



# StarbaseMini Version 1.0.0

## Manual

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# 1 Introduction

Thank you for downloading *StarbaseMini*. *StarbaseMini* is an instrument control application for use with use with hardware-compliant with the British Astronomical Association (BAA) Radio Astronomy Group (RAG) Staribus Protocol. *StarbaseMini* is not a data logger and requires additional controller hardware to be useful.

Controller hardware can be obtained direct from the United Kingdom Radio Astronomy Association (UKRAA):

<http://www.ukraa.com/store/controller>

or you can using the *StarinetPythonLogger* software for the Beaglebone Black, provided by the author and obtainable from:

<https://github.com/mhorn71/StarinetPythonLogger/releases>

*StarbaseMini* is a simplified form of the *Starbase* Observatory software written by Dr Laurence Newell and provided by the United Kingdom Radio Astronomy Association (UKRAA) – the trading arm of the British Astronomical Association (BAA) Radio Astronomy Group (RAG).

<http://www.ukraa.com/starbase>

The author would like to thank the following people of their assistance during the development of this software: Laurence Newell, Alan Melia, David Farn, Martin Richmond-Hardy and Norman Pomfrett.

## 1.1 License

*StarbaseMini* *Staribus/Starinet Client* for the British Astronomical Association Staribus Protocol  
Copyright © 2015 Mark Horn

*StarbaseMini* is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 2 of the License, or (at your option) any later version.

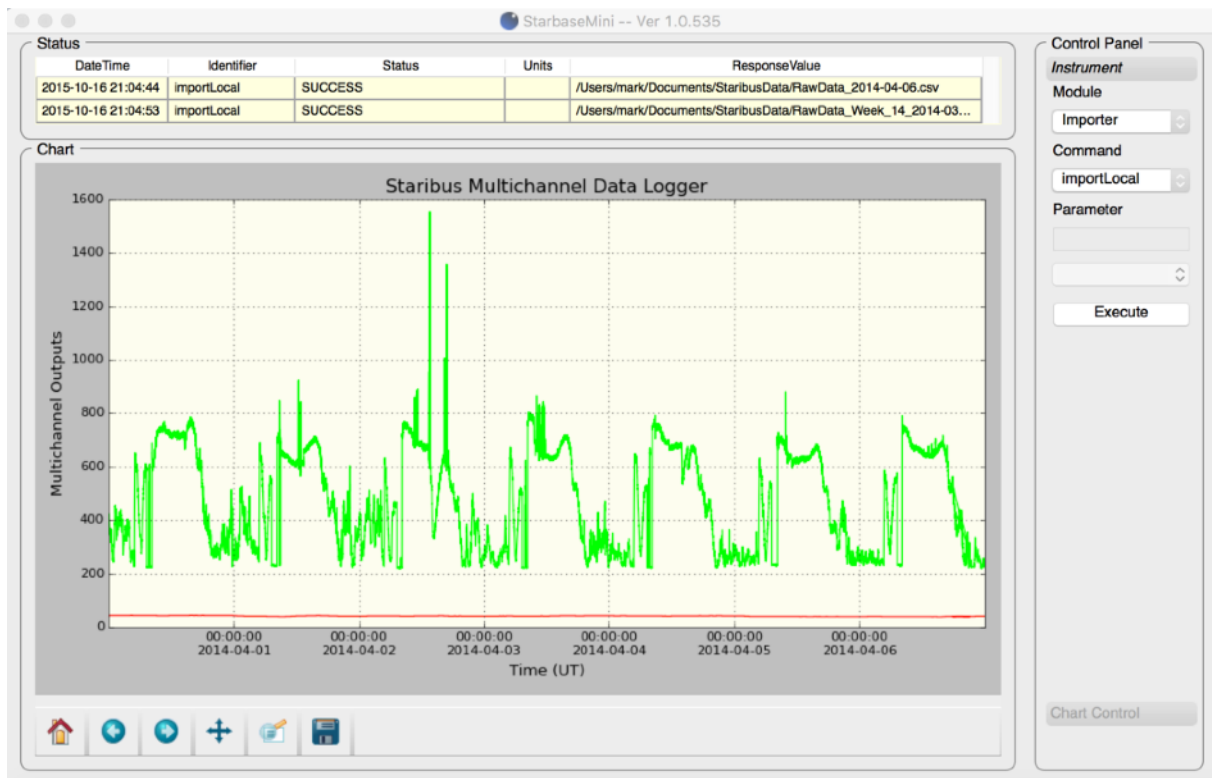
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<http://www.gnu.org/licenses/>.

## 2 Overview

StarbaseMini is an application to control and display data from radio astronomy equipment in conjunction with either an RS232 or Ethernet controller, it doesn't, however, support RS485, unlike Starbase. The main design considerations were for a simple user interface and application configuration. The software is simpler to configure compared with Starbase (upon which it is based) but doesn't require the user to understand XML to configure it. Figure 1 shows the main application window.



**Figure 1: Main application window**

Its main limitations are:

- only supporting one parameter with a command not multiple parameters,
- the ability to control a single instrument at anyone time unless a configuration change is made and the application restarted, and
- not aware of timezones.

Configuration is done via the configuration tool located under **File** in the menu bar in Windows or, for Mac OS X, via the application Preferences. The configuration window is shown in Figure 2.

The tool also has the ability to update the Observatory and Observer metadata that is saved with exported data. The Observatory metadata panel is shown in Figure 3.

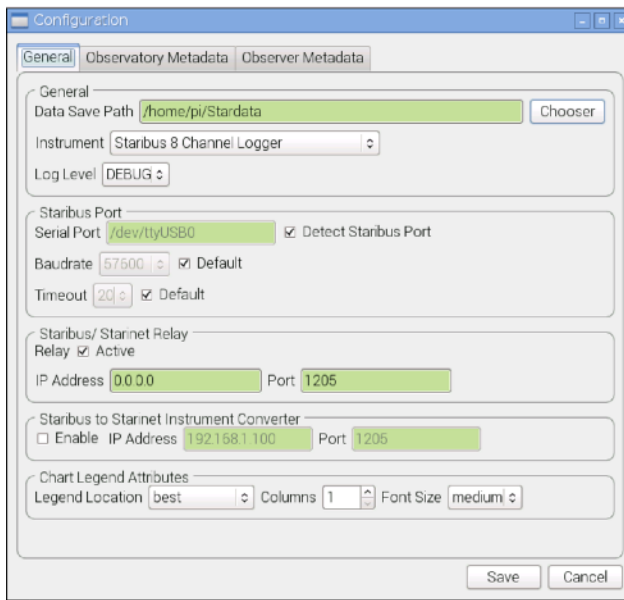


Figure 2: Configuration - General

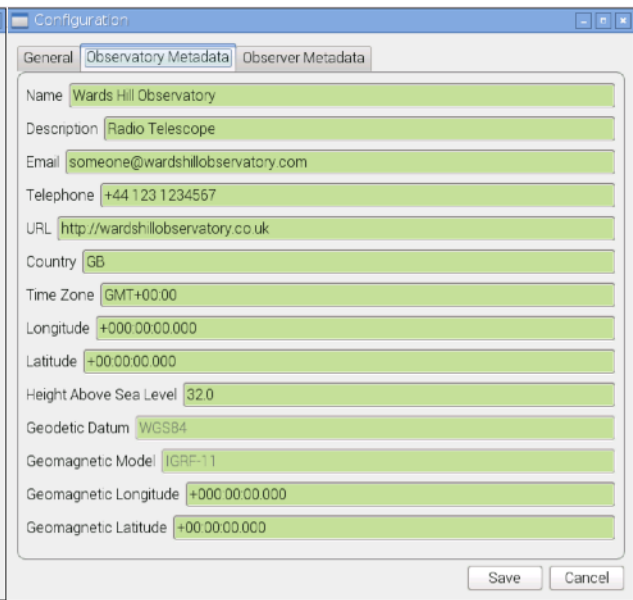


Figure 3: Observatory meta data

### 3 Installation

*StarbaseMini* can be installed as precompiled application for Windows 7 or greater, Linux and Mac OS X. It requires a screen resolution of 1024 x 768. The software can also be installed from source but is beyond the scope of this document.

Download the version required from:

<http://some.com/download/>

When the software is first run it may take a while to load. This is because it is generating the applications configuration files and setting up the logging area.

#### 3.1 Windows 7 or above

Please beware that some antivirus software will report the application as being a virus – this obviously isn't true and is just the antivirus software being overly zealous. Once you have downloaded the software, run the executable which will install the software to 'Program File' and install menu shortcuts. You can also install a shortcut to the desktop if you so wish.

#### 3.2 Mac OSX

Uncompress the zip file and drag the application to 'Applications' in the Finder window.

#### 3.3 Linux

Uncompress the tgz file using tar,

```
tar -zxvf StarbaseMini-Linux*.tgz
```

To run the software

```
./StarbaseMini
```

You can add a shortcut for the software by adding a file called *starbasemini.desktop* in *\$HOME/.local/share/application/* with the following contents. Also adjust the Path, Exec and Icon paths to suit where you installed the software.

```
[Desktop Entry]
Name=StarbaseMini
Comment=StarbaseMini
Path=/usr/local/StarbaseMini-Linux-armv6l_Ver_1_0_535/
Exec=/usr/local/StarbaseMini-Linux-armv6l_Ver_1_0_535/StarbaseMini
```

```
Icon=/usr/local/StarbaseMini-Linux-armv6l_Ver_1_0_535/images/
starbase.png
Terminal=false
MultipleArgs=false
Type=Application
Categories=Other;
StartupNotify=false
```

## 4 Application Configuration

When changes are made to the application configuration, a restart is required. The configuration tool consists of three tabbed panes General, Observatory Metadata and Observer Metadata.

### 4.1 General Panel

The general application configuration is split into five sections,

- General,
- Staribus Port,
- Staribus / Starinet Relay,
- Staribus to Starinet Instrument Converter, and
- Chart Legend Attributes.

Here we'll go through each section, starting with **General**. All changes made in the **General** panel require you to restart the application for the changes to take affect, except for the 'Chart Legend Attributes'.

#### 4.1.1 General

The general configuration section has three parts:

- **Data Save Path**,
- **Instrument** and
- **Log Level**

The **Data Save Path** is path into which you wish save exported data. If the 'Data Save Path' isn't set the application will default to using the users Home folder.

**Instrument** is the current instrument for which the application is configured. If the instrument is to be used only as method of reading exported Starbase data, set this to one of the Starinet instruments, otherwise the control panel will be disabled.

The **Log Level** can be set to either 'INFO' or 'DEBUG'. The application will auto-rotate the log file once its size reaches approximately 1.5MB and will keep a maximum of 6 log files. Log files are located in the user's Home directory in the folder `.starbasemini`. This folder is hidden on Linux and Mac OS X platforms – note the prefix `<.>`.

#### 4.1.2 Staribus Port

Serial port has four parts:

- **Serial Port**,
- **Detect Serial Port**,
- **BaudRate**, and
- **Timeout**.

To set the Serial, uncheck **Detect Serial Port** and set your serial port in the **Serial Port** line edit box. For Windows this would be, for example, 'COM1' or, for Linux and Mac OS X, the serial port including path for example `/dev/ttyS0`

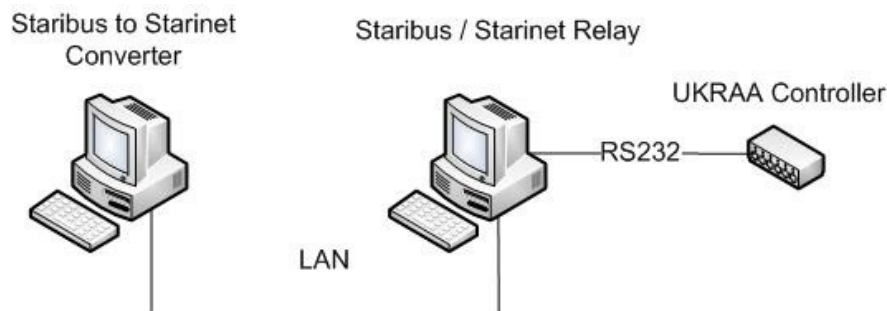
If you have a Staribus instrument attached to a local serial port you can leave **Detect Serial Port** checked. In this instance the software will attempt to auto detect the serial port to which the instrument is attached. Please note, however, that the correct instrument must be selected within the application configuration for this to work. This feature is handy if you use a USB-to-Serial Port adaptor where the serial port can change depending on which USB port the adaptor is plugged into.

The UKRAA controller can be configured to use a different Baud rates (not described here) rather than the default Baud rate as supplied by UKRAA. You can set the application Baud rate to match here or leave default checked for the standard baud rate as set by UKRAA. [Does this now make sense, Martin]

The Staribus port timeout is set to 20 seconds as default. This can be increased if you experience application timeouts. Please note that this timeout is also used for all application commands, not just the Staribus port.

#### 4.1.3 Staribus / Starinet Relay

*StarbaseMini* has the ability to act as a relay between an Ethernet interface and a serial port. The purpose of this is to allow you to connect to a remote UKRAA controller via a Local Area Network.

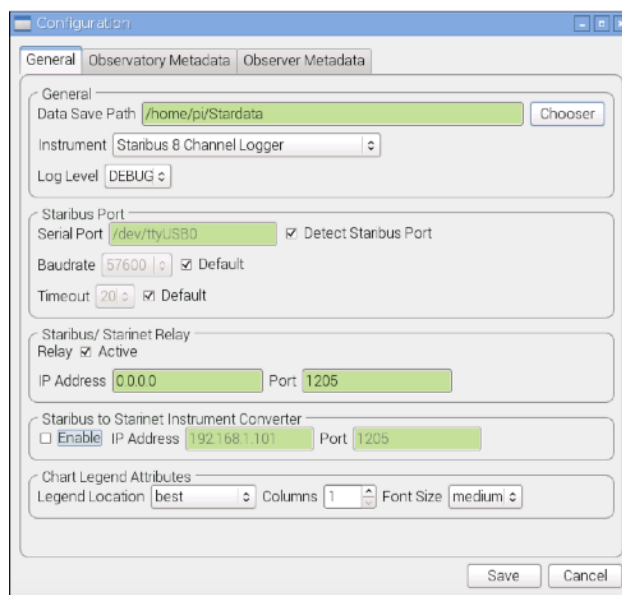
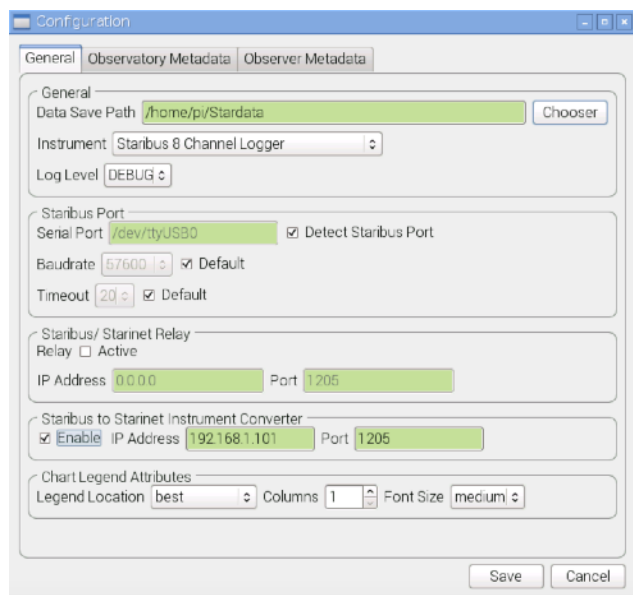


On the machine that has the UKRAA controller attached, enable the relay via the check box. If you have more than one interface you can set the IP address of the Ethernet interface to which you wish to connect from your remote machine, otherwise leave the IP set to 0.0.0.0 which will bind to the first available Ethernet interface. The relay also has the ability to change to the default port on which it listens for Starinet UDP packets. This is handy when you have multiple RS232 controller instruments attached to a single server such as the RPi where you can run multiple instances of *StarbaseMini*.

#### 4.1.4 Staribus To Starinet Converter

To use the relay mentioned above you need to use *StarbaseMini* as a Starinet client, to accomplish this you need to set the Staribus instrument in the 'General' section and then enable the 'Staribus to Starinet Converter' by checking the check box. Now set the IP address of the remote host running the relay making sure both the client and relay are using the same port.

Figure 4 shows an example configuration for the client and Figure 5 shows the configuration of the relay.



**Figure 4: Example configuration for the client**      **Figure 5: Configuration of the relay**

Please note: if you have both the relay and client checked, by default the application will start as a relay.

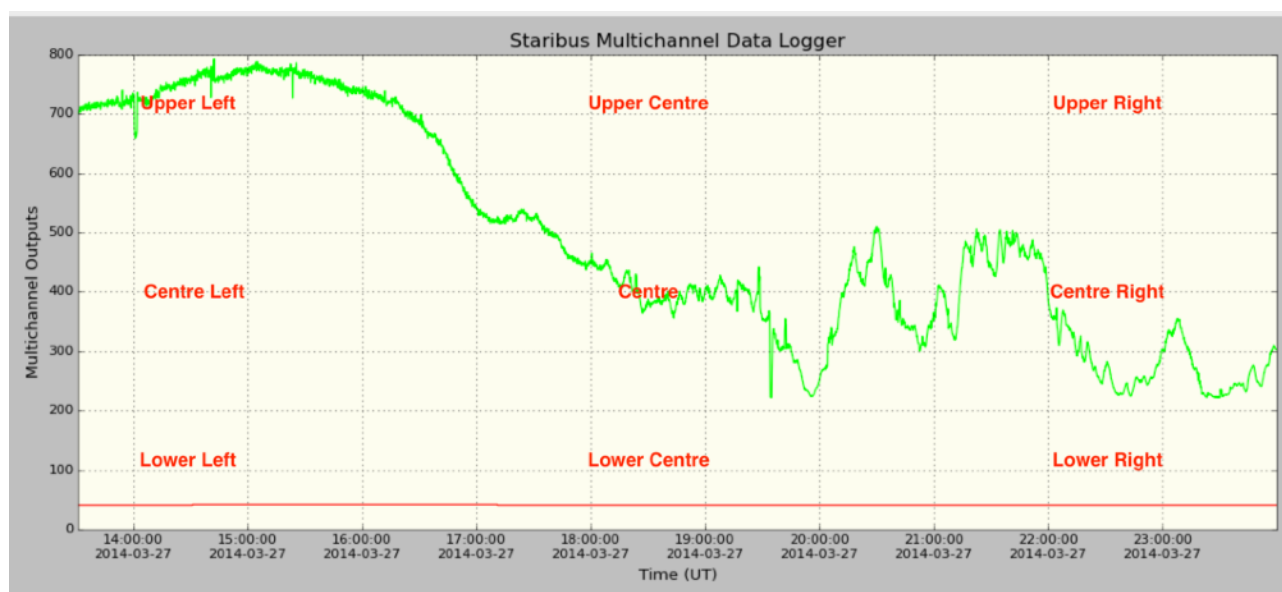
#### 4.1.5 Chart Legend Attributes

Using the chart legend attributes you can set the location of the legend, columns and font size. As shown in Figure 6, you can select one of the following locations:

upper left	upper centre	upper right
centre left	centre	centre right
lower left	lower centre	lower right

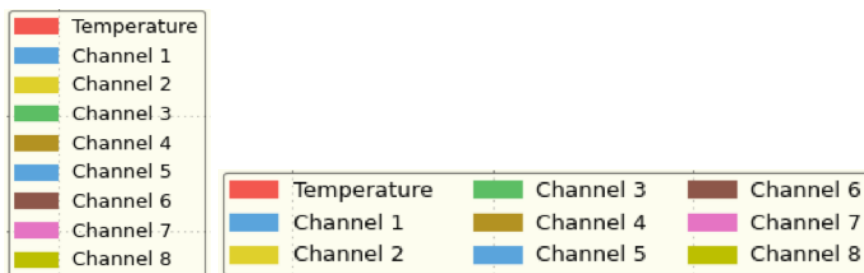
The best option will attempt to locate the legend in the most unobtrusive position possible.

Please note: the legend attributes can be modified without restarting the application, despite what the status window reports upon closing the configuration tool.



**Figure 6: Legend locations**

Using the **columns** attribute, you can adjust the layout of the legend handles up to a maximum of six columns. Figure 7 shows a single column layout and Figure 8 three columns.



**Figure 7**

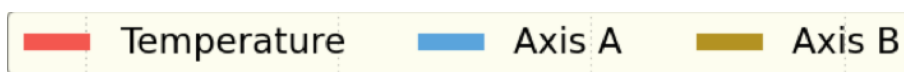
**Figure 8**

The font combo box allows you select the size of legend text from xx-small to xx-large.

Figures 9 and 10 show the smallest to largest font respectively. For reference ,the chart handle colour bars are the same size in real life.



**Figure 9: Smallest legend**



**Figure 10: Largest legend**

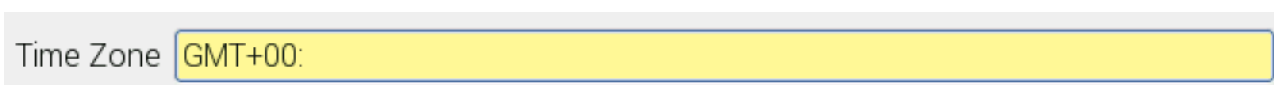
The medium font is set by default, which will suit most charts.

## 4.2 Observatory / Observer Metadata

*StarbaseMini* allows the setting of Observatory and Observer metadata which is to be included in exported files. The entries need to be Starbase-compliant and, as such, the application will attempt to check what the user enters into each field. Characters that aren't allowed can not be entered. The field will turn yellow when a partially correct entry (Figure 11) is entered and turns green once the field is fully compliant (Figure 12).

Holding the mouse cursor over the field will display a tooltip giving the user information about the field (Figure 13).

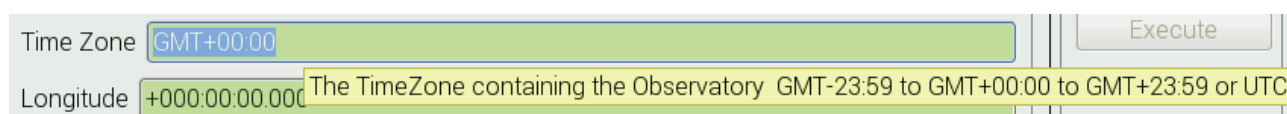
Please note that, like the legend attributes, metadata can be modified without restarting the application, despite what the status window reports upon closing the configuration tool.



**Figure 11: Partially correct entry**



**Figure 12: Fully compliant entry**

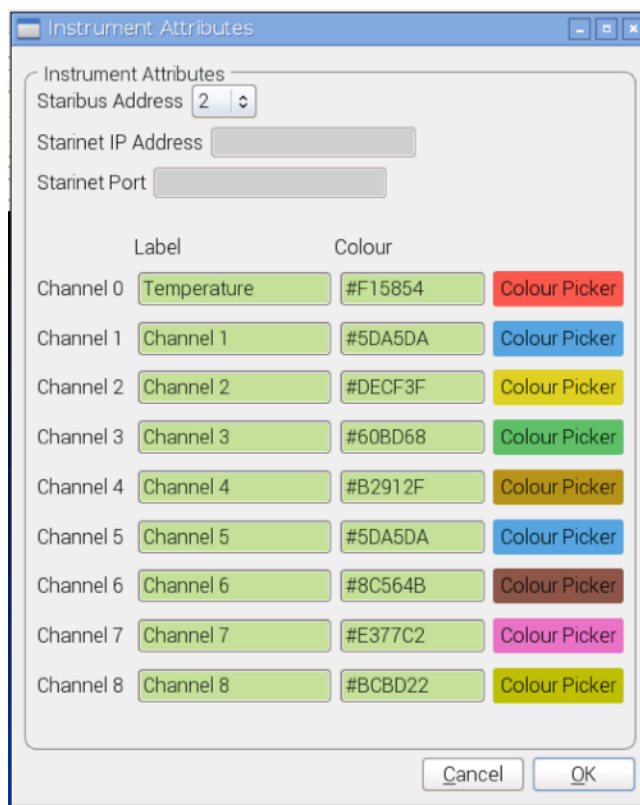


**Figure 13: Tool tip displayed**



## 5 Instrument Attributes

Each loaded instrument has a set of attributes that can be changed using the Instrument Attributes editor (Figure 20) located under the edit menu item. The user can set the Staribus Address or Starinet IP / Port where applicable. You can also rename the individual channel labels and chart line colours, by either entering Hex colours directly or using the Colour Picker.



The 'Instrument Attributes' dialog box is shown. It has a title bar with standard window controls. Inside, there's a section titled 'Instrument Attributes'. Below this, there are three input fields: 'Staribus Address' with a dropdown menu showing '2', 'Starinet IP Address' with an empty text box, and 'Starinet Port' with an empty text box. Below these is a table with two columns: 'Label' and 'Colour'. There are nine rows, each representing a channel from 0 to 8. Each row has a 'Label' text box and a 'Colour' text box with a hex code. To the right of each 'Colour' text box is a 'Colour Picker' button. At the bottom of the dialog are 'Cancel' and 'OK' buttons.

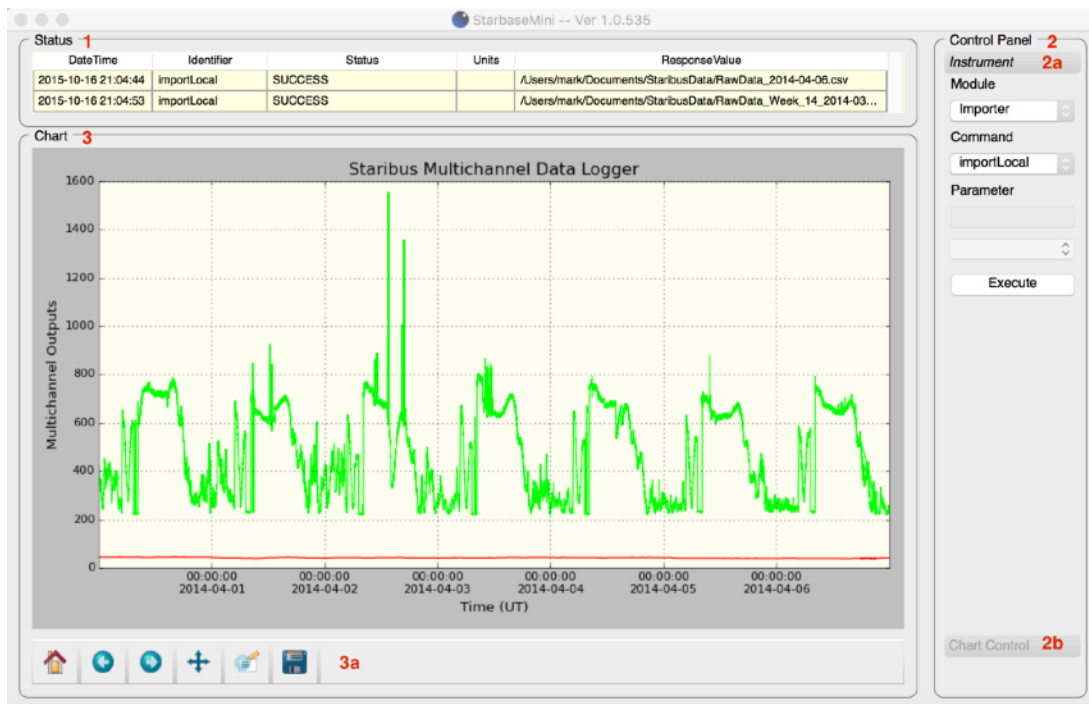
	Label	Colour	
Channel 0	Temperature	#F15854	Colour Picker
Channel 1	Channel 1	#5DA5DA	Colour Picker
Channel 2	Channel 2	#DECF3F	Colour Picker
Channel 3	Channel 3	#60BD68	Colour Picker
Channel 4	Channel 4	#B2912F	Colour Picker
Channel 5	Channel 5	#5DA5DA	Colour Picker
Channel 6	Channel 6	#8C564B	Colour Picker
Channel 7	Channel 7	#E377C2	Colour Picker
Channel 8	Channel 8	#BCBD22	Colour Picker

**Figure 20: Instrument attributes**

Note : To restore the default setting you'll need to remove the associated instrument XML from the **USER\_HOME/.starbasemini/instruments** folder. This will result in the application using the default XML.

## 6 Application Interface

The application interface is made up of three main components shown in Figure 14.

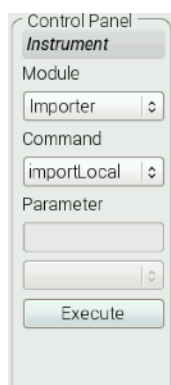


**Figure 14: Application interface**

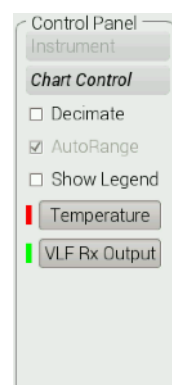
**Item 1** is the status window, it shows the date time the command was run, command name or system identifier, status code of the command upon completion, units of the response if available and finally the value of the response where applicable.

**Item 2** the control panel which consists of two parts the instrument panel item 2a and the chart control panel item 2b shown in figures 15 & 16 respectively.

**Item 3** is the chart pane and including the chart toolbar item 3a.



**Figure 15 (Item 2a)**



**Figure 16 (Item 2b)**

## 6.1 Control Panel

The instrument control panel is made up of four parts:

- Module,
- Command,
- Parameter
- Execute.

The instrument module and command combo boxes are populated from the instrument XML as described else where in this document. By clicking on either the module or command combo boxes a list of available modules or commands is displayed, by hovering the mouse pointer over these commands a description of its use is displayed as shown in figure 17.

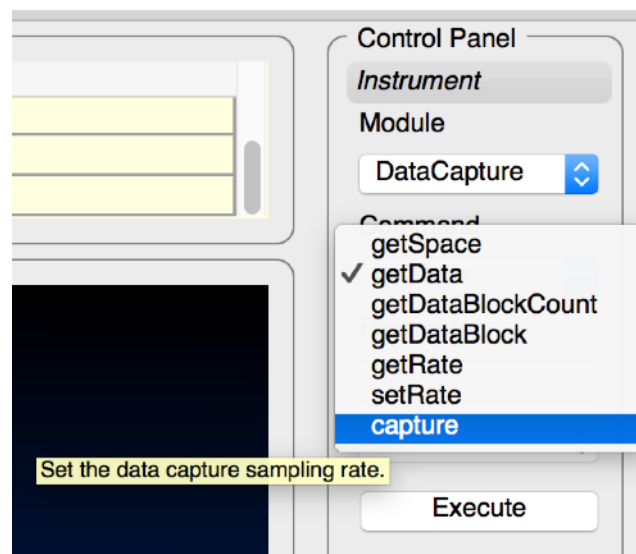


Figure 17

By default the parameter text entry and combo box are greyed out and disabled unless the command selected requires additional user input, in which case the parameter text entry will appear white or the combo box will become populated, again by hovering the mouse pointer over one or t'other a tooltip will be displayed. When the parameter text entry is enabled the application will only allow you to write the correct format of text and only when a correctly formatted parameter is entered enable the execute button, this however isn't the case when the parameter combo box is enabled.

To execute a command select the desired Module and Command combination, set the required parameter if applicable and press the execute button once, as default the command should work immediately however it will take, as default, a minute to timeout if some unspecified error occurs or the controller is not contactable.

## 6.2 Chart Control Panel

Using the chart control panel you can perform various operations on the data being displayed.

Checking the decimate check box will reduce the current data set by 75% in other words 3 in every 4 samples are dropped. Please note it may take awhile for the data to be redrawn depending on the size of the data set being decimated.

By checking the autoscale check box the data will be scaled to fit the plot window, it will only autoscale to the biggest sample no matter whether or not that particular channel is hidden or displayed.

As default the chart legend isn't shown by checking the chart legend check box the legend will displayed in the position set in the application configuration. If a channel is set to invisible and the legend is then enabled the legend handle colour will be missing against the label name, to overcome this enable the legend before hiding a channel. See figure 18 as an example.



**Figure 18: Example chart legend**

Each channel has a channel select button with the colour of that channel next to it, by selecting or deselecting the channel that channel will be hidden or shown. You can set the button label using the instrument attributes described further below.

### 6.3 Chart Toolbar

The chart toolbar appears at the bottom of the chart pane once the user has imported some data into the application either via the DataCapture module getData command or the Importer module importLocal command it consists of six parts as shown in figure 19



**Figure 19: Chart toolbar**

Starting from the left are the following controls:

**Home      Back      Forward      Pan      Rectangle Zoom      Save**

The Home button resets the screen to the original view.

When Pan or Zoom is used each operation results in a new view which can be navigated forward and backward using the Forward and Back buttons in the same manner as the forward and back button of an Internet browser.

Using the Pan button you can do one of two operations, by using the left mouse button you can pan the view in any direction and by using the right mouse button zoom the current view.

The Rectangle Zoom allows you to draw a box over a specific part of the chart and zoom in on that area.

By clicking the Save button the save dialog box will appear allowing you to save the current view to a number of different formats, by default PNG is the selected format. The additional supported formats are EPS, JPEG, PGF, PDF, PS, RAW, RGBA, SVG, SVGZ, and TIFF. The application will save the resulting images to the Data Save Path that is set in the application configuration this can be overridden using the file dialog when it appears.

## 7 Data Processor Module.

The DataProcessor module has one single command SegmentTimeSeries with two options segment by day or month.

Segment by month uses the Python 3 isocalendar module where the first week of the ISO calendar is the first week that contains at least four days of the month January. A more detailed explanation of the ISO calendar can be found at the below link.

<http://www.staff.science.uu.nl/~gent0113/calendar/isocalendar.htm>

The file naming for each option is as follows :

Day filename              RawData\_2014-04-07.csv

Week filename            RawData\_Week\_15\_2014-04-07.csv

If the file already exists then an extra number is appended to the filename such as the following, RawData\_2014-04-07.0.csv the appended number will increment until a unique filename is found.

## 8 Creating a new Instrument.

Creating a new instrument is fairly easy undertaking but does involve creating some XML.

<https://en.wikipedia.org/wiki/XML>

The easiest way to create a new instrument is to copy one of the original instruments from the \$APP\_HOME/instruments folder where \$APP\_HOME is the installation folder which will be :

Windows                  C:\Program Files\StarbaseMini

Mac OSX                  /Applications/StarbaseMini/

Linux where the user has uncompressed the installation too.

——— MORE TEXT TO BE ADDED LATER ———

### 8.1 Adding The New Instrument To The Application.

Once the new instrument XML has been created it needs to be placed in the .starbasemini/instruments folder located in the users Home directory. Please note that, due to the preceding period, this folder is hidden on Unix based systems.

To add the new instrument you will need to create a new file called instruments.xml which must start with the following line:

```
<?xml version="1.0" standalone="yes"?>
```

Each instrument is defined between the Instruments open and closing tags:

```
<Instruments>
</Instruments>
```

For each instrument you wish to define you need add an instrument open and closing tag, between which you need to have the name and file tags, which hold the instrument name and the file name holding the instrument XML

```
<Instrument>
  <Name>Example 4 Channel Logger</Name>
  <File>example-4ch-logger.xml</File>
</Instrument>
```

Note the name of the file must be in exactly the same format as shown in your file manager.

The completed file contents for a single instrument should look like this:

```
<?xml version="1.0" standalone="yes"?>
<Instruments>
  <Instrument>
    <Name>Example 4 Channel Logger</Name>
    <File>example-4ch-logger.xml</File>
  </Instrument>
</Instruments>
```