 3: Radar Screen

The above example shows the screen centred on the Gatwick waypoint with a diameter of 50 nautical miles. Five aircraft can be seen on the screen, one of which, 4690C1, is shown as a red box to indicate that it is selected. Since the Display Bearing & Distance option has been enabled for this radar screen, a red line displays the bearing (100 °) and range (23.3 nautical miles) of that aircraft from the centre of the view (Gatwick).

The aircraft, and the trails indicating their past positions, are colour coded to indicate whether they are climbing, descending, or flying level. By default, these colours are:

Ascending

Descending

Level

(The way to remember it is that ascending aircraft are flying towards blue sky, descending aircraft are flying towards brown earth, and aircraft flying straight and level are somewhere in between – hence the bluey-green colour).

In our example, 400C47 (top of the screen) has been steadily climbing, 4CA12A (top middle of the screen) was flying straight and level when it entered the screen but is now descending, and 4CA264 (left middle of the screen) was descending when it entered the screen, but is now flying straight and level.

There are two other colours that aircraft can be shown as:

Aircraft that are currently on the ground are shown as grey. If we do not receive a signal from an aircraft for a set period of time (by default, this is 30 seconds) we change the colour of the aircraft to yellow. If we do not receive a signal for a further 5 seconds, then we remove it from the screen.

Main Menu

File Menu

Start Recording

This menu option brings up a file save dialog box that prompts you for the name of a file to save received data to (the default will be yyyymmdd-hhmmss.bst). Once you click on Save, all received aircraft transponder messages will be saved to the file.

Play Previous Recording

This menu option brings up a file selection dialog box that allows you to select a .bst file that you previously saved a session to. The application will then "play" the data in that file, displaying it ***instead*** of the data being received from the SBS1.

Stop Recording/Playing

This menu option is only enabled if you are either recording or playing a session. It stops the recording or playing.

Print

This menu option has two submenu options.

- Print Radar Screen:- Prints the currently selected radar screen. (If you only have one radar screen currently visible then that is the one that will be printed – but if you have split the screen then the one that is surrounded by a red box is the one that will be printed).
- Print Aircraft List:- Prints the aircraft list (the grid of data on the right-hand side of the screen).

Exit

This menu option shuts down the application.

Edit Menu

Copy Radar Screen

This menu option copies the currently selected radar screen to the Windows clipboard as a bitmap image that can then be pasted into standard Windows graphical applications.

Copy Aircraft List

This menu option copies the data in the aircraft list to the Windows clipboard in a tab delimited text form. It can then be pasted into standard word processors of spreadsheets.

Radar Menu

Zoom In

This menu option increases the "magnification" of the view on the selected radar screen, so that it shows a smaller area but in greater detail.

Zoom Out

This menu option is the opposite of Zoom In.

Pan

The four Pan sub-menu options allow you to shift the centre point of the view, up, down, left and right.

Reset

This resets the view (i.e. screen centre, zoom, and view toggles) to the default for that view.

Save Radar Screen View

This menu option allows you to save the settings of the currently selected radar screen under a name specified by yourself. Clicking on this menu option brings up the following dialogue box with the name of the saved view currently assigned to the radar screen highlighted (every radar screen has a saved view associated with it – if you have not created any saved views then it will be a view called "Default").

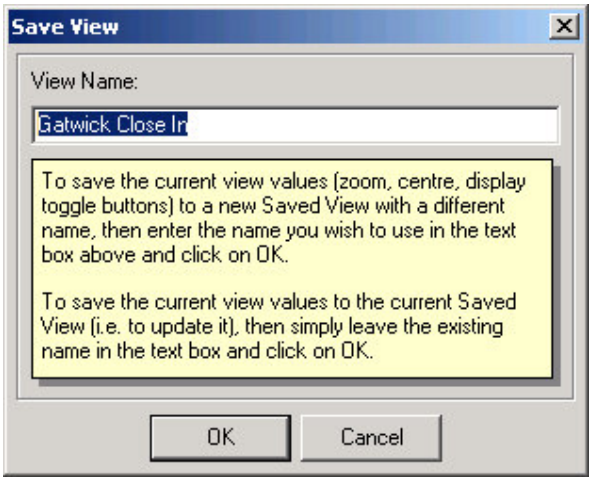


Figure 4: Save View dialog box

To update the named saved view with the current settings of the radar screen simply click on OK. To save the current settings to a new saved view – and link the radar screen to that new saved view – simply type in the name of the new view and click on OK.

The following attributes are recorded in a saved view:

- The view centre.
- The zoom diameter.
- Whether Show All Trails is enabled.
- Whether Show Bearing & Distance is enabled.
- Whether Show Waypoints is enabled.
- Whether Show Range Rings is enabled.
- Whether Show Outlines is enabled.

> It is important to understand that a view is only updated if you click on Save Radar Screen View. If you select a saved view for a radar screen and then (for example) zoom in, the saved view will still be set to the previous value. If you then shut down the application and rerun it, the application will start up with the radar screen set to that saved view, but with the zoom diameter as saved in the saved view (i.e. as it was before you zoomed in). It is done this way so that you can create a set of standard views for yourself and then quite happily zoom and pan around without fear that you will inadvertently "overwrite" your saved views.

Add Radar Screen Tab

This menu items creates an additional radar screen tab, so that you can have two radar screens active and switch between them simply by clicking on the tabs that appear at the bottom of the screen. Each tab is identified by the name of the saved view that is currently assigned to the radar screen on that tab.

Figure 5: Radar Screen tabs

☞ You can switch between tabs from the keyboard by pressing Ctrl + Alt + [Tab Number]. In the example shown in the above screenshot, you could switch to the Gatwick tab by selecting Ctrl + Alt + 1.

Remove Radar Screen Tab

This menu option removes the currently selected tab. It is disabled if you only have a single tab currently in existence.

Split Radar Screen

This splits the radar screen on the current tab into two side-by-side screens, each of which can be zoomed and panned independently and can have its own saved view.

When you have two views displayed on one tab, select between them simply by clicking inside them. The selected view will have a red border drawn around it.

If the current screen is already split, then this menu item will be called “Merge Radar Screens” and will causes the second screen to be removed.

Show Elevation

This menu item causes a separate side elevation view to be displayed below the currently selected radar screen.

If the current screen already has the elevation shown, then this menu item will be called “Hide Elevation” and will cause the elevation to be removed.

Set View Centre and Bearing

This menu option brings up a dialog box that allows you to enter in a specific latitude and longitude that you want the currently selected radar screen to be centred on. You can also set the bearing that you wish to be looking along. (By default, this is north, so the scope display has 0º at the top and the elevation runs from west to east). Setting the bearing can be useful when you want to line the elevation up with the glidepath that aircraft are following.

Centre on Waypoint

This menu option brings up a sub menu that lists your home position (the latitude and longitude you entered in as your actual position when the startup configuration wizard was running) followed by all of the waypoints. Selecting any of these will cause the currently selected radar screen to be centred on the location of that point.

Set Elevation Upper Limit

By default, the upper limit of the elevation view is 50,000 feet. This menu option brings up a dialog box that allows you to change it. This is useful if you are zooming right in on an airport, watching aircraft that are just landing or taking off, and are thus very low.

✍ Aircraft whose altitude exceed the elevation upper limit will not be displayed on the elevation view, even if they are visible on the scope.

Display All Trails

Selecting this menu option causes the trail of every aircraft on the selected radar screen to be displayed, regardless of whether or not it has a tick in the “Show Trails” column of the Aircraft List. (If you deselect it then trails will only be shown for those aircraft that do have a tick in the Show Trails column of the Aircraft List).

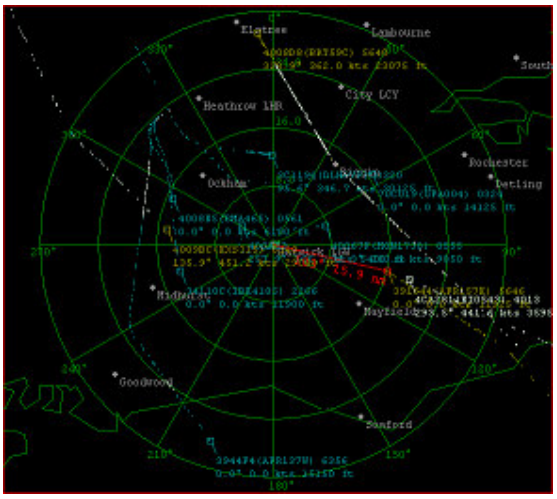


Figure 6: Display All Trails menu item/button selected/depressed

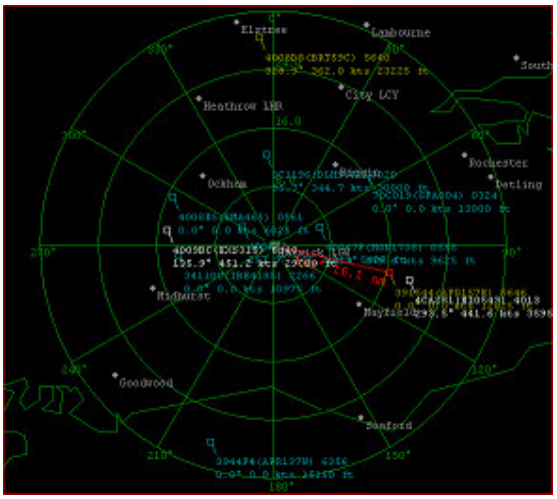


Figure 7: Display All Trails menu item/button not selected/not depressed

Display Bearing & Distance

Selecting his menu option will cause a range and bearing line to be drawn on the selected Radar Screen.

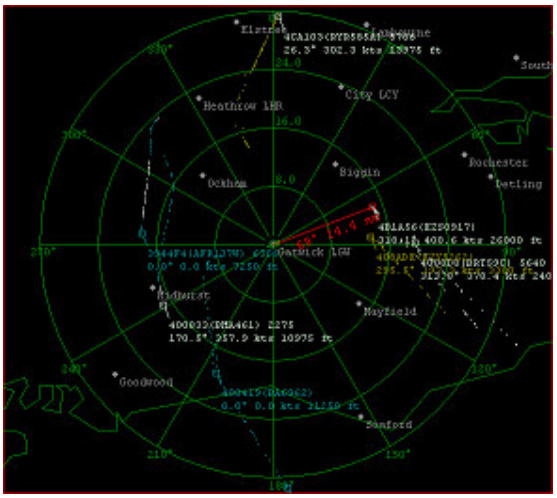


Figure 8: Display Bearing & Distance menu item/button selected/depressed

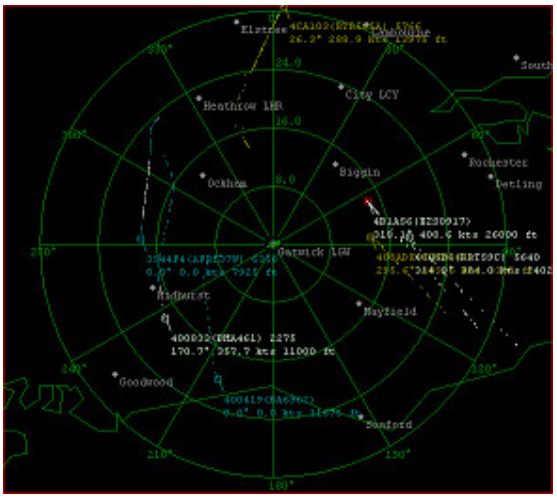


Figure 9: Display Bearing & Distance menu item/button not selected/not depressed

Display Waypoints

Selecting this menu option will cause waypoints to be displayed.

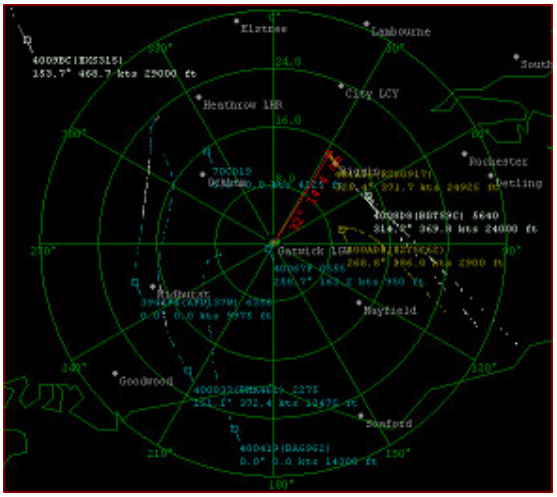


Figure 10: Display Waypoints menu item/button selected/depressed

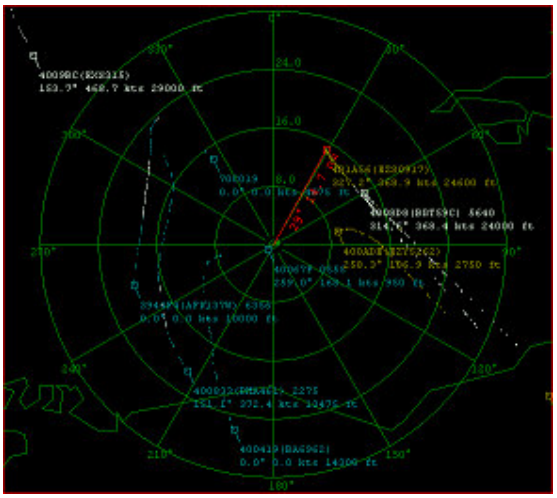


Figure 11: Display Waypoints menu item/button not selected/not depressed

Display Range Rings

Selecting this option will cause range rings to be displayed.

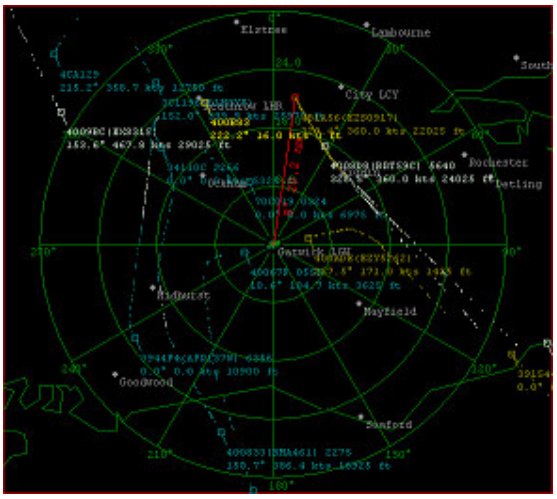


Figure 12: Display Range Rings menu item/button selected/depressed

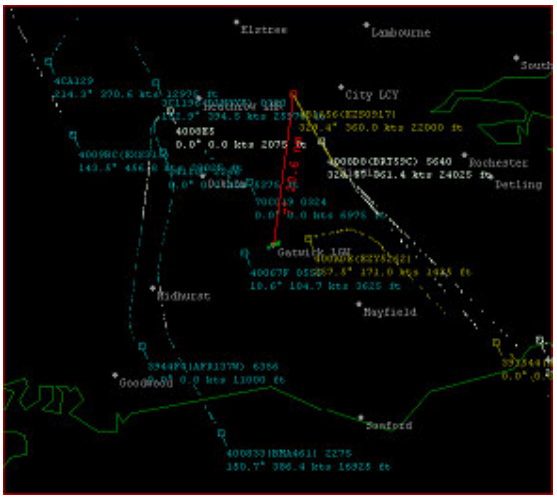


Figure 13: Display Range Rings menu item/button not selected/not depressed

Display Outlines

Selecting this option will cause outlines to be displayed:

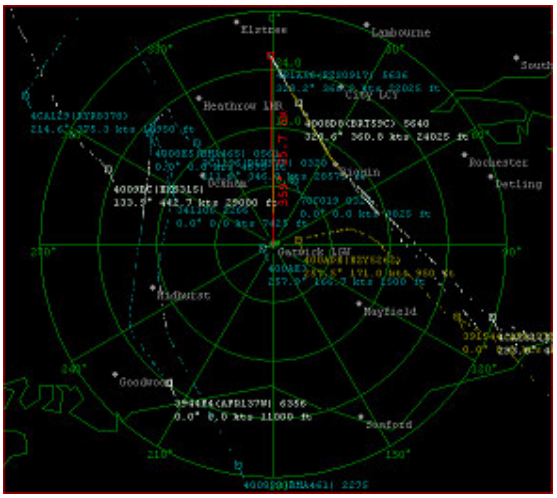


Figure 14: Display Outlines menu item/button selected/depressed

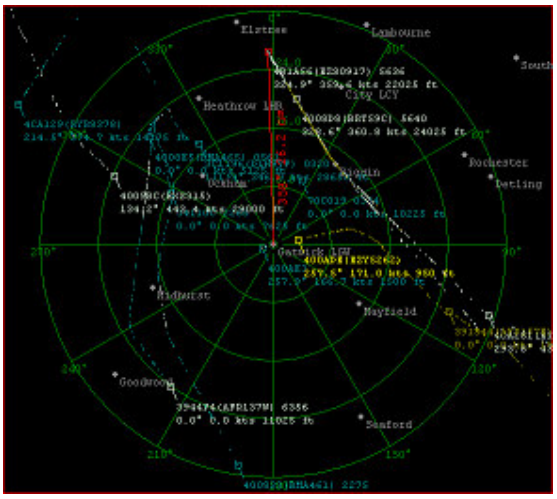


Figure 15: Display Outlines menu item/button not selected/not depressed

Aircraft Menu

Expanded All Aircraft List

This menu item duplicates the effect of the Aircraft List Expand Button. Selecting it (i.e giving it a check mark) pops the aircraft list open (see Figure 2). Clicking on it again to deselect it (i.e. take away the check mark) pops the aircraft list back to its normal extent.

Show All Aircraft (Inc. Non Position)

This causes all aircraft to be shown in the Aircraft List, regardless of whether or not we have position information for them. (By default, only aircraft that we are able to plot on the radar screen are shown in the aircraft list).

Display Full Info Window

This menu option displays a floating window that contains the details of whichever aircraft is currently selected.

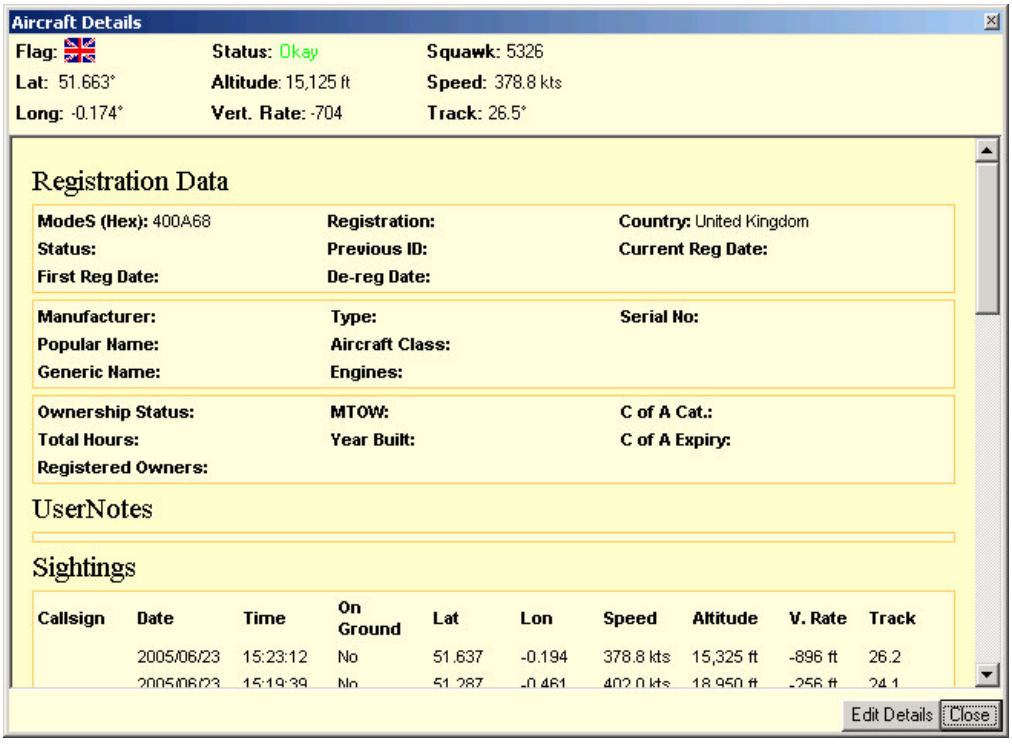


Figure 16: Aircraft Details Window

This details in this window will be updated each second. You can leave this window visible while you select other aircraft – it will always display whichever aircraft is currently selected.

☞ An easier way to display this window is simply to double-click on either the aircraft box on the Radar Screen, or on the aircraft's row in the Aircraft List.

Sort By

This menu option allows you to set which column in the Aircraft List you wish to sort on.

☞ An easier way to do this is simply to click on the heading at the top of the column in the actual list itself.

Columns

This menu option allows you to set which columns you wish to appear in the Aircraft List. By default, all columns are visible, but you can turn off those you aren't interested in.

If the menu item has a check next to it then that column is visible. Clicking on a checked item will deselect it and the hide the column. Clicking on an unchecked column will select it and restore the column.

Toggle Tracking on Selected Aircraft

The selected aircraft is the one that is highlighted in the Aircraft List (a solid blue bar) and in the Radar Screen (aircraft box drawn in red). Selecting this menu item will set the aircraft to be tracked (have it's trail shown) if it was not already set, or sets it to not be tracked if it was previously set.

Aircraft that are set to be tracked have a tick in the show trail column in the Aircraft List. The value of that column is overridden if the Display All Tracks menu option/button is set.

Centre on Selected Aircraft

This centres the radar screen on the current position of selected aircraft. (Note, the Radar Screen will then stay fixed on that particular point, not the aircraft itself).

☞ This option is useful if an interesting looking aircraft has appeared on your Aircraft List, but is not visible on the Radar Screen. Rather than zoom and pan around looking for it, you can simply centre on it.

Caption Position

The four items on this submenu (Top Left, Top Right, Bottom Left and Bottom Right) allow you to set the radar screen caption for the selected aircraft to a different position (relative to the aircraft). This is chiefly for use when two aircraft are flying close to each other and their captions are overlapping.

Settings Menu

Display Settings

This menu option brings up the Display Settings dialog box:

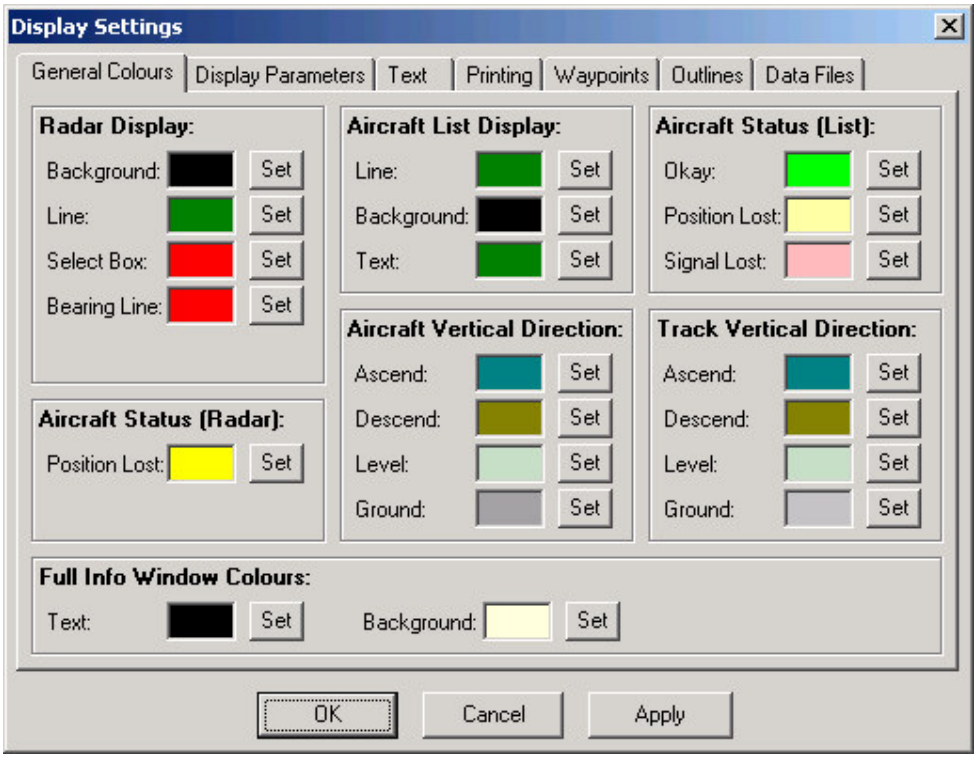


Figure 17: The Display Settings dialog box (General Colours tab)

The settings on this tab concern the colours used by the application. If you want to experiment with colours, then clicking the Apply button saves the updated colours – which will cause the application to start using those colours – without exiting the dialog box.

Radar Display: These set the colours used on the Radar Screen.

Line is the colour used in the Range Rings (and the horizontal lines in the Elevation view) as well as the text associated with the Range Rings.

Select Box is the colour used both for the box around a selected Radar Screen as well as the colour used to display a selected aircraft.

Bearing Line is the colour used to display the bearing and range line for the selected aircraft.

Aircraft List Display: These set the colours used in the Aircraft List.

Aircraft Status (Radar): Position Lost sets which colour aircraft on the radar screen are shown if they have a status of position lost. (For an explanation of aircraft statues, see Data Settings).

Aircraft Status (List): Okay, Position Lost and Signal Lost relate to which colour the aircraft symbol in the first column is painted. (For an explanation of aircraft statues, see Data Settings).

Aircraft Vertical Direction: These set the colours used on aircraft on the Radar Screen.

Aircraft (this includes the box representing the location of the aircraft, the information text, and the line connecting the two) are coloured according to whether they are ascending, descending, flying level, or on the ground. However, if we don't receive a signal for the Position Lost timeout period (by default, this is 30 seconds) the aircraft turns to the colour set by the Position Lost setting – regardless of whether it was ascending, descending, level, or on the ground.

Track Vertical Direction: These are similar to the aircraft colours, except there is no position lost colour. This is because each dot in the track represents a time when we received a message, so we knew what the position was then.

Full Info Window Colours: These set the colours of the Full Info Window.

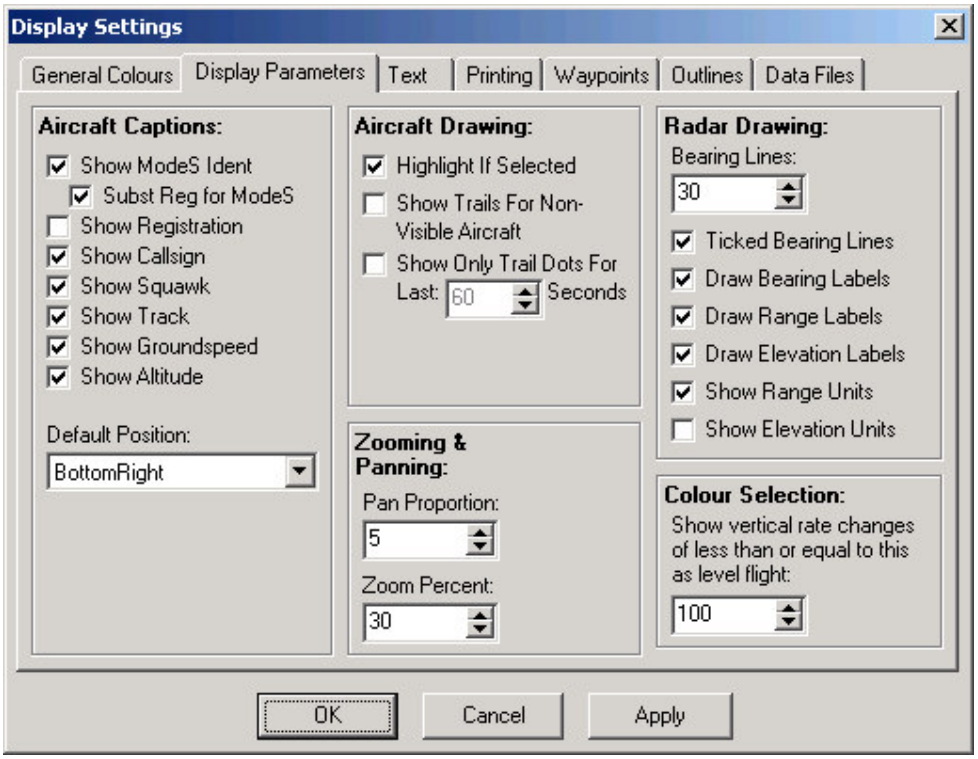


Figure 18: The Display Settings dialog box (Display Parameters tab)

Aircraft Captions: These set which bits of information get written beside each aircraft on the radar screen.

Subst Reg for ModeS is a special case that can be used where *Show ModeS Ident* is also checked. If checked, then the aircraft's radar screen caption will show the ModeS code where it does not have a registration for that aircraft, but the registration instead where it does. (Which means that if you have this option checked, you should uncheck *Show Registration*).

Default Position sets where the caption will, by default, be drawn on the radar screen relative to the aircraft.

Aircraft Drawing: *Highlight If Selected* sets whether the aircraft that is currently selected (this is also shown by a blue highlight bar in the Aircraft List) should be highlighted on the Radar Screen by being drawn as a red box (rather than whichever colour would indicate its ascending/descending/level/ground status).

Show Trails For Non Visible Aircraft sets whether or not we display trails for aircraft that are no longer visible. By default, if an aircraft disappears from the screen, either by flying off the edge, or by failing to send out a message for a (default) 35 seconds, then the trail is removed from the screen also (and will only reappear if the aircraft itself reappears). However, if you check this setting, then the trail will continue to be shown until the aircraft is removed from the aircraft list (which by default happens if we don't receive a message for a further 5 minutes).

Show Only Trail Dots For Last x Seconds allows you to set the system to now show the complete trail of an aircraft, but instead show only the most recent portion of the trail. (Note:- this only applies if the aircraft is set to have its trail drawn).

Radar Drawing: *Bearing Lines* shows how many segments ("pies") the radar display will be divided into by the range rings. The minimum is four, which gives four quadrants. If *Ticked Bearing Lines* is checked then small ticks are drawn instead of the radial lines.

Zooming & Panning: These parameters related to how far the screen moves sideways while panning (decreasing the number will increase how far you pan), and by which percentage of the existing view you zoom in and out when zooming in and out.

Colour Selection: Aircraft flying notionally level sometimes make slight up and down movements. To avoid ending up with "rainbow coloured trails" we – for the purpose of deciding which colour to use for dots in the trail only – ignore changes of less than this amount.

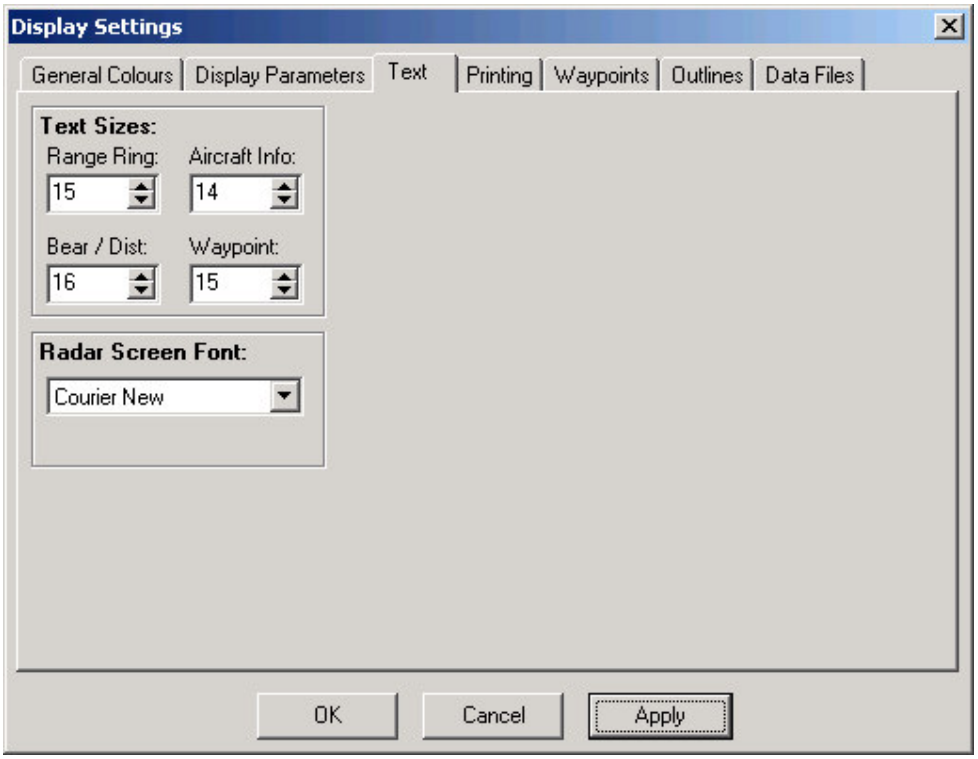


Figure 19: The Display Settings dialog box (Text tab)

Text Sizes: These set the size of the text that is written to the radar screen.

Radar Screen Font: This is which font is used to draw the text on the radar screen.

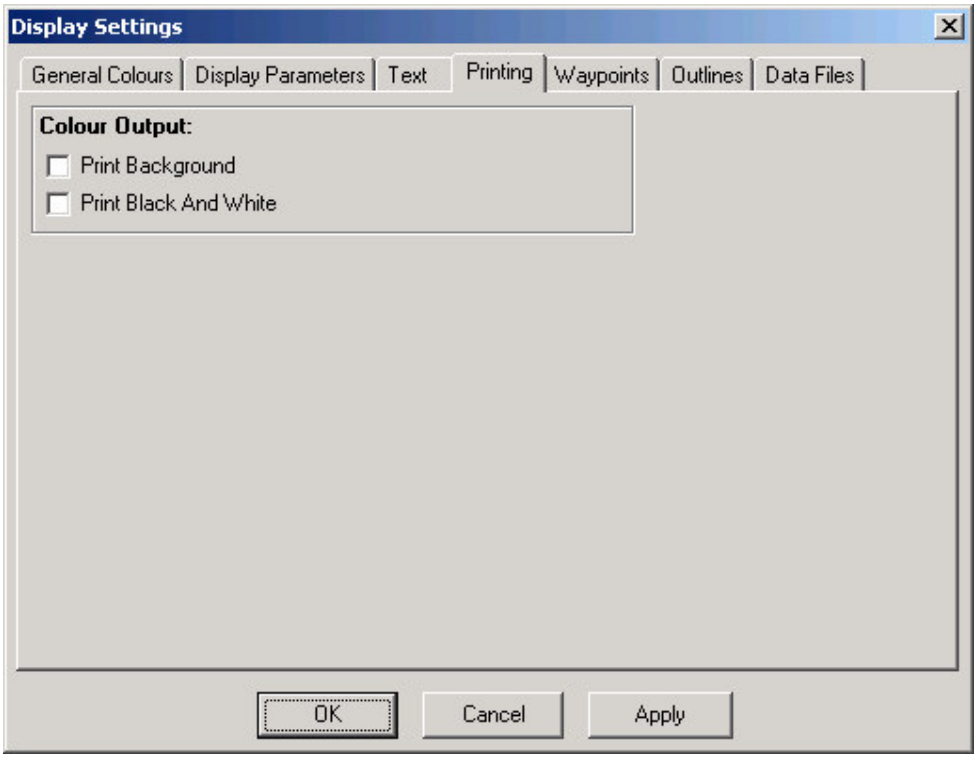


Figure 20: The Display Settings dialog box (Printing tab)

Print Background sets whether or not the background (which by default is black) is printed when you print the radar screen.

Print Black and White sets whether or not the radar screen is printed in colour or black and white.

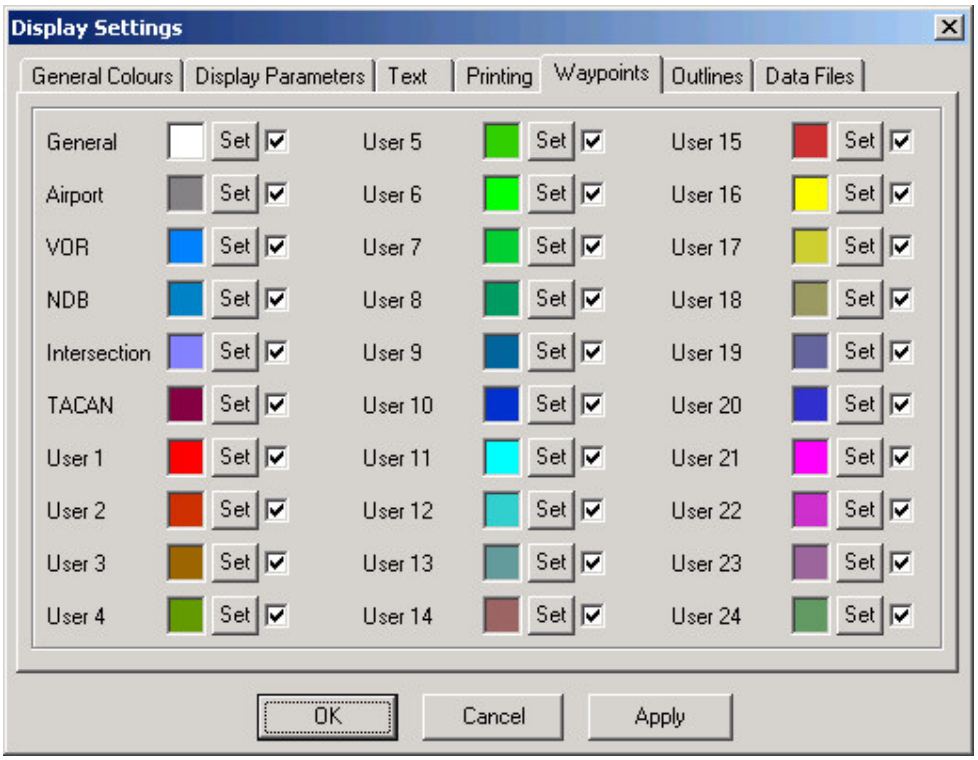


Figure 21: The Display Settings dialog box (Waypoints tab)

This tab allows you to set the colours used for each type of waypoint. It also allows you to select which types of waypoints you wish to be visible (check the checkbox to make them visible, uncheck it to hide them).

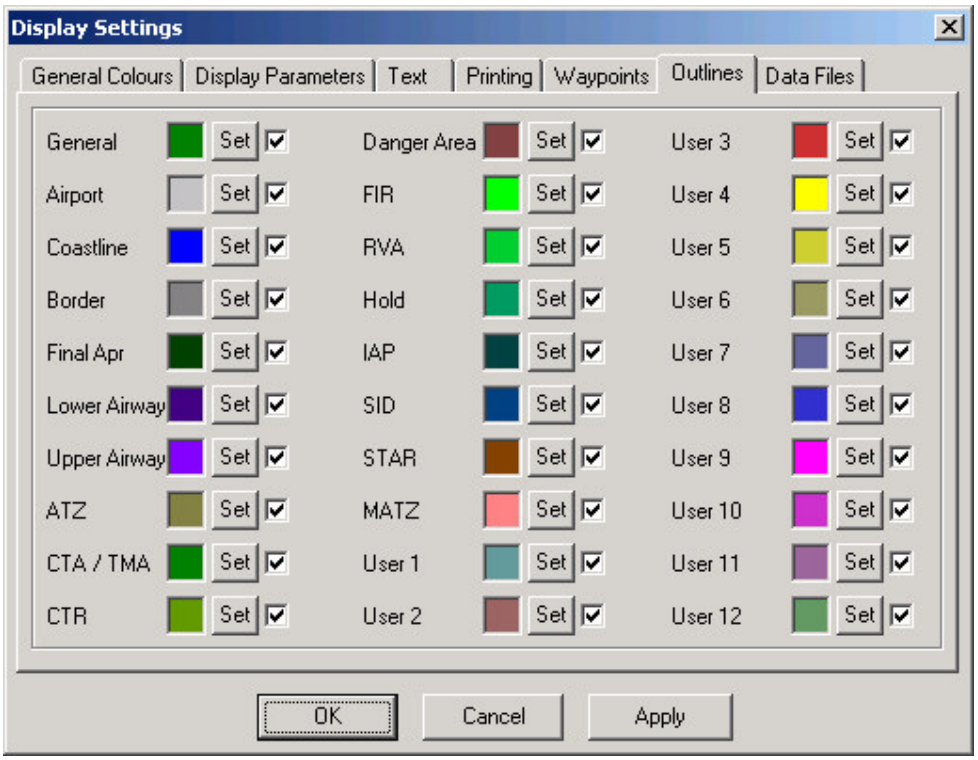


Figure 22: The Display Settings dialog box (Outlines tab)

This tab allows you to set the colours used for each type of outline. It also allows you to select which types of outlines you wish to be visible (check the checkbox to make them visible, uncheck it to hide them).

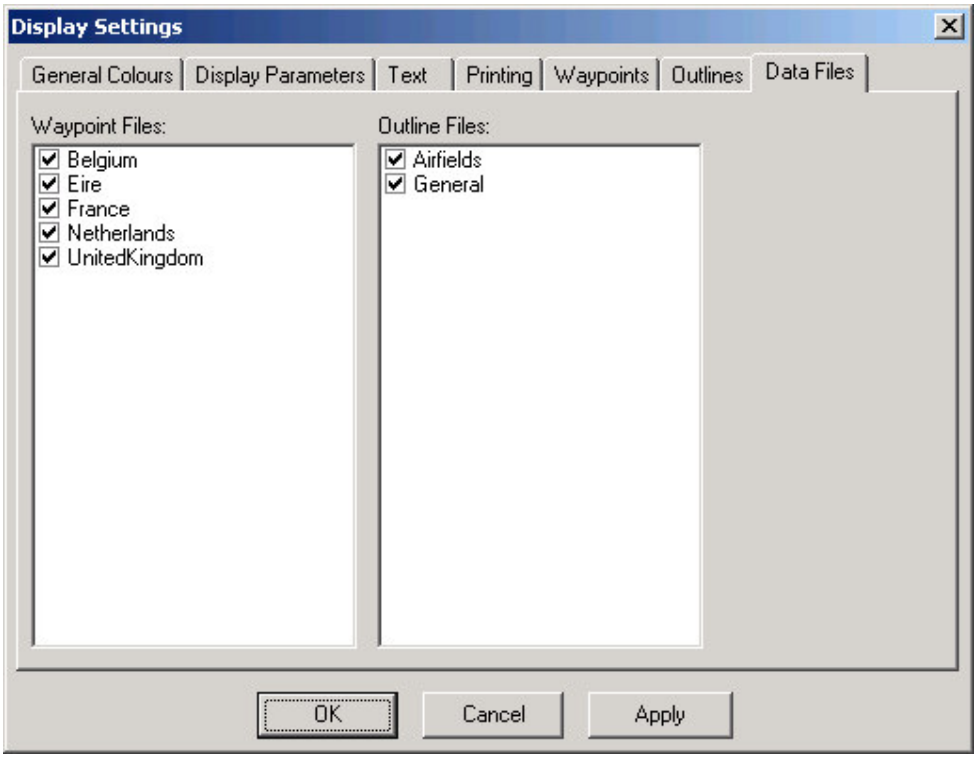


Figure 23: The Display Settings dialog box (Data Files tab)

This tab displays the outline and waypoints files that are in your \Outlines and \Waypoints directories respectively, and allows you to opt to not load specific files.

To stop a file being loaded, simply uncheck the checkbox next to its name. When you click on OK or Apply, the system will purge and reload the waypoint or outline lists, loading only those files you have set to be loaded.

Data Settings

This menu option brings up the Data Settings dialog box:

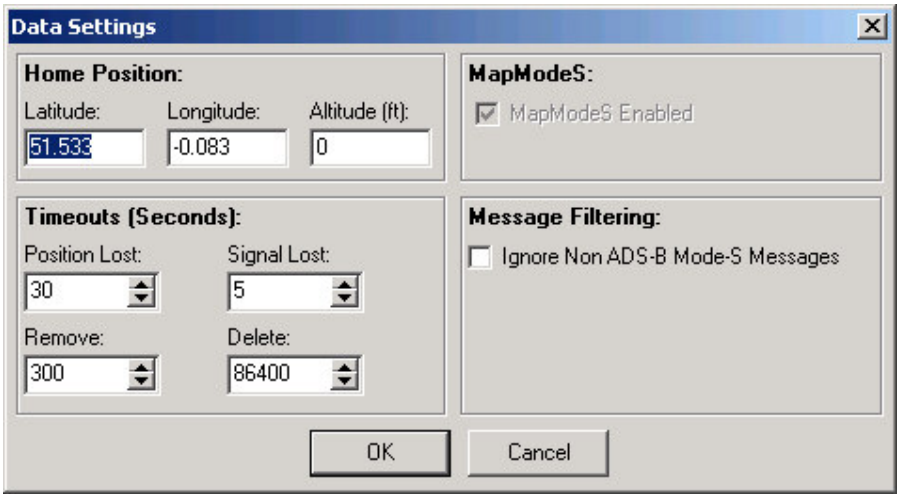


Figure 24: The Data Settings dialog box

Home Position: This is the latitude and longitude of your location. We need to know your approximate location in order to decode the messages that you receive. The altitude is only necessary if your SBS-1 is a barometer equipped model and you have turned Correct Altitudes For Pressure on.

Message Filtering: Many

By default BaseStation receives and processes both ADS-B and non-ADS-B Mode-S messages. However, you can turn off the processing of non-ADS-B messages by checking the Ignore Non ADS-B Mode_S Messages checkbox.

Timeouts (Seconds): These parameters dictate how the application responds when it stops receiving messages from an aircraft. After Position Lost seconds has elapsed since the last message is received, the aircraft changes to a state of “position lost” and is shown as yellow (by default) on both the Radar Screen and in the Aircraft List. If a further Signal Lost seconds elapse without receiving a message, the aircraft changes to a state of “signal lost” and is removed from the Radar Screen and shown as red in the Aircraft List. If a further Remove seconds elapses without receiving a message then we remove the aircraft from the Aircraft List. Finally, when a further Delete seconds have elapsed, we purge its data from memory.

MapModeS: The MapModeS Enabled checkbox (which is initially unchecked) enables the use of the MapModeS network. If checked, then the previously hidden MapModeS menu item will be made visible. If unchecked, the menu item will be hidden. (Note: If this checkbox is greyed out, then this means that the MapModeS network is not currently available).

> ✍ You will not be able to use the MapModeS network until you have gone to the website and registered, using the serial number of your SBS-1 (to get this click on the Help->About menu item to view the About Dialog).

Hardware Settings

This menu option brings up the Hardware Settings dialog box:

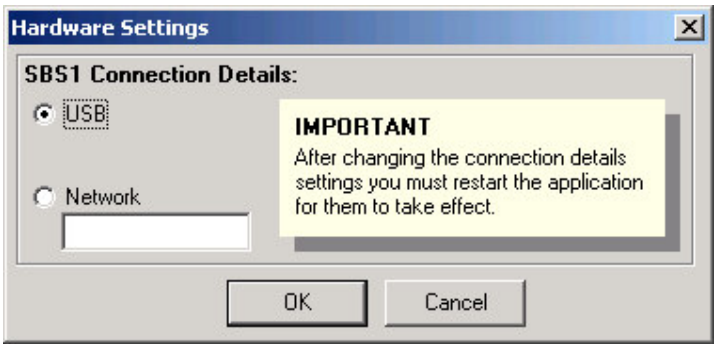


Figure 25: The Hardware Settings dialog box

This dialog box should only be used if you change the way you are connecting to your SBS-1, such as if you change from USB to connecting via a network hub.

Toolbars

This submenu allows you to hide or show individual parts of the toolbar.

Status Bar

This menu option allows you to hide or show the status bar.

Sidebar

This menu option allows you to hide or show the sidebar.

Help Menu

Reference Manual

This menu option displays the PDF reference manual.

Release Notes

This menu option displays the release notes.

BaseStation Websites

This submenu can launch (in your default browser) various BaseStation related web sites that can be used to get help and information about the BaseStation and SBS-1 products.

User Websites

This submenu can launch websites that are not connected with the BaseStation system but that we think might be of interest to users.

About BaseStation

This menu option launches an About dialog box that displays the version number of your BaseStation software and other information.

Aircraft List

What It Shows

The Aircraft List has an entry for each aircraft that we are currently receiving messages from.

The **status** column shows the transmission status of the aircraft by means of colour-coded symbols. Green indicates that we are receiving transmissions. Yellow indicates that more than 30 seconds have gone by without us receiving a transmission. Red indicates that 35 seconds have gone by without us receiving a transmission.

If the symbol is an aircraft (✈) then it indicates that we are receiving ADS-B messages from this plane that contain latitude and longitude data.

If the symbol is a solid circle (●) then this indicates that we are receiving ADS-B messages from the plane, but that they do not contain latitude and longitude data.

If the symbol is four diamonds (❖) then this indicates that we are receiving only Mode-S messages from the aircraft (but no ADS-B messages).

The **state** column uses colour coded arrows to indicate whether the aircraft is ascending (upward pointing thick blue arrow), flying straight and level (level pointing thick blue-green arrow), descending (downward pointing thick brown arrow), or on the ground (level pointing thin grey arrow).

The **show trail** column indicates whether or not the aircraft is being individually tracked. A tick indicates that it is.

The **squawk** column shows the squawk code, if any, that the aircraft is transmitting. Under certain circumstances, the squawk code will be displayed with a symbol after it. The possible symbols are:

* (Ident): Transmitted when the pilot presses the "Ident" button in response to a request from Air Traffic Control. Normally transmitted for 18 seconds.

+ (Alert): Transmitted when the squawk code changes (usually for 18 seconds).

E (Emergency): Indicates that the squawk is one of a set number of codes defined to indicate an emergency. These include 7700 (emergency condition), 7600 (radio failure) and 7500 (unlawful interference).

The **last update** and **time tracked** columns display the time that the last message was received for that aircraft and the time that has elapsed since the first message was received.

The remaining columns simply display the data received from the aircraft.

Initially, the Aircraft List is sorted on **last update**. This means that as new aircraft appear, their rows are inserted in at the top, with the existing rows shuffling down.

Using It

To select an aircraft, simply click on that aircraft's row. You can move the selection up and down by using the arrow keys.

To sort on a different column, simply click on that column's heading.

You can toggle the "show track" status of the currently selected aircraft with the space bar.

And double-clicking on the Aircraft List will bring up the Aircraft Details window. Once that is visible, it will display the details of whichever aircraft is selected.

Finally, right-clicking on the Aircraft List will display a pop-up menu containing the menu options that particularly apply to the Aircraft List.

The Show All button determines which aircraft are shown on the aircraft. It duplicates the functionality of the **Show All Aircraft (Inc. Non Position)** menu item (see the description of that item for details).

Customising It

You can change the width of columns by simply moving the pointer to the “groove” between column headings and then dragging (holding down the mouse button and moving the mouse) the column heading to be wider or narrower.

You can opt to hide certain columns using the Columns submenu of the Aircraft menu.

Toolbar

Most of the items on the toolbar are duplicates of commonly used menu items, and are described in the section above. However, there are three items that are unique to the toolbar, and are described in this section.

Zoom Diameter Selector

Popping this down offers a range of specific zoom diameters (the width, in miles, of the real-world area covered by the radar scope range rings) to set the current view to. You can also type in a specific number.

Zoom Diameter Slider

This offers an alternative way to zoom in and out. Simply slide to the left to zoom in, and to the right to zoom out.

Saved View Selector

This allows you to select a previously saved view to apply to the current view. The current view (zoom diameter, zoom centre and display toggle settings) will change to the settings saved in the saved view.

Sidebar

The sidebar offers duplicates of some of the controls in the main toolbar, plus one unique control: the Full Screen button.

Clicking on the Full Screen button puts the application into full screen mode. In this mode, the application occupies the entire screen (including the area where the taskbar would normally be) and all controls except for the sidebar and the radar screen are hidden (i.e. no menu, no toolbar, no status bar and no aircraft list).

This mode is ideal if you want to concentrate on the Radar Screen alone without any distractions.

To get out of full screen mode, simply click on the Full Screen button again.

Using The MapModeS Network

Enabling

In order to use the MapModeS network, you must first enable it, which involves first registering on the website, and then clicking on the MapModeS Enabled checkbox in the Data Settings dialog box.

For full details on how to do this, go to the section for the Data Settings dialog box.

Switching On And Off

When you first start the application up, it will not be using the MapModeS network. To activate use of the network, click on the MapModeS->Connect menu item (this menu will be hidden until you have enabled MapModeS).

Once you are connected, the Connect menu item will change to a Disconnect menu item.

While connected, your system will display data coming from the MapModeS network (which will include the data coming from your SBS-1 box).

To disconnect from the network (and return to simply viewing your local data) click on the MapModeS->Disconnect menu item.

Kinetic House : 44 Hatton Garden • London • EC1N 8ER T: +44 (0)207 404 1914 F: +44 (0)207 404 1916
Elstree Aerodrome : Borehamwood • Hertfordshire • WD6 3AR T: +44 (0)208 953 8855

DECLARATION OF CONFORMITY

(According to ISO/IEC Guide 22 And EN45014)

We, Kinetic Avionic Products Limited, Kinetic House, 44 Hatton Garden, London, EC1N 8ER, United Kingdom

declare that the following product:

SBS-1 Real-Time Virtual Radar

is in conformity with the provisions of the following European Directives:

Council Directive 89/336/EEC, as amended by 91/263/EEC, 92/31/EEC, 93/68/EEC, 93/97/EEC and 98/13/EC

Council Directive 73/23/EEC, as amended by 93/68/EEC

And the following standards:

EN55022:1994 + A1:1995 + A2:1997
EN55024:1998 + A1:2001
EN61000-3-2:2000
EN61000-3-3:1995 + A1:2001
FCC Part 15, Class A

Done London, United Kingdom, on 25th August 2005

Mark Maurice
Product Manager

Kinetic Avionic Products Ltd. – Palladium House, 1-4 Argyll Street, London W1F 7LD Registered in England No: 3316717